



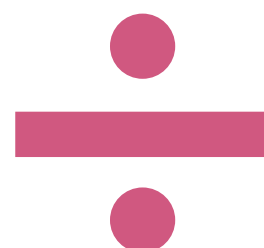
TEDS-M

An Analysis of Teacher Education Context, Structure, and Quality-Assurance Arrangements in TEDS-M Countries

*Findings from the IEA
Teacher Education and
Development Study in
Mathematics (TEDS-M)*

Lawrence Ingvarson
Maria Teresa Tatto
Ray Peck

John Schwille
Glenn Rowley
Sharon L. Senk



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Lawrence Ingvarson, John Schwille,
Maria Teresa Tatto, Glenn Rowley,
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*Australian Council for Educational Research
Michigan State University*



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Foreword

The IEA Teacher Education and Development Study in Mathematics (TEDS-M) represents the first ever large-scale international study of the preparation of primary and lower-secondary teachers. The study investigated the pedagogical and subject-specific knowledge that future primary and lower-secondary school teachers acquire during their mathematics teacher education. It also examined variations in teacher education programs within and across countries.

TEDS-M was carried out by the International Association for the Evaluation of Educational Achievement (IEA), an independent, international cooperative of national research agencies. For over 50 years, the association has conducted large-scale comparative studies of educational achievement and reported on key aspects of education systems and processes.

TEDS-M gathered data in 2008 from approximately 22,000 future teachers from 750 programs in about 500 teacher education institutions in 17 countries. Teaching staff within these programs (close to 5,000 mathematics and general pedagogy educators) were also surveyed.

The study identified striking differences within and across countries in the knowledge that future teachers have of school mathematics and how to teach it. The study also showed that, in almost all countries, the majority of future teachers surveyed saw mathematics as a process of enquiry that is best learned through active student involvement. This belief was held most widely by future teachers with relatively greater knowledge of mathematics content and pedagogy. These conclusions are just a few of those drawn from the results presented in the first TEDS-M report published in 2012, which focused on the future teachers' data.

This current report, in portraying various characteristics of teacher education systems, aids interpretation of the individual student-level results and provides information useful for policymakers as they endeavor to increase teacher quality. The report's major results show that countries where future teachers have greater knowledge of mathematics and mathematics teaching pedagogy place greatest emphasis on policies that enable the teaching profession to compete for high-ability secondary school graduates, balance teacher demand and supply, ensure a rigorous system of assessment/accreditation of teacher education programs, and set high standards for entry to the profession (i.e., gaining registration/licensing) after graduation.

These results are consistent with teacher education policy discussions occurring nationally and internationally about the most successful processes for assuring teacher quality. Such policies typically start with those designed to make teaching an attractive career and to ensure the quality of entrants to teacher education programs. They continue on to those focused on developing and implementing strong quality-assurance mechanisms throughout the teacher education cycle.

International studies such as TEDS-M would not be possible without the dedication, skill, cooperation, and support of a large number of individuals, institutions, and organizations from around the world. Referring to the list of acknowledgments on the next pages of this volume, I would like to thank all of them and especially the international study centers at Michigan State University in the United States and the

Australian Council of Educational Research, as well as the national teams headed by the national research coordinators in the participating countries. They are the people who manage and execute the study at the national level. This study also would not have been possible without the participation of many future teachers, their educators, and the policymakers within the participating countries. The education world benefits from their commitment.

I would also like to thank the study's funders. A project of this size is not possible without considerable financial contribution. TEDS-M was supported by the US National Science Foundation, IEA, and the ministries of education and many other organizations in all participating countries.

Dr Hans Wagemaker
Executive Director, IEA

Acknowledgements

Introduction

TEDS-M is the result of the collaborative effort of scholars and institutions to study the mathematics preparation of future primary and lower-secondary teachers. The study's success is due to the efforts of a great many people. The key contributors among this group are listed below.

Credit is due to the country national research centers, to the coordinators of the teacher education programs in the TEDS-M samples, and to the future teachers and teacher educators who made the collection of data possible. The willingness of so many future teachers and instructors to participate is very gratifying, especially given that participation for the future teachers meant agreeing to take a test of mathematics content and mathematics pedagogy knowledge.

The participating countries were Botswana, Canada (Newfoundland and Labrador, Nova Scotia, Québec, and Ontario), Chile, Chinese Taipei, Georgia, Germany, Malaysia, Norway, Oman, the Philippines, Poland, the Russian Federation, Singapore, Spain, Switzerland, Thailand, and the United States of America. The commitment of these countries to participate and overcome the many challenges of newly implementing a study of such magnitude as TEDS-M have made it possible to envisage a rich future of crossnational research on teacher education.

TEDS-M Management and Coordination

TEDS-M was conducted under the auspices of the International Association for the Evaluation of Educational Achievement (IEA). The College of Education at Michigan State University (MSU) and the Australian Council of Educational Research (ACER) were appointed by IEA as the joint international study centers (ISCs) for TEDS-M under the executive direction of Maria Teresa Tatto of MSU. To design and carry out the study, the ISCs worked in collaboration with the IEA Data Processing and Research Center (DPC), the IEA Secretariat in Amsterdam, Statistics Canada, and the TEDS-M national research centers in the 17 participating countries. Together, these teams of researchers and institutions conceptualized the study, designed and administered the instruments, collected and analyzed the data, and reported the results.

The TEDS-M ISC at Michigan State University worked closely with the ISC at ACER and the IEA Secretariat in Amsterdam, which provided overall guidance, and was responsible for verification of translations of the survey instruments produced by the participating countries and for the quality control of data collection.

The IEA DPC in Hamburg worked with the TEDS-M international center at MSU to prepare the manuals guiding the collection of data, and with both ISCs in all other aspects of data verification. The DPC was also responsible for data processing and verifying the internal consistency and accuracy of the data submitted by the participants. They were furthermore responsible for developing the TEDS-M database, which is available for secondary analysis by researchers worldwide.

Statistics Canada was responsible for the innovative sampling design that produced nationally representative samples of teacher education institutions, future primary and lower-secondary teachers, and teacher education instructors. Michigan State University

in collaboration with ACER and the University of Minnesota provided expertise on the application of psychometric methods and on data calibration and scaling of the opportunity to learn, beliefs, and knowledge assessment data. We are thankful to Eugene Gonzales of the ETS/IEA DPC for his contribution to the data calibration and scaling process.

The TEDS-M management team met twice a year throughout the study to discuss progress, procedures, and schedules. In addition, the directors of the TEDS-M ISCs met with members of IEA's technical executive group twice yearly to review technical issues.

Maria Teresa Tatto from Michigan State University was the principal investigator and the executive director of the TEDS-M study, and also chair of the TEDS-M Management Team. The study co-directors were John Schwille and Sharon Senk at the ISC at MSU. Lawrence Ingvarson, Glenn Rowley, and Ray Peck co-directed the study center at ACER.

TEDS-M frequently brought together panels of internationally recognized experts in mathematics and mathematics education, research, curriculum, instruction, and assessment. Their advice and review were critical to the credibility of the study and the results achieved. In order to expedite work with the international team and coordinate within-country activities, each participating country designated one or more individuals to be the TEDS-M national research coordinator or NRC. The NRCs had the complicated and challenging task of advising the international design team as well as implementing TEDS-M in their countries in accordance with international guidelines and procedures. The quality of the TEDS-M assessment and other data depended on the NRCs and their colleagues carefully carrying out the very complex sampling, data collection, and scoring tasks involved. Their names and affiliations are listed in Appendix B of this report.

Technical and Editorial Advice

Throughout TEDS-M, the writing and publishing of the various reports associated with it benefitted from the careful reviews of the IEA technical executive committee (TEG), comprising Hans Wagemaker (chair), Jan Eric Gustafson (Göteborg University), Larry Hedges (Northwestern University), Marc Joncas (Statistics Canada), Mick Martin (Boston College), Ina Mullis (Boston College), Heiko Sibberns (IEA DPC), and Norman Verhelst (Eurometrics). The IEA publications committee provided excellent editorial feedback; special thanks go to David Robitaille (University of British Columbia) and Bob Garden (Education Research Consultant, New Zealand).

Funding

TEDS-M was made possible through several sources of funding: fees from participating countries; a grant to Michigan State University from the National Science Foundation (REC 0514431); and funds from IEA's own financial reserves.

Any opinions, findings, and conclusions or recommendations expressed in this report are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

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OVERVIEW OF THE TEDS-M PROJECT

The Teacher Education and Development Study in Mathematics (TEDS-M), sponsored by the International Association for the Evaluation of Educational Achievement (IEA), is a crossnational comparative study of teacher education in 17 countries. Its particular focus is on the preparation of teachers who will teach mathematics.

Teacher education has become an area of considerable interest among policymakers in many countries over recent years. This interest reflects a growing body of research on the central importance that teacher knowledge and skills holds for quality learning opportunities for students. It also reflects the need to recruit and prepare a new generation of teachers as large numbers of current teachers reach retirement age. TEDS-M provided policymakers in the study's participating countries with a valuable opportunity to conduct research on their own teacher education systems and to learn from approaches used in other countries. The study also provided participating countries with valuable comparative data with which to examine the impact of current policies on teacher education practices and the quality of graduates from teacher education programs.

TEDS-M grew, in part, out of questions raised by earlier IEA studies of student achievement in mathematics and science, such as the Third International Mathematics and Science Study (TIMSS). Questions arose from those studies about the extent to which differences in student achievement across participating countries might relate to differences in how mathematics teachers are prepared.

To address such questions, TEDS-M gathered data at three levels. At the *national* level, information was gathered about the policy context and the organization of the teacher education system (the focus for the present volume). At the *institutional* level, the TEDS-M team gathered data from future teachers and teacher educators about the nature and content of their teacher education programs, including, for example, data about their opportunities to learn mathematics and how to teach it and their opportunities for school experience. At the *individual* level, data were gathered from future teachers nearing the end of their training about their knowledge of mathematics and mathematics pedagogy, as well as their beliefs about teaching and learning mathematics.

Reports from the Teacher Education and Development Study in Mathematics (TEDS-M)

Brese, F., & Tatto, M. T. (2012). *TEDS-M 2008 user guide for the international database*. Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement (IEA).

Carnoy, M., Beteille, T., Brodziak, I., Loyalka, P., & Luschei, T. (2009). *Teacher Education and Development Study in Mathematics (TEDS-M): Do countries paying teachers higher relative salaries have higher student mathematics achievement?* Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement.

Ingvarson, L., Schwille, J., Tatto, M. T., Rowley, G., Peck, R., & Senk, S. L. (2013). *The Teacher Education and Development Study in Mathematics (TEDS-M) policy report: An analysis of teacher education context, structure, and quality assurance in TEDS-M countries*. Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement.

Schwille, J., Ingvarson, L., & Holdgreve-Resendez, R. (in press). *The Teacher Education and Development Study in Mathematics (TEDS-M) encyclopedia*. Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement.

Tatto, M. T. (Ed.). (in press). *Teacher Education and Development Study in Mathematics (TEDS-M): Technical report*. Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement.

Tatto, M. T., Schwille, J., Senk, S. L., Ingvarson, L., Peck, R., & Rowley, G. (2008). *Teacher Education and Development Study in Mathematics (TEDS-M). Policy, practice, and readiness to teach primary and secondary mathematics: Conceptual framework*. Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement.

Tatto, M. T., Schwille, J., Senk, S. L., Ingvarson, L., Rowley, G., Peck, R., Bankov, K., Rodriguez, M., & Reckase, M. (2012). *Policy, practice, and readiness to teach primary and secondary mathematics in 17 countries: Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M)*. Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement.

INTRODUCTION

Lawrence Ingvarson

The present report is a companion report to the TEDS-M publication *Policy, Practice, and Readiness to Teach Primary and Secondary Mathematics in 17 Countries: Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M)* written by Tatto et al., (2012). That report presented findings about the nature and content of teacher education programs in the 17 participating countries, as well as the mathematical knowledge and pedagogical knowledge of graduates from those programs.

The present report focuses on reporting data gathered at the national level and placing those findings in context. When interpreting the findings presented in the aforementioned publication, it is important to understand the national context for schooling and the different ways in which the participating countries organize and regulate their teacher education systems.

Part One of this current report focuses on the national context for teacher education in the participating countries. Its purpose is to provide background information about those countries that will assist readers of other reports produced by the TEDS-M team. This information includes the following:

- The historical context of teacher education and current trends;
- The status of teaching and the relative attractiveness of teaching as a career; and
- The context within which teachers carry out their work.

These conditions have a strong impact on the quality of people attracted into teacher education programs and, therefore, the quality of future teachers of mathematics.

Part Two of this volume focuses on the policy context for teacher education, with special reference to the preparation of teachers of mathematics and, even more specifically, to the policies that regulate the quality of teachers and initial teacher education programs. Part 2 also documents the quality assurance arrangements operating in the 17 TEDS-M countries. These arrangements concern:

- The recruitment and selection of students entering teacher education programs;
- The assessment and accreditation of teacher education programs; and
- The certification of graduates as ready to enter the teaching profession.

Part Two furthermore examines relationships between policies for assuring the quality of future teachers and the quality of teacher education practices and outcomes measured in TEDS-M.

Data Sources

The primary source of data for this report was the “country report,” which each participating country prepared in response to guidelines provided by the TEDS-M international team. These reports provided fascinating windows into how much teacher education systems have come to vary within the context of continuing effort to make primary and lower-secondary education universal throughout the world.

The international team also asked the participating countries' national research coordinators (NRCs) to provide information in what was called the "route questionnaire." The questionnaire contained a range of questions about the main routes or pathways into teaching in each country, from entry to university (or equivalent) through to graduation and certification as a teacher. Questions asked in relation to each route, included, for example, the minimum credential or qualification required to enter that route, the level of prior academic achievement typical of teacher education students in that route, relative to their age group, and whether their country was experiencing a shortage of teachers.

The NRCs submitted their country reports in three main parts: (a) context and organization of teacher education, (b) quality assurance arrangements and program requirements, and (c) funding and reform of teacher education. Under *context and organization*, the NRCs reported on the following:

- The historical, cultural, and social factors that have played a significant role in shaping the teacher education system;
- Current policies and issues related to the teacher workforce, the teacher labor market, and teacher quality; and
- The structure and organization of the teacher education system.

Under *quality assurance and program requirements*, NRCs were asked about policies related to these aspects:

- Recruitment and entry into teacher education;
- Accreditation of teacher education programs; and
- Requirements for full entry to the teaching profession.

NRCs were also asked to pay particular attention in this part of their reports to curricula and field experience requirements. The third part of the report—*funding and reform of teacher education*—required NRCs to report on the financing of teacher education as well as current debates on reforms in this area.

The international team also asked specific questions and provided additional guidance for the NRCs under all three headings. In addition, the guidelines for the NRCs called for clarity about the within-country differences between types of teacher education, between education levels (elementary, lower secondary, upper secondary), between states or provinces in federal systems, and between public and private institutions. These data are not, however, reported in the present volume.

Initial drafts of the country reports from the NRCs generally comprised 20 to 30 pages of single-spaced type. Lawrence Ingvarson and John Schwille reviewed these reports and began a detailed editing process, raising questions and making suggestions as the basis for a second version. After completion of the initial review, time was scheduled during two meetings of the TEDS-M NRCs to meet individually with these people in order to discuss matters needing clarification or meriting further elaboration in a second draft of their country reports. It is mainly the content of these second versions that served as the basis for this volume. As might be expected, the country reports have different emphases, with each providing more depth in some sections than in others. Some reports have little or nothing to say about topics considered unimportant or irrelevant to the country in question—a feature that (logically) is replicated in this international volume.

NRCs experienced difficulty providing information on some of the topics included in the guidelines for preparing country reports. For example, most countries were unable to report the costs of teacher education with sufficient accuracy and coverage for this information to be used in the present volume. Responses to questions on curricula and reform initiatives were also more limited and general than we had hoped for. This situation may simply mean that, at the national level, discourse on teacher education and the specific requirements imposed on teacher education are largely framed in ways that apply to all curriculum subjects rather than in terms specific to mathematics teacher education.

The country reports used for this volume are generally well documented with citations and references. Because readers wanting complete references can obtain copies of these reports, we have not duplicated them all in this volume. Instead, references are limited to quotations and other specific information whose source needs to be acknowledged. We have also included other references not found in the country reports so as to fill in matters not addressed in those reports.

Authors and Titles of the TEDS-M Country Reports

Botswana

Garegae, K. G., Mzwinila, T. J., and Keitumetse, T. M. (2008). *Mathematics teacher education in Botswana: Policies, programs and practices.*

Canada

Crocker, R. and Jodouin, H. (2008). *Country report on teacher education: Canada.*

Chile

Avalos Davidson, B. (2008). *Teacher education in Chile: Context, policies and institutions.*

Chinese Taipei

Hsieh, F.-J., Lin, P.-J., Chao, G., and Wang, T.-Y. (2008). *Country report on teacher education: The development and transformation of teacher education in Chinese Taipei.*

Georgia

Mzhavandze, N., and Bokuchava, T. (2008). *Country report on teacher education: Georgia.*

Germany

König, J., and Blömeke, S. (2008). *Country report on teacher education in Germany.*

Malaysia

Nagappan, R., Ratnavadivel, N., Lebar, O., Kailani, I., and Malakolunthu, S., and Karim, M. (2008). *Country report on teacher education in Malaysia.*

Norway

Breiteig, T. (2008). *Country report on teacher education: Norway.*

Oman

Al Ghafri, M., Al Abri, A., and Al Shidhani, M. (2008). *Country report on teacher education: Oman.*

Philippines

Ogena, E. B., Brawner, F. G., and Ibe, M. D. (2008). *Country report on teacher education: Philippines*.

Poland

Sitek, M. (2008). *Country report on teacher education: Poland*.

Russian Federation¹**Singapore**

Wong, K. Y., Lim-Teo, S. K., Lee, N. H., Boey, K. L., Koh, C., Dindyal, J., Teo, K. M., and Cheng, L. P. (2008). *Country report on teacher education: Singapore*.

Spain

Castro Martínez, E. and Flores Martínez, P. (2008). *Spanish report on teacher education at the primary level*.

Switzerland

Brandt, S., Oser, F., Biedermann, H., Kopp, M., Steinmann, S., Krattenmacher, S., and Brühwiler, C. (2008). *Country report about teacher training in Switzerland*.

Thailand

Dechsri, P., and Pativisan, S. (2008). *Country report on teacher education: Thailand*.

United States of America

Youngs, P., and Grogan, E. (2008). *United States country report on teacher education*.

Reference

Tatto, M. T., Schwille, J., Senk, S. L., Ingvarson, L., Rowley, G., Peck, R., Bankov, K., Rodriguez, M., & Reckase, M. (2012). *Policy, practice, and readiness to teach primary and secondary mathematics in 17 countries: Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M)*. Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement.

¹ Because of funding difficulties, the Russian Federation was unable to provide a report. The information on Russia in this volume was written with the assistance of G. Kovaleva.

Part One

National and Crossnational Perspectives on Mathematics Teacher Education and Its Contexts

The first part of this volume examines the diversity of teacher education provision from the following perspectives:

- A crossnational analysis of similarities and differences in the organization of teacher education and its contexts (Chapter 1);
- Portraits of the distinctive aspects of teacher education for mathematics in each country that readers need to know in order to successfully interpret the TEDS-M survey results (Chapter 2);
- An analysis of four major developments in the history of teacher education provision within and across the participating countries (Chapter 3); and
- An examination of the different positions and careers for which these countries are preparing future teachers (Chapter 4).

CHAPTER 1:

ORGANIZATION OF TEACHER EDUCATION AND ITS CONTEXTS ACROSS THE TEDS-M COUNTRIES

John Schwille, Lawrence Ingvarson, Maria Teresa Tatto, Richard Holdgreve-Resendez, Wangjun Kim, and Soo-Yong Byun

The manner in which teacher education is organized varies in many ways both within and across countries. Some of these differences are major in the sense that they are likely to have considerable impact on the amount, scope, and nature of the opportunities to learn offered to future teachers as well as on what those teachers actually learn. The TEDS-M crossnational data collection and analysis indicated that the organization of teacher education can, however, be characterized and compared in terms of a few key parameters (see also Schwille & Dembélé, 2007, Chapter 3). We discuss each of these below in terms of why they were chosen and what their likely importance is crossnationally. It is important to note here that countries differ greatly as to which parameters are determined at the national level and which are left for the institutions to decide. However, as is evident from the thumbnail sketches of the organizational characteristics of teacher education in the TEDS-M countries in Chapter 2, one or more of these parameters is addressed in the national policy of each country.

The information reported in this chapter is based primarily on national reports prepared by the TEDS-M national research coordinators (NRCs) from each of the countries in response to a structured list of questions provided by the study's international research centers, and a survey about the teacher education policies in the respective countries.

TEDS-M Organizational Terminology

TEDS-M uses two key terms to denote the structure and organization of teacher education: *program* and *program-type*. Program refers to a prescribed course of study leading to a teaching credential. Program-type refers to groups of programs that share similar purposes and structural features, such as the credential earned, the type of institution in which the program-type is offered, whether the program-type is concurrent or consecutive, the range of school grade levels for which teachers are prepared, the duration of the programs in the program-type, and the degree of subject-matter specialization for which future teachers are prepared.

In other words, program-type refers to the distinctive organizational features that distinguish the different pathways leading to qualification as a teacher. For example, in Poland, one of the program-types is a relatively new first-cycle Bachelor's degree designed to prepare teachers for integrated teaching in Grades 1 to 3. The opportunities to learn organized for future teachers within this program-type have certain attributes in common regardless of which university offers them. Some of these common features differ from the common features of other program-types in Poland, such as those that prepare mathematics specialists to teach in Grade 4 and above. In contrast, the word program in TEDS-M refers only to the way a program-type has been implemented in one particular institution.

In short, the terms program and program-type replace the need to use the one word program to refer ambiguously either to teacher education as organized in one particular institution or to closely related offerings at multiple institutions.¹ Thus, whatever National Taiwan Normal University offers to qualify students to teach secondary school mathematics is a program, whereas the program-type Secondary Mathematics Teacher Education consists of the common characteristics of all such programs throughout Chinese Taipei. Thus, multiple programs of the same type in multiple institutions typically make up a program-type. Exhibit 1.1 lists all program-types included in the TEDS-M target population of each country along with some of their most important organizational features.

Key Organizational Parameters

Concurrent and Consecutive Program-Types

Reference to the distinction between *concurrent* and *consecutive* program-types is one of the ways we can distinguish teacher education both within and across the TEDS-M countries. Concurrent program-types grant future teachers a single credential for studies in subject-matter content, pedagogy, and other courses in education; this all happens at the same time, concurrently during the first period of post-secondary education. In contrast, a consecutive teacher education program-type requires completion of two phases of post-secondary education: first, a university degree with specialization in the subject-matter to be taught, followed by a separate program focused primarily on pedagogy and practicum. Most program-types in TEDS-M are concurrent, but consecutive program-types exist and were surveyed in Georgia, Malaysia, Norway, Oman, Singapore, Thailand, and the United States.

The only TEDS-M country where this distinction does not have close application is Germany, where preparation for teaching is spread across two phases. The first phase takes place in universities and the second (a practical phase) is provided in special institutions by each federal state.² In addition to coursework in academic subjects, the first phase includes classes in subject-specific pedagogy and general pedagogy. During the second phase, future teachers pursue further study while simultaneously taking full responsibility for teaching assigned classes in a primary or secondary school.

Although the distinction between concurrent and consecutive program-types is now widely used in both literature and practice, few systematic crossnational studies have investigated how concurrent and consecutive program-types differ in terms of curricula and practices, except for the fact that consecutive program-types tend to provide all or most of their subject-matter content early in the program-type and their pedagogical content and field experience toward the end. While the TEDS-M data should further clarify the distinction for us, the difference may not be that great, especially when, as is commonly the case, concurrent and consecutive programs are offered in the same institution.

1 However, in some countries, just one institution offers a program-type (e.g., the University of Botswana and the National Institute of Education in Singapore), in which case program and program-type are the same.

2 However, a few states have no such special institution; the second phase is offered in regular elementary and secondary schools.

Exhibit 1.1: Organizational characteristics of teacher education program-types in TEDS-M

Country	Program-Type	Consecutive/ Concurrent	Duration (Years)	Grade Span	Specialization	Program-Group	Test Administered
Botswana	Diploma in Primary Education	Concurrent	3	1-7	Generalist	3: Primary-lower secondary (Grade 10 max.)	Primary
	Diploma in Secondary Education, Colleges of Education	Concurrent	3	8-10	Specialist	5: Lower secondary (Grade 10 max.)	Secondary
	Bachelor of Secondary Education (Science), University of Botswana	Concurrent	4	8-12	Specialist	6: Upper secondary (up to Grade 11 and above)	Secondary
Canada							
Ontario	Primary/Junior	Consecutive	4+1	1-6	Generalist	2: Primary (Grade 6 max.)	NA
	Junior/Intermediate	Consecutive	4+1	4-10	Generalist and specialist	Both 3 (primary-lower secondary, Grade 10 max.) and 5 (lower secondary, Grade 10 max.)	NA
	Intermediate/Senior	Consecutive	4+1	7-12	Specialist (in two subjects)	6: Upper secondary (up to Grade 11 and above)	NA
	Primary	Concurrent	4	1-6	Generalist	2: Primary (Grade 6 max.)	NA
	Secondary	Concurrent	4	7-11	Specialist	6: Upper secondary (up to Grade 11 and above)	NA
	Primary	Consecutive	4+2	1-6	Generalist	2: Primary (Grade 6 max.)	NA
Nova Scotia	Secondary (Junior and Senior)	Consecutive	4+2	7-12	Specialist	6: Upper secondary (up to Grade 11 and above)	NA
	Primary/Elementary	Concurrent	5	1-6	Generalist	2: Primary (Grade 6 max.)	NA
Newfoundland-Labrador	Intermediate/Secondary	Consecutive	4+1	7-12	Specialist	6: Upper secondary (up to Grade 11 and above)	NA
	Generalist	Concurrent	4	1-8	Generalist	Both 3 (primary-lower secondary, Grade 10 max.) and 5 (lower secondary, Grade 10 max.)	Both
Chile	Generalist with Further Mathematics Education	Concurrent	4	5-8	Generalist	5: Lower secondary (Grade 10 max.)	Secondary
Chinese Taipei	Elementary Teacher Education	Concurrent	4.5	1-6	Generalist	2: Primary (Grade 6 max.)	Primary
	Secondary Mathematics Teacher Education	Concurrent	4.5	7-12	Specialist	6: Upper secondary (up to Grade 11 and above)	Secondary
Georgia	Bachelor of Pedagogy	Concurrent	4	1-4	Generalist	1: Lower primary (Grade 4 max.)	Primary
	Bachelor of Arts in Mathematics	Concurrent	3	5-12	Specialist	6: Upper secondary (up to Grade 11 and above)	Secondary
	Master of Science in Mathematics	Concurrent	5	5-12	Specialist	6: Upper secondary (up to Grade 11 and above)	Secondary
	Master of Science in Mathematics	Consecutive	5	5-12	Specialist	6: Upper secondary (up to Grade 11 and above)	Secondary

Exhibit 1.1: Organizational characteristics of teacher education program-types in TEDS-M (contd.)

Country	Program-Type	Consecutive/ Concurrent	Duration (Years)	Grade Span	Specialization	Program-Group	Test Administered
Germany	Teachers for Grades 1–4 without mathematics as a teaching subject (Type 1B)	Hybrid of the two	3.5+2.0	1–4	Generalist	1: Lower primary (Grade 4 max.)	Primary
	Teachers of Grades 1–9/10 with Mathematics as a Teaching Subject (Type 2A)	Hybrid of the two	3.5+2.0	1–9/10	Specialist (in two subjects)	Both 4 (primary mathematics specialist) and 5 (lower secondary, Grade 10 max.)	Both
	Teachers for Grades 1–10 without Mathematics as a Teaching Subject (Type 2B)	Hybrid of the two	3.5+2.0	1–4	Generalist	1: Lower primary (Grade 4 max.)	Primary
	Teachers for Grades 5/7–9/10 with Mathematics as a Teaching Subject (Type 3)	Hybrid of the two	3.5 + 2.0	5/7–9/10	Specialist (in two subjects)	5: Lower secondary (Grade 10 max.)	Secondary
	Teachers for Grades 5/7–12/13 with Mathematics as a Teaching Subject (Type 4)	Hybrid of the two	4.5+2.0	5/7–12/13	Specialist (in two subjects)	6: Upper secondary (up to Grade 11 and above)	Secondary
	Bachelor of Education, Primary	Concurrent	4	1–6	Specialist (in two subjects)	4: Primary mathematics specialist	Primary
Malaysia	Diploma of Education (Mathematics)	Concurrent	4+1	1–6	Specialist (in two subjects)	4: Primary mathematics specialist	Primary
	Malaysian Diploma of Teaching (Mathematics)	Concurrent	3	1–6	Specialist (in two subjects)	4: Primary mathematics specialist	Primary
	Bachelor of Education (Mathematics), Secondary	Concurrent	4	7–13	Specialist (in two subjects)	6: Upper secondary (up to Grade 11 and above)	Secondary
	Bachelor of Science in Education (Mathematics), Secondary	Concurrent	4	7–13	Specialist (in two subjects)	6: Upper secondary (up to Grade 11 and above)	Secondary
	General Teacher Education (ALU) with Mathematics Option	Concurrent	4	1–10	Generalist with extra mathematics	Both 3 (Primary–lower secondary, Grade 10 max.) and 5 (lower secondary, Grade 10 max.)	Both
	General Teacher Education (ALU) without Mathematics Option	Concurrent	4	1–10	Generalist	Both 3 (primary–lower secondary, Grade 10 max.) and 5 (lower secondary, Grade 10 max.)	Both
Norway	Teacher Education Program (PPU)	Consecutive	3+1 (or 5+1)	8–13	Specialist (in two subjects)	6: Upper secondary (up to Grade 11 and above)	Secondary
	Master of Science	Concurrent	5	8–13	Specialist (in two subjects)	6: Upper secondary (up to Grade 11 and above)	Secondary

Exhibit 1.1: Organizational characteristics of teacher education program-types in TEDS-M (contd.)

Country	Program-Type	Consecutive/ Concurrent	Duration (Years)	Grade Span	Specialization	Program-Group	Test Administered
Oman	Bachelor of Education, University	Concurrent	5	5-12	Specialist	6: Upper secondary (up to Grade 11 and above)	Secondary
	Educational Diploma after Bachelor of Science	Consecutive	5+1	5-12	Specialist	6: Upper secondary (up to Grade 11 and above)	Secondary
	Bachelor of Education, Colleges of Education	Concurrent	4	5-12	Specialist	6: Upper secondary (up to Grade 11 and above)	Secondary
Philippines	Bachelor in Elementary Education	Concurrent	4	1-6	Generalist	2: Primary (Grade 6 max.)	Primary
	Bachelor in Secondary Education	Concurrent	4	7-10	Specialist	5: Lower secondary (Grade 10 max.)	Secondary
	Bachelor of Pedagogy Integrated Teaching, First Cycle	Concurrent	3	1-3	Generalist	1: Lower primary (Grade 4 max.)	Primary
Poland	Master of Arts Integrated Teaching, Long Cycle	Concurrent	5	1-3	Generalist	1: Lower primary (Grade 4 max.)	Primary
	Bachelor of Arts in Mathematics, First Cycle	Concurrent	3	4-9	Specialist	Both 4 (primary mathematics specialist) and 5 (lower secondary, Grade 10 max.)	Both
	Master of Arts in Mathematics, Long Cycle	Concurrent	5	4-12	Specialist	Both 4 (primary mathematics specialist) and 6 (upper secondary, up to Grade 11 and above)	Both
Russian Federation	Primary Teacher Education	Concurrent	5	1-4	Generalist	1: Lower primary (Grade 4 max.)	Primary
	Teacher of Mathematics	Concurrent	5	5-11	Specialist	6: Upper secondary (up to Grade 11 and above)	Secondary
Singapore	Post-Graduate Diploma in Education, Primary Option C	Consecutive	4+1	1-6	Generalist	2: Primary (Grade 6 max.)	Primary
	Bachelor of Arts in Education, Primary	Concurrent	4	1-6	Generalist	2: Primary (Grade 6 max.)	Primary
	Bachelor of Science in Education, Primary	Concurrent	4	1-6	Generalist	2: Primary (Grade 6 max.)	Primary
	Diploma of Education, Primary Option A	Concurrent	2	1-6	Specialist (in two subjects)	4: Primary mathematics specialist	Primary
	Diploma of Education, Primary Option C	Concurrent	2	1-6	Generalist	2: Primary (Grade 6 max.)	Primary
	Post-Graduate Diploma in Education, Primary Option A	Consecutive	4+1	1-6	Specialist	4: Primary mathematics specialist	Primary
	Post-Graduate Diploma in Education, Lower Secondary	Consecutive	4+1	7-8	Specialist (in two subjects)	5: Lower secondary (Grade 10 max.)	Secondary
	Post-Graduate Diploma in Education, Secondary	Consecutive	4+1	7-12	Specialist (in two subjects)	6: Upper secondary (up to Grade 11 and above)	Secondary

A third form of teacher education organization, namely, school-based program-types, is now widely available in some countries such as the United States, in addition to consecutive and concurrent program-types. These take more of an apprenticeship approach to learning to teach. They are not, however, represented in the TEDS-M database.

School Grade Levels For Which a Program-Type Prepares Teachers

One of the most obvious ways in which to classify teacher education program-types is to determine whether they prepare teachers for primary school or secondary school. However, it quickly became apparent in TEDS-M that this classification is an oversimplification. The terms *primary* and *secondary* do not mean the same thing from country to country. Instead, the grade spread covered by each teacher education program-type better reflects the structure of schooling in each country. For example, a number of countries have primary program-types that prepare teachers to teach from Grades 1 to 6. Example countries are Chinese Taipei, Georgia, and Malaysia, where these grades constitute primary school (see Exhibit 1.1). Other countries, such as Botswana, Chile, and Thailand, have program-types that also start at kindergarten or Grade 1 and extend up to Grade 7, Grade 8, and even Grade 12, respectively. At the other extreme, primary schooling in most German states is limited to Grades 1 to 4.

Chile and Norway have program-types that prepare teachers for both primary and lower-secondary schools. These program-types make little or no distinction between the preparation of teachers for the early grades and for the middle grades, a situation very different from countries such as Chinese Taipei and Germany where there is much differentiation. Grade spread is thus a useful indicator of policy decisions (albeit shaped by tradition and history) on the extent to which the teacher workforce should be unified in its knowledge base and practice.

As Exhibit 1.1 shows, these differences in grade spread are reflected in the decisions that the TEDS-M research team made on which instruments to administer to future teachers studying under each program-type. Although the TEDS-M crossnational assessment instruments were developed to assess mathematics teaching knowledge at two levels of schooling only (primary and lower secondary), for purposes of test administration, all program-types were classified according to three levels:

- *Primary* for program-types in a country judged to be purely primary;
- *Lower secondary* for program-types in a country judged to be purely secondary; and
- *Primary–secondary* for program-types covering both primary and secondary grades.

The future teachers studying under the program-type judged to be primary were given only the primary instruments, and those judged to be studying under the secondary program-type were given only the secondary instruments. The future teachers studying under the program-types judged to be combined primary–secondary received either the primary instrument or the secondary instrument. Allocation was done by dividing the future teacher sample in the combined program-types into two random halves, with one half receiving the primary assessment and the other half the secondary assessment.³

³ For the rest of this report, it is essential to remember that in the tables and graphs reporting on primary and secondary future teachers separately, one of the split halves is reported under primary and the other under secondary, even though the future teachers in question experienced exactly the same program-type and its opportunities to learn.

Duration of Program-Types

Duration of initial teacher education is of major concern to policymakers, and one reason for this is cost. Full-time initial-teacher-preparation program-types that last a number of years are expensive (see, for example, Schwille & Dembélé, 2007). However, although shorter program-types may be cheaper, they may also be less effective (with more teachers requiring professional development, remediation, or termination). Longer program-types are ordinarily more expensive not only in terms of institutional costs but also in terms of foregone income and other expenses borne directly by the student. Comparable crossnational data on duration provides a platform from which to analyze teacher-education costs.

The TEDS-M program-types preparing *primary* teachers are usually four years long, but there is some variation. Exhibit 1.1 shows the duration of the single phase of concurrent program-types as well as the duration of the first phase plus the second phase (e.g., 4 + 1, meaning four years in the first phase and one year in the second) of consecutive program-types. Program-types preparing *secondary* teachers also show some variation. Concurrent program-types commonly require four years. The first phase of consecutive program-types typically lasts four years and the second phase one year. Germany is again an exception. The first phase in Germany is usually 3.5 or 4.5 years and the second 1.5 or 2 years.

As is the case with grade span, the length of teacher education program-types is a key issue for higher-education policymakers. According to the literature, variation in the duration of teacher education within and across countries is striking, ranging (in the sources consulted) from a few months to eight years (Lewin & Stuart, 2003; OECD, 2005). This variation is due to various conditions, including economic constraints, the relationship between demand for and supply of teachers, the education level of applicants, and, in particular, the amount and quality of applicants' content knowledge. Because of costs and pressures accompanying the need to attain universal primary schooling in countries that lack it, program-types of less than a year are more prevalent in developing than in industrialized countries. The *alternative routes* for school-based or apprenticeship program-types in industrialized countries likewise tend to have relatively short terms of formal training accompanied by longer periods of internship and/or probation.

In short, duration raises an unavoidable dilemma: "... longer, the more expensive, and... shorter, the more difficult to do anything worthwhile" (Schwille & Dembélé, 2007, p. 69). Knowing the effects of duration in total years from completion of secondary school to becoming fully qualified to teach is therefore useful because this information allows us to see how much of the differences between program-types in knowledge scores is accounted for by duration and how much is left to other factors to explain. Because the total duration of the two phases of consecutive program-types tends to make the latter more expensive than concurrent program-types, it is important to know if these longer program-types are cost-effective in terms of added value relative to the cost of longer duration. In other words, is the longer duration of a consecutive over a corresponding concurrent program-type worth the cost? TEDS-M does not answer this question. Instead, it makes clear that this is a question that requires an answer.

Subject-Matter Specialization

Program-types can also be classified according to whether they prepare *generalist* teachers or *specialist* teachers of mathematics. Primary-school teachers in most of the TEDS-M countries are prepared as generalists able to teach most if not all the core subjects in the school curriculum. However, several TEDS-M countries also prepare specialist teachers of mathematics to teach below Grade 6. They are Germany, Malaysia, Poland, Singapore, Thailand, and the United States. In lower-secondary schools, specialization is more the norm across countries. However, in most cases, this situation means teaching not one but two main subjects, such as mathematics and science. If degree of specialization were not kept in mind, comparing program-types that differ in this respect would lead to misleading conclusions. A future teacher being prepared to specialize in teaching mathematics is likely to learn more mathematics content knowledge than a future teacher being prepared to teach more than one subject.

The difference between one, two, or three or more teaching subjects is not necessarily clear-cut since the various country reports speak of students taking small amounts of a second or third subject without being explicit about whether and under what conditions they would be able to teach those subjects. TEDS-M addressed this problem by classifying each program-type in terms of *primarily* teaching only one subject, *primarily* teaching only two subjects (mathematics and one other), and *primarily* teaching three or more subjects (i.e., the generalist teacher).⁴

This classification of specialization in TEDS-M does not cover the preparation of teachers who eventually teach “out of field,” that is, teach a subject, such as mathematics, for which they are neither adequately prepared nor qualified according to the official norms of the country. Thus, in this and other respects, the preparation of the future teachers surveyed by TEDS-M may have differed markedly from how recently hired practicing teachers were actually prepared.

Exhibit 1.1 above shows the degree of specialization in each of the program-types included in TEDS-M.

Number of Future Teachers in Different Program-Types

Paying attention to the number of future teachers who reach the final year of their program-type is essential to understanding the structure of teacher education in any particular country. If we did not keep this matter in mind, we might easily assume that some program-types play a more important role in meeting the demand for new teachers than they in fact do.

The exhibits in Chapter 2 show how number of future teachers varies by program-type. For each country, the corresponding exhibit indicates which program-types produce the most graduates and which the least. In Norway, for example, where we stress the importance of not confusing the two main program-types, we see that ALU/PLS with mathematics is a much smaller program-type than the ALU/PLS without supplemental mathematics. We also clearly see that the other two secondary program-types in Norway are very marginal in terms of numbers.

⁴ When analyzing and reporting TEDS-M survey results, we combined program-types specializing in just one teaching subject with program-types specializing in two teaching subjects to form the dichotomy “specialist program-types” versus “generalist program-types.”

This estimate of program-type enrolments in the last year of teacher education is based on the sum of weights from the achieved TEDS-M sample. These sums of weights are unbiased estimates of the actual total number of future teachers in the target population broken down by program-type. It is unlikely that all these estimates could be derived from any source other than TEDS-M—even within a single country. This point is especially applicable to preparation of teachers for lower-secondary school. TEDS-M was *not* searching for the total number of future teachers preparing to become lower-secondary teachers—a figure that might be easier to find. Instead, TEDS-M was concerned with finding out how many future lower-secondary teachers are preparing for mathematics as their only or as one of their two main teaching subjects. National educational statistics are unlikely to contain number of future secondary teachers by subject-matter specialization.

Duration and Nature of Field Experience

Field experience refers to the time that future teachers spend in primary- or lower-secondary schools in order to learn pedagogical skills by participating in those settings. Duration of field experience is a particularly important consideration, for the same reasons discussed in relation to overall duration above. We can assume that the more time a future teacher spends practicing in schools, the stronger the impact on his or her pedagogical learning.

Although TEDS-M data on field experience are limited, each of the country reports discusses field experience as a major organizational factor in teacher education. These reports make clear that there is much variation in the duration of field experience, especially when it is defined to include all segments of field experience within a program-type. There is also the need to take into account that this experience can be concentrated in one segment of time at the end of the program-type or dispersed in segments throughout the program-type.⁵ Distinguishing between official expectations or requirements and the actual number of days future teachers spend in school is also desirable, even though doing this did not prove possible in TEDS-M. We know from other sources that in resource-scarce countries especially (and more so when transportation is difficult), future teachers are often unable to fulfill all officially expected field- experience requirements.

Duration may be important, but it is not at all a sufficient means of gauging the quality of field experience. As the TEDS-M country reports illustrate, program-types differ greatly in the nature of field experience, leading to variation in the following:

1. The total duration of field experience from beginning to end of the program-type;
2. The number and duration of each of the segments of field experience that may be dispersed throughout the program-type (field experience requirements are often apparent during each year of the program-type) or concentrated in a single intensive experience late in the program-type;
3. Exactly when each of these segments is scheduled;

⁵ It is important to measure this duration in terms of days because the more conventional way of stating practicum lengths, for example, in number of weeks or even months, may conceal important differences in terms of the number of days per week (adjusting for partial days) that future teachers are actually “on the job” in elementary or secondary school in order to gain field experience. We already know (e.g., from the TEDS-M country reports) that, in some countries, future teachers may be required to spend only one, two, three, or four full days a week in school and/or to spend less than a fulltime complement of hours on those days when they are in school.

4. The sites where they take place (in terms of constraints and options for selecting appropriate schools); and (by no means least)
5. How and by whom the future teachers in these segments are assigned, mentored, and assessed.

There is also much variation in the responsibilities assigned to future teachers during their field experience and final practicum. These responsibilities range from being assigned—often early in the program-type—solely to observe teachers and students through to being required to tutor individual students or work with small groups, to provide other assistance to the teacher in charge either before, during, or after instruction, and finally to becoming the lead teacher, that is, being temporarily given charge of the whole class with or without close supervision from the assigned mentor.

National or state/provincial policy could spell out what is expected from field experience in these diverse respects. However, according to TEDS-M country reports, it rarely does do this. Chinese Taipei is an exception. There, according to the country report, ministry guidelines include or require policies on the following:

- Selection of practicum schools and internship supervisors;
- Mandatory qualifications for university supervisors (teaching staff only, no doctoral students);
- Mandatory qualifications for school supervisors (at least three years' teaching experience);
- Methods of supervision of future teachers;
- The number of future teachers that can be assigned to each supervisor;
- The number of hours future teachers must spend in a school each week;
- The rights and obligations of future teachers during field experience;
- Procedures for handling unsatisfactory performance;
- Methods of evaluating future teachers; and
- Provision of counseling literature, hotlines, and internet resources to respond to questions or problems troubling future teachers during field experience.

One plausible hypothesis regarding the differences in how much field experience is regulated is that field experience that is taken seriously (i.e., carefully and competently planned, mentored, and evaluated) will have a greater (and positive) effect on future teachers' learning than field experience that is not taken seriously. This directed approach contrasts with field experience as a “sink or swim” process. Sink or swim captures the essence of field experience when there is little or no mentoring or assistance from others, such as experienced practicing teachers or specially selected university personnel. When the persons responsible for teaching, guiding, assisting, and/or supporting future teachers during field experience receive no release time from their other fulltime teaching duties, are not given additional compensation for this role, are not specially trained to be mentors, and are not held accountable in any way for their performance as mentors, we can hypothesize that sink or swim is nearly inevitable (Clift & Brady, 2005).

Locus of Control in the Organization of Teacher Education

In some countries, policymaking with respect to teacher education is highly centralized, which means that many decisions about the organization of teacher education are made by policymakers in the national or provincial ministries of education. In other countries, many of the same decisions are left to the institutions of teacher education. The following are examples of program features that are decided in some countries at the national or provincial level and in others at the local level.

- *Goals and program-type emphases:* for example, whether the program-type embodies a vision of good teaching that serves to unify its curriculum and practices in a coherent fashion; also whether the program-type upholds “traditional” best practices or is intended to advance a particular reform.
- *Selectivity of future teachers entering a program-type:* that is, variation in prior levels of academic achievement as a function of such factors as appeal of teaching careers, labor market demand for teachers, and incentives offered by policymakers (all of which are discussed in a subsequent chapter).
- *Duration and other characteristics of the practicum/field experience:* that is, when scheduled, what types of schools and classrooms are used, and especially how and by whom practicum assignments are assigned, mentored, and assessed; also the nature of responsibilities assigned to future teachers during field experience, ranging from observation and tutoring small numbers of students to assisting the teacher in other ways, and eventually taking the lead in teaching a whole class.
- *Accountability to external authorities:* that is, through quality assurance policies, a topic discussed in Part Two of this volume.
- *Qualifications required of teacher educators:* for example, policies governing possession of advanced degrees and requirements for teaching experience in primary or secondary schools.

TEDS-M found governance of teacher education to be highly centralized in Germany, Oman, and Spain. Countries with the most decentralized systems of governance for teacher education were Canada, Chile, Norway, the Philippines, Switzerland, and the United States.

Grouping Program-Types for Crossnational Analysis

All this variation in the national policies informing teacher education organization and structure raises issues for the reporting of TEDS-M results. Because the teacher education systems in the participating countries differ in important ways, comparing opportunities to learn and the knowledge outcomes of teacher education across whole countries is problematical. It is certainly possible to compare whole country against whole country, but what can be inferred from this comparison? TEDS-M decided that whole country comparisons would be best avoided in favor of grouping program-types in sensible comparable ways, assuming that this was possible. Earlier in this chapter, we identified two policy variables—grade span and degree of specialization—that proved particularly useful in clarifying similarities and differences in the teaching roles for which future teachers are being prepared. Hence, presentation of TEDS-M test results is organized, as far as possible, in other publications on this study, to compare like with like. In the current case, the comparison focuses on future teachers being prepared to undertake similar roles once qualified.

When we grouped teacher education programs according to the grade levels and the degree of specialization in mathematics for which the future teachers were being prepared, six clearly identifiable program-groups emerged. Four of these were at the primary level, and thus encompassed the future teachers who took the primary test, and two were at the secondary level (the future teachers given the secondary test). More specifically, the program-groups for primary future teachers were:

- *Group 1*: programs that prepare lower-primary generalist teachers to teach up to Grade 4 maximum;
- *Group 2*: programs that prepare primary generalist teachers to teach up to Grade 6 maximum;
- *Group 3*: programs that prepare primary/lower-secondary generalist teachers to teach up to Grade 10 maximum;
- *Group 4*: programs that prepare primary school specialist mathematics teachers.

The program-groups for secondary future teachers were:

- *Group 5*: lower-secondary (Grade 10 maximum)—mostly mathematics specialists;
- *Group 6*: upper-secondary (up to Grade 11 and above)—all specialists.

Exhibit 1.1 (above) shows the program-group to which we assigned each program. The exhibit indicates, for example, that Germany has three different program-types assigned to Group 1, that is, generalists prepared to teach no higher than Grade 4.

Conclusion

Examination of the key parameters discussed in this chapter demonstrates that simply classifying program-types into concurrent versus consecutive or primary versus secondary school is greatly oversimplified if we want to understand how national or provincial policy shapes the organization of teacher education. For example, consideration of grade spread indicates that “primary” and “secondary” simply do not mean the same thing from country to country.

At the same time, this crossnational analysis of organizational features gives reason to believe that some of these features at least will have a major impact on the opportunities to learn and outcomes of teacher education, including scores on the TEDS-M tests. One such hypothesis is that three of the variables (highest grade level for which future teachers are prepared, the duration of the program-type, and degree of subject-matter specialization) may be especially powerful in shaping opportunities to learn and outcomes. And, as far as mathematics pedagogy outcomes are concerned, it may be as well that longer field experience and a wider grade spread are associated with high knowledge scores. But all this is subject to confirmation in subsequent TEDS-M analyses designed to explore how well empirical data fit with these hypotheses.

References

- Clift, R. T., & Brady, P. (2005). Research on methods courses and field experiences. In M. Cochran-Smith & K. M. Zeichner (Eds.), *Studying teacher education: The report of the AERA Panel on Research and Teacher Education*. Washington, DC: American Educational Research Association (AERA).
- Lewin, K. M., & Stuart, J. S. (2003). *Researching teacher education: New perspectives on practice, performance and policy. Multi-Site Teacher Education Research Project (MUSTER) synthesis report*. London, UK: Department for International Development.
- Organisation for Economic Co-operation and Development (OECD). (2005). *Teachers matter: Attracting, developing and retaining effective teachers*. Paris, France: Author.
- Schwille, J., & Dembélé, M. (2007). *Global perspectives on teacher learning: Improving policy and practice* (Fundamentals of Educational Planning Series). Paris, France: International Institute for Educational Planning (IIEP).

CHAPTER 2:

THE DISTINCTIVE NATIONAL IMPRINT OF EACH TEDS-M SYSTEM¹

John Schwille, Richard Holdgreve-Resendez, Wangjun Kim, and Patrick Leahy

Although there are many commonalities across national systems of teacher education, at least in terms of the organizational characteristics by which they were analyzed (see Chapter 1), each has its own particular characteristics. This national imprint is rooted in history and reflects a particular cultural, social, and political context. We begin this chapter with a comparison of the 17 countries in terms of relevant demographic and development indicators and then provide a brief summary of the salient, distinctive organizational features of all 17 of the teacher education systems represented in TEDS-M. What becomes apparent as this chapter unfolds is that the countries and their teacher education systems parallel one another in various respects, but they also all differ from one another in distinctive, non-parallel ways that need to be taken into account when interpreting the TEDS-M survey data. Each country summary is based primarily on the TEDS-M country reports, with authorship as cited in each section.

National Differences in Demographic and Development Indicators

The 17 countries that agreed to participate in TEDS-M differ in many important geographic, demographic, economic, and educational respects. A selection of these characteristics is presented in Exhibits 2.1 and 2.2. The TEDS-M sample included very large countries, such as the Russian Federation and the United States, and small countries, such as Singapore. Although well over half the population lives in urban areas in nearly all of the countries, some countries are densely populated while others are sparsely populated (just 3 people per square kilometer in Botswana, compared with 230 in Germany, 301 in the Philippines, and 6,545 in the city-state of Singapore). It is more challenging for education systems, in general, and teacher education, in particular, to serve a widely dispersed population.

Health statistics are also relevant. A high incidence of poor health affects all sectors of society, including education, and the effect is especially great in the case of pandemics such as HIV/AIDS. TEDS-M countries are relatively fortunate in this respect: as shown in Exhibit 2.1, life expectancy at birth is high in the TEDS-M countries. It is, on average, above 70 in all but three countries (80 or more in six). These healthy, aging populations will, all else being equal, make for slower growth in the demand for basic education.

The TEDS-M countries vary greatly with respect to per capita income. Countries with very large per capita incomes can more readily fund the needs of education than those where resources are far more limited. A look at gross national income (GNI) per capita (all amounts are shown in US dollars) reveals roughly four levels of wealth across the TEDS-M countries (the last column of Exhibit 2.1). Countries that score *very high* on this index (with a range of \$40,000 to just above \$60,000) are (in descending order) Norway, Singapore, the United States, and Switzerland. The next set of countries, labeled *high* (a range of \$30,000 to \$40,000), are Canada, Germany, Chinese Taipei, and Spain.

¹ This chapter was first published as Chapter 3 in the TEDS-M international report of findings (Tatto et al., 2012). It is reproduced here with some slight modifications.

Exhibit 2.1: TEDS-M participating countries: national demographic and human development statistics

Country	Population (millions)	Area (1,000s of sq km)	Population Density (people per sq km)	Urban Population (% of total)	Life Expectancy at Birth (years)	Rank in Total GDP	GNI per Capita (Purchasing Power Parity)	Levels of Wealth
Botswana	1.9	582	3	59	54	113	13,250	Middle
Canada	33.3	9,985	3	80	81	10	38,490	High
Chile	16.8	756	22	88	79	45	13,430	Middle
Chinese Taipei	22.9	36	637	80	78	20	32,700	(High)
Georgia	4.3	70	62	53	72	117	4,860	Low
Germany	82.3	357	230	74	80	4	37,510	High
Malaysia	27.0	331	82	70	74	40	13,900	Middle
Norway	4.8	324	12	77	81	23	60,510	Very high
Oman	2.8	310	9	72	76	74	24,530	Middle
Philippines	90.3	300	301	64	72	47	3,940	Low
Poland	38.1	313	122	61	76	21	17,640	Middle
Russian Federation	141.4	17,098	8	73	68	12	19,770	Middle
Singapore	4.6	1	6,545	100	81	43	52,000	Very high
Spain	44.5	506	88	77	81	9	32,060	High
Switzerland	7.5	41	183	73	82	19	42,220	Very high
Thailand	67.4	513	131	33	69	32	7,830	Low
United States	311.7	9,629	32	81	78	1	47,100	Very high

Notes:

GDP = gross domestic product, GNI = gross national income.

For the sources of these statistics, see Exhibit A2.1 in Appendix A.

Exhibit 2.2: TEDS-M participating countries: youth demographic and education statistics

Country	Total Fertility Rate	Population Age Composition Ages 0–14 (%)	Public Expenditure on Education (% of GDP)	Net Enrolment Ratio in Education (% of relevant group)		Primary Student–Teacher Ratio
				Primary	Secondary	
Botswana	3	34	8.1	90	64	25
Canada	2	17	4.9	100	94	17
Chile	2	23	3.4	95	85	25
Chinese Taipei	1	17	4.2	97	95	17
Georgia	2	17	2.7	99	81	9
Germany	1	14	4.4	100	89	13
Malaysia	3	30	4.5	96	68	15
Norway	2	19	6.7	99	96	11
Oman	3	32	4.0	72	78	12
Philippines	3	34	2.6	92	61	34
Poland	1	15	4.9	96	94	11
Russian Federation	1	15	3.9	91	–	17
Singapore	1	17	2.8	–	–	19
Spain	1	15	4.4	100	95	12
Switzerland	1	16	5.3	99	85	13
Thailand	2	22	4.9	89	72	16
United States	2	20	5.5	93	88	14

Note: For sources of these statistics, see Exhibit A2.2 in Appendix A.

The set of countries labeled *middle* (with a range of \$10,000 to \$30,000) include Oman, Poland, the Russian Federation, Malaysia, Chile, and Botswana. The final set of countries—those with the lowest GNI in the TEDS-M study and therefore labeled *low* (with a range of \$3,000 to \$10,000)—are Thailand, Georgia, and the Philippines. There were no very low income countries in the sample, that is, those countries with GNI per capita of less than \$3,000.

TEDS-M also included some of the largest economies in the world, as measured by total gross domestic product (GDP) for 2008. The United States (ranked first), Germany (fourth), Spain (ninth), Canada (10th), and the Russian Federation (12th) are all among the most highly ranked of 186 countries with economies of more than US\$1 trillion each in total GDP. Nine others are also in the first quartile of countries, when ranked by the total size of their economy, even though some of these countries are very small in terms of population: Switzerland (19th), Chinese Taipei (20th), Poland (21st), Norway (23rd), Thailand (32nd), Malaysia (40th), Singapore (43rd), Chile (45th), and the Philippines (47th). Thus, only one country (Oman) is in the second quartile, and the two remaining countries (Botswana and Georgia) are just slightly below the median rank. TEDS-M makes no claim to being representative of the world's countries. It includes instead a relatively advantaged, but still diverse, subsample.

The factors affecting population growth—fertility, mortality, and net immigration—also differ greatly among the TEDS-M countries. A higher rate of population growth means a greater need for schools and teachers, which, in turn, affects the demand for teacher education. Conversely, and without compensating for rates of immigration, if there is a decline in the number of children born because of declining fertility rates, the need for new teachers will decline, thus reducing the demand for teacher education.

When we look at the total fertility rates of TEDS-M countries, we see that, in general, this is a group of low-fertility countries. According to recent statistics (shown in Exhibit 2.2), all but four of the TEDS-M countries are at or below the replacement level (which ranges from about 2.1 to 2.3 children born per woman, depending on adjustments made for mortality and sex ratios at birth). The four countries with high total fertility rates are Botswana, Malaysia, Oman, and the Philippines. A closely related statistic, the percentage of the total population aged birth to 14 years, shows the same four countries at a relatively high level: about a third of their respective populations comprise this young age group. All the other countries with lower total fertility rates have a much smaller proportion of children in the total population, from 14 to 23 percent. Even with equal levels of per capita wealth, countries with a lower proportion of children find it easier to support teachers and teacher education.

In another demonstration of important country differences, Exhibit 2.2 provides key statistics on education, including public expenditure on education, net enrolment ratios in primary and secondary schools, and student–teacher ratios. Most revealing among these data is public expenditure on education, as indicated by percentage of GDP. The countries that allocate the highest proportion of their GDP to public education are Botswana and Norway (8.1 and 6.7%, respectively). These are followed by four countries at about 5.0 to 5.5 percent (United States, Switzerland, Poland, Thailand, and Canada), then six countries at about 4.0 to 4.5 percent (Malaysia, Germany, Spain, Chinese Taipei, Oman, and the Russian Federation), and, finally, four countries at about 2.5 to 3.5 percent (Singapore, Georgia, the Philippines, and Chile).

Nevertheless, whatever the differences in resources, other education indicators tend toward uniformity. Only Oman is below 89 percent with regard to primary school enrolment rate and, with the exception of Botswana, Chile, Chinese Taipei, and the Philippines, student–teacher ratios in primary schools are in the 10 to 20 students per teacher range or even slightly lower. Secondary enrolment rates, however, show more variation. The move toward a universal basic education, with 8, 9, or 10 years of compulsory schooling, is still far from complete, even among the TEDS-M countries.

Within these varied and changing contexts, teacher education has been a work in progress for the last 200 years, and there is little sign that this situation will change. Systems are in a constant state of flux, making it difficult to describe each system as an ongoing entity. At any one time, a system may be experiencing changing types of program, growth or decline in size, program-types being phased out or created, and discussions of all sorts of other changes that may or may not happen. Thus, both a broader and deeper perspective is needed to make this ongoing mixture of new and old forms of organization, in varying degrees of implementation, and subject to normal fluctuations of growth and decline, more understandable. To this end, TEDS-M country reports provide fascinating windows into how much teacher education systems have come to vary within the context of the continuing effort to make primary and lower-secondary education universal throughout the world. In this process, each of the program-types described below has come to have its own distinctive character in response to these different contexts.

Country-by-Country Introduction to Program-Types and Their National Contexts

The remainder of this chapter portrays the distinctive characteristics and context of each national system, in terms of what the authors of the country reports consider is most important for readers to know when analyzing and interpreting the TEDS-M survey data. In addition to a narrative explanation, each section contains three graphs that give an immediate visual image of the diversity of program-types within and across countries. These graphs are based on Exhibit 1.1 in Chapter 1 and on a table displaying estimated sizes of program-types as an additional feature.

The three organizational characteristics portrayed in these graphs were discussed in crossnational terms in Chapter 1. They are:

- The grade span for which each country prepares teachers;
- The duration of each program-type (i.e., the total number of years of postsecondary education required to become a fully qualified teacher); and
- The size of the program-type in terms of number of future teachers in the final year of their teacher education (as estimated from the TEDS-M sample).

The narrative summarizes the distinctive national context required for understanding these program-types and for interpreting the data discussed in later chapters. These are listed under three headings: (1) institutions and governance, (2) program-types and credentials, and (3) curriculum content, assessment, and organization.

Botswana²

Botswana is a classic mixed system, in which some teachers are prepared at university, while others are enrolled in teachers' colleges that do not have university status.

Institutions and governance

Under the jurisdiction of its Ministry of Education, Botswana has six colleges of education. Four prepare only primary school teachers and two prepare only secondary school teachers. Primary and secondary teachers are also trained at what was, until recently, the country's only university, the University of Botswana. It has more autonomy than the colleges (e.g., to set limits on admissions).

Program-types and credentials

Primary school in Botswana extends from Grades 1 to 7—longer than in most countries. Junior secondary schools cover Grades 8 to 10; only 56 percent of the age group's population is enrolled in secondary education, a proportion that is lower than in any other TEDS-M country. Teacher education aligns with these school types (see Exhibit 2.3). The Botswana authors reported one primary program-type—the Diploma in Primary Education from the colleges, as portrayed in Exhibit 2.3. (The Bachelor of Primary Education from the university was not included in TEDS-M due to a lack of students.) Secondary teachers can be prepared in four program-types: one at the two colleges for teachers and three at the university. However, as is evident in Exhibit 2.3, only two were included in TEDS-M: the Diploma in Secondary Education at the colleges and the Bachelor of Secondary Education (Science) at the university.

² This section is based on the country report written by K. G. Garegae, T. J. Mzwinila, and T. M. Keitumetse.

The latter is a concurrent program-type with more demanding entrance requirements than the corresponding program-type at the colleges. Graduates of this program-type can teach up to Grade 12, whereas the graduates of the college program-type can teach only up to Grade 10. The two secondary program-types not included in the TEDS-M target population are the consecutive Post-Graduate Diploma in Education, which produces almost no graduates, and the Bachelor of Education (secondary) program-type, which is intended for practicing teachers who have at least two years’ teaching experience.

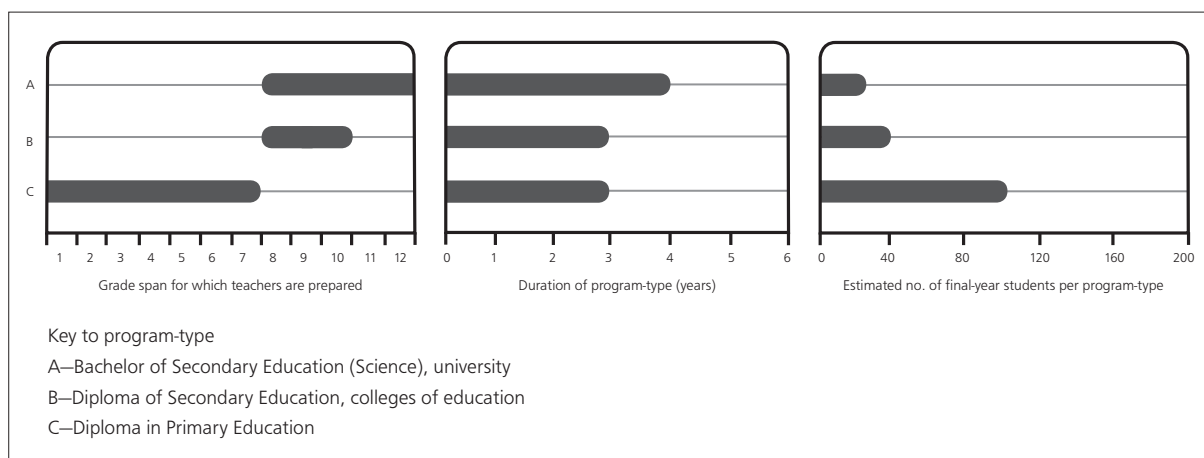
Curriculum content, assessment, and organization

The colleges offer a three-year, fulltime program-type. The first year, for example, includes courses in communication and study skills, educational technology, special needs education, two teaching subjects, and teaching practice. Although primary teachers are expected to teach all subjects, a new trend is to add a specialization in certain areas, such as primary education and mathematics/science. At the university, the Bachelor of Secondary Education (Science) produces teachers of mathematics as well as science. It is a fulltime, four-year program-type, but students start taking education coursework only in the second year. Overall, this program-type is 70 percent content and 30 percent mathematics education. The instructor determines course content and submits a course outline to the department head for his or her approval.

Each program-type has different practicum requirements. The colleges of education require two weeks of classroom observation in the first year (for primary but not secondary future teachers), 10 weeks of internship in Year 2, and a five-week practicum in Year 3. At the university, the Bachelor of Secondary Education (Science) students undertake seven weeks of teaching practice during both Years 2 and 3.

College students are required to complete written assignments, annual examinations, and a final research project. An external moderator conducts a final assessment of every student’s work. This includes a research project and teaching practice. At the university, the final grade for each course combines continuous assessment and a final examination. Teaching practice is graded pass or fail; there is no external moderation.

Exhibit 2.3: Teacher education program-types in Botswana



Note: Because the Postgraduate Diploma in Education one-year consecutive program produces very few graduates, it was not included in the TEDS-M target population. The Bachelor of Primary Education at the university was also excluded because of a lack of students. The Bachelor of Education (secondary) program was not included because it is intended for practicing teachers who have at least two years of teaching experience. It was therefore outside the scope of TEDS-M.

Canada (Newfoundland and Labrador, Nova Scotia, Québec, and Ontario)³

In Canada, education is the responsibility of each province or territory; there is no federal body overseeing education at the national level. TEDS-M was conducted in four Canadian jurisdictions—Newfoundland and Labrador, Nova Scotia, Ontario, and Québec. These four provinces account for 66 percent of the total Canadian population, estimated at nearly 34 million in 2010 (62% of all Canadian residents live in Ontario and Québec).

Institutions and governance

Teacher education is offered in a total of 56 institutions across all provinces in Canada. A small number of these are affiliates of larger institutions and include English- and French-speaking programs within the same institution. Multiple institutions are found in all but two provinces, Newfoundland and Labrador, and Prince Edward Island. Four institutions in Nova Scotia offer teacher education, three in English and one in French. Twelve institutions offer teacher education in Québec—nine in French and three in English. There are 13 faculties of education in Ontario universities. All 13 have offerings in English and two also in French. There is no preservice teacher education in Canada's three territories, as they tend to draw their teachers from the provincial teacher education institutions across the country.

Program-types and credentials

Canada has diverse program-types but they share commonalities. In general, teacher education institutions offer two routes to graduation—concurrent or consecutive. Concurrent program-types usually offer four years of professional education courses along with academic courses. Some of these concurrent program-types lead to a Bachelor of Education (B.Ed.) degree; others, which require five years, lead to a degree in an academic specialty, as well as the B.Ed. Consecutive program-types require candidates to obtain an academic degree before being accepted in a teacher education program-type, with the latter usually concentrated into one or two years. The duration is related to certification requirements. For example, the minimum requirement for certification in Nova Scotia is a two-year program-type following the first degree; in Ontario, certification follows a one-year post-degree program-type. The general trend across most provinces is toward consecutive program-types. The exception is Québec, where almost all preservice teacher education is concurrent.

Most institutions offer primary- and secondary-level intakes for each of the two routes to the B.Ed. Primary teachers are usually considered generalists, but teachers at the secondary level are expected to specialize in one or more disciplines. Generally, secondary teachers are expected to specialize in school subjects, that is, subjects mentioned in certification requirements and provincial curricula, and taught in schools. Most primary program-types are concurrent, while secondary program-types are consecutive.

In some jurisdictions, teaching certificates are endorsed only for specific levels or subjects. However, the degree to which teachers holding these endorsed certificates are restricted to their defined areas of specialization varies with jurisdiction and location, and depends on teacher supply and demand.

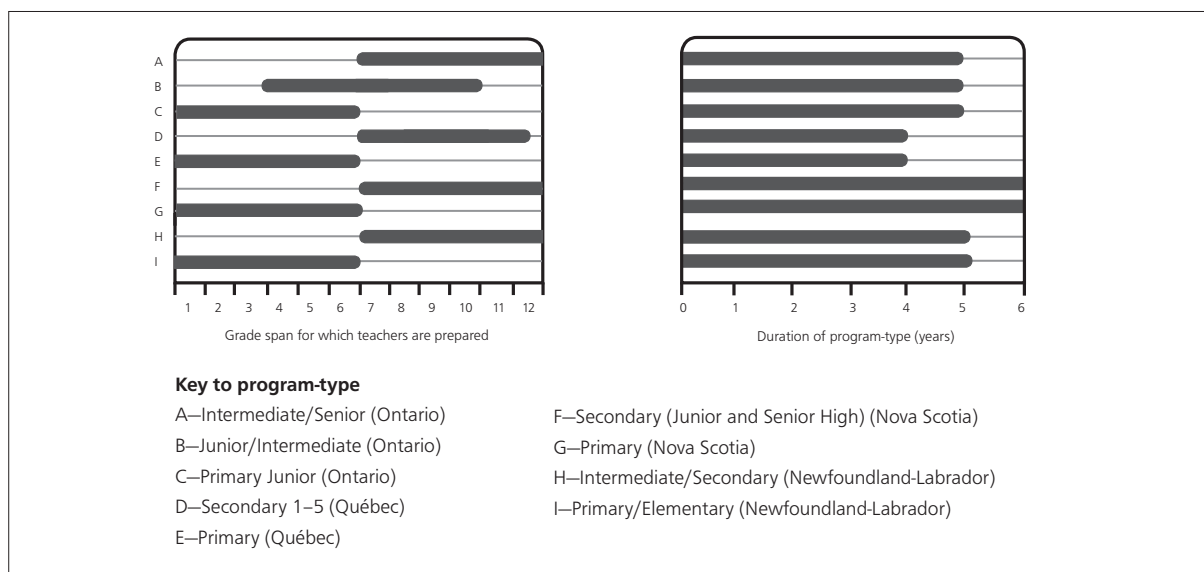
All teacher education program-types in Canada require future teachers to participate in some in-school teaching experience, referred to variously as a practicum, an internship, or student teaching. The long-term trend is toward longer in-school placements, distributed throughout the program-type, rather than concentrated at the end.

³ This section is based on the country report written by R. Crocker and H. Joduin and was also written with the assistance of national research coordinator Pierre Brochu.

Because education is a provincial responsibility, curriculum content, assessment, and certification requirements vary from jurisdiction to jurisdiction (see Exhibit 2.4):

- *Newfoundland and Labrador*: The main program-type divisions are referred to as primary/elementary and intermediate/secondary. The primary/elementary program-type is concurrent, requiring a total of five years to complete. Students typically enter the professional component in their third year. The secondary program-type is a three-semester consecutive one, completed over 14 months. A representative body of stakeholders governs teacher certification in Newfoundland and Labrador, and the Department of Education administers the system.
- *Nova Scotia*: Nova Scotia has the only system in Canada in which a two-year (four-semester) consecutive program-type is the norm and is a requirement for certification. Teacher certification in Nova Scotia is administered by the Department of Education. It is offered at two levels—one for Grades 1 to 6 and the other for Grades 7 to 12.
- *Québec*: Given the concurrent nature of almost all Québec preservice program-types, future teachers in that system generally take four years to complete the B.Ed. degree. Teacher certification in Québec is governed by the *Comité d'agrément des programmes de formation à l'enseignement* (CAPFE), a representative body of stakeholders. Certification is for Grade spans 1 to 6 and 7 to 11.
- *Ontario*: Almost all Ontario institutions offer consecutive program-types (of two semesters' duration) to students who already have a Bachelor's degree. The practicum takes up almost half of that time. Three program-types—primary⁴/junior (Grades K to 6), junior/intermediate (Grades 4 to 10), and intermediate/secondary (Grades 7 to 12)—are typical. This structure conforms to the structure for teacher certification, thereby allowing teachers to be certified to teach across a range of grade levels. Teacher certification in Ontario is governed by the Ontario College of Teachers, an independent body.

Exhibit 2.4: Teacher education program-types in Canada



Note: The third graph was omitted because the nature of the data collected meant it was not possible to accurately estimate enrolments by program-type.

4 Note that the term primary as used in Ontario differs from its more general use in TEDS-M. In TEDS-M, *primary* is used consistently for what is generally the first level of compulsory schooling, even when the national terminology is different (e.g., *elementary*).

Chile⁵

Most teacher education provision in Chile focuses on preparing generalist teachers for all subjects of the eight-year basic school. In this respect, Chile differs from most countries, where teachers for Grades 7 and 8 (and sometimes 4, 5, and/or 6) are prepared differently and are more specialized than teachers in the lower grades.

Institutions and governance

Responsibility for teacher education in Chile is almost entirely delegated to the universities, as well as to a few tertiary-level professional institutes. During the 1990s, most teacher education in Chile took place in publicly funded universities. More recently, however, a growing number of private universities have started to provide teacher education. TEDS-M sampling information shows that when the study began in 2006, 16 public universities, 22 private universities, and 5 professional institutes offered teacher education program-types for basic education teachers.

Chile has no established government policies related to coordination of teacher education. Instead, the Ministry of Education maintains an informal relationship with teacher education institutions.

Program-types and credentials

Applicants for teaching positions must have a teaching qualification from a university or a professional institute appropriate to the level in which they are to teach. Beyond that, there are no national requirements governing appointment in schools. The Organic Law of Education (1990) defines teaching qualifications in terms of a licentiate degree in education and a teaching entitlement (*Título de Profesor*).

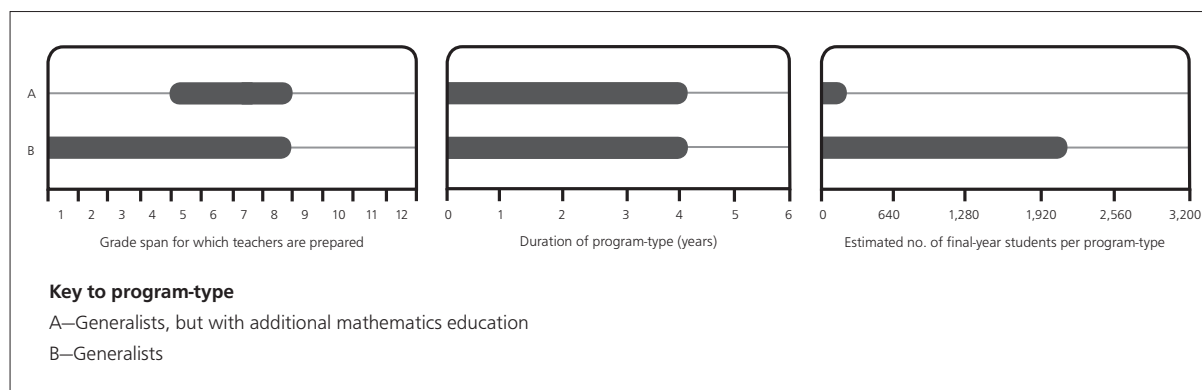
In most institutions, teacher education is offered as a concurrent program-type, lasting from 8 to 10 semesters. However, as mentioned above, the main program-type prepares future teachers to teach all subjects in Grades 1 to 8, and 11 institutions offer supplementary subject-matter specialization, requiring candidates to take additional courses in a particular subject. As Exhibit 2.5 shows, both program-types serve Grades 5 to 8, but compared to the program-type for Grades 1 to 8, the program-type with additional mathematics prepares only a few teachers.

Curriculum content, assessment, and organization

Within the Chilean program-types, the offerings are similar: subject-matter knowledge, pedagogy, general education, and field experience. A semester-long or four-month practicum is required in addition to the program-long field experiences. The licentiate mandates a written thesis. Students spend the majority of their last semester on this requirement, working individually or collectively.

5 This section is based on the country report written by B. Avalos Davidson.

Exhibit 2.5: Teacher education program-types in Chile



Note: According to the national research coordinator for Chile, the program-type offering extra mathematics did not include enough mathematics to warrant it being designated a specialist program-type. Estimates for the final-year students per program-type were calculated as the mean of the estimates from the two subsamples for Program-Type B.

Chinese Taipei⁶

Institutions and governance

In 2007, 59 universities in Chinese Taipei were authorized to provide teacher education. Of these, 48 universities were admitting future secondary teachers, and 23 universities were accepting future primary teachers. The current system was developed after the end of World War 2 and the Japanese colonial era. The Nationalist (KMT) government at that time considered the quality of teachers important to political life, economic development, and national defense, and therefore established advantageous conditions and incentives for becoming a teacher, in an effort to attract talented people to this occupation. Throughout this early period, the government exercised tight control over which institutions could educate teachers and when to increase or decrease the number of teacher education institutions, the number of teachers being educated, and the deployment of novice teachers.

From the 1960s to the early 1990s, as the economy developed rapidly and then slumped, this rigid control was relaxed. New ideas about a free society and free economy clashed with the existing system. The government made changes to teacher recruitment, training, and employment policies and practices. For example, the ministry no longer took responsibility for assigning jobs to teachers. Instead, future teachers had to compete for specific vacancies. In short, Chinese Taipei was taking steps toward what the Organisation for Economic Co-operation and Development (OECD, 2005) has called position-based as opposed to career-based teacher employment.

Program-types and credentials

There are two types of teacher in Chinese Taipei—primary school teachers in Grades 1 to 6 and secondary school teachers who teach either lower-secondary (Grades 7 to 9) or upper-secondary (Grades 10 to 12) classes. Primary school teachers are generalists, but most secondary school teachers teach within a single level (either junior or senior high school) and a single subject. Hence, as illustrated in Exhibit 2.6, Chinese Taipei

⁶ This section is based on the country report written by F.-J. Hsieh, P.-J. Lin, G. Chao, and T.-Y. Wang.

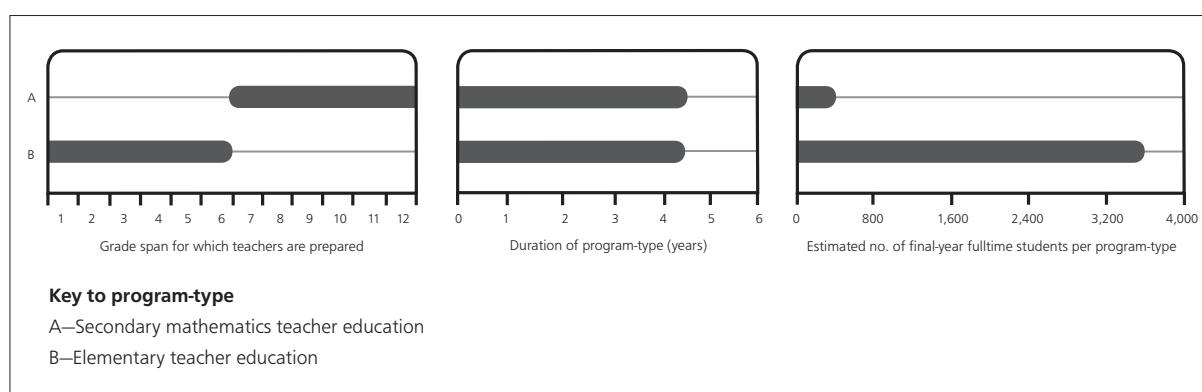
has only two program-types with respect to TEDS-M, one for primary school teachers and the other for secondary. In each one, future teachers take four years to complete the Bachelor's requirements, after which they complete the half-year practicum. Both program-types are concurrent; Chinese Taipei has no consecutive program-types.

Curriculum content, assessment, and organization

Both program-types include three components. These are general curriculum requirements for all university students from any field, a subject-matter curriculum, the goal of which is to improve students' understanding of the subject(s) that they will teach, and a professional education curriculum. Universities may choose offerings from a list established by the ministry. In addition, future teachers must complete a practicum organized according to ministry guidelines.⁷

Once these requirements have been completed, future teachers have to take the Teacher Qualification Assessment. This national test is the last step in quality control of preservice teacher education. The assessment includes two general subjects and two professional education subjects. The pass rates for 2007 and 2008 were just under 68 percent and 76 percent of the future teacher cohorts, respectively.

Exhibit 2.6: Teacher education program-types in Chinese Taipei



Note: Eleven institutions in the target population were excluded because they were very small—fewer than 26 future primary teachers and fewer than five future lower-secondary mathematics teachers in the final year of their programs. The primary and secondary programs both take 4.5 years to complete. This period of time includes the four-year Bachelor's degree and a six-month practicum.

⁷ These guidelines include or require policies relating to selection of practicum schools and internship supervisors, the qualifications of university supervisors (teaching staff only, no doctoral students), the qualifications of school supervisors (at least three years' teaching experience), supervision methods, the number of future teachers assigned to each supervisor, the number of hours interns spend in school each week, intern rights and obligations, procedures for handling unsatisfactory performance, intern evaluation, and the provision of counseling literature, hotlines, and internet resources to interns.

Georgia⁸

Georgia has been undertaking educational reforms that are drastically changing policies and practices inherited from the Soviet Union. Although the reforms are far from being completely implemented, the implications for teacher education are profound.

Institutions and governance

Ten institutions of higher education currently offer teacher preparation in Georgia. These are mostly state institutions but there are also some private ones. The 2004 Law on Higher Education of Georgia mandated major changes in teacher education. Also, for the first time, the State Commission on Educational Facilities set upper limits on the number of teacher education students to be admitted to each university. Within these upper limits, institutions determine the actual number of students admitted. Institutions previously had complete autonomy in this respect.

Program-types and credentials

Candidates holding a Bachelor's degree in pedagogy or any other subject can become primary school teachers. They do not need any other certificate issued by the authorities. However, teaching is becoming a more regulated profession. The qualification being implemented for secondary school is a Master's degree in teaching. This requirement greatly increases the role of educational sciences in the preparation of secondary teachers.

Even under the new law, a person holding a Bachelor's remains eligible to teach Grades 1 to 6 and, until 2014, in secondary school. Once implemented, the new law will require any person entering a teaching career to pass a teacher certification examination after he or she has received a relevant degree and completed a one-year probationary period in school.

Given this complex, changing situation, where preparation for teaching still takes place in a wide range of departments, the TEDS-M sample for Georgia was defined in terms of four program-types (Exhibit 2.7): a four-year Bachelor of Pedagogy for future primary school teachers of Grades 1 to 4, and a Bachelor of Mathematics and two Master's degrees in teaching at the secondary school level.⁹

Curriculum content, assessment, and organization

Each institution establishes its own entrance standards and requirements. In general, there are no specific content area requirements and no tests of prerequisite subject-matter knowledge for entrance into teacher education institutions. Applicants must have successfully completed a more general national examination. Institutions also develop their curricula independently. Each unit within a university department of education decides on the number and content of courses while, in principle, taking into account the professional standard in mathematics, the national teacher standard, and the student standard (created by the Ministry of Education and Science).

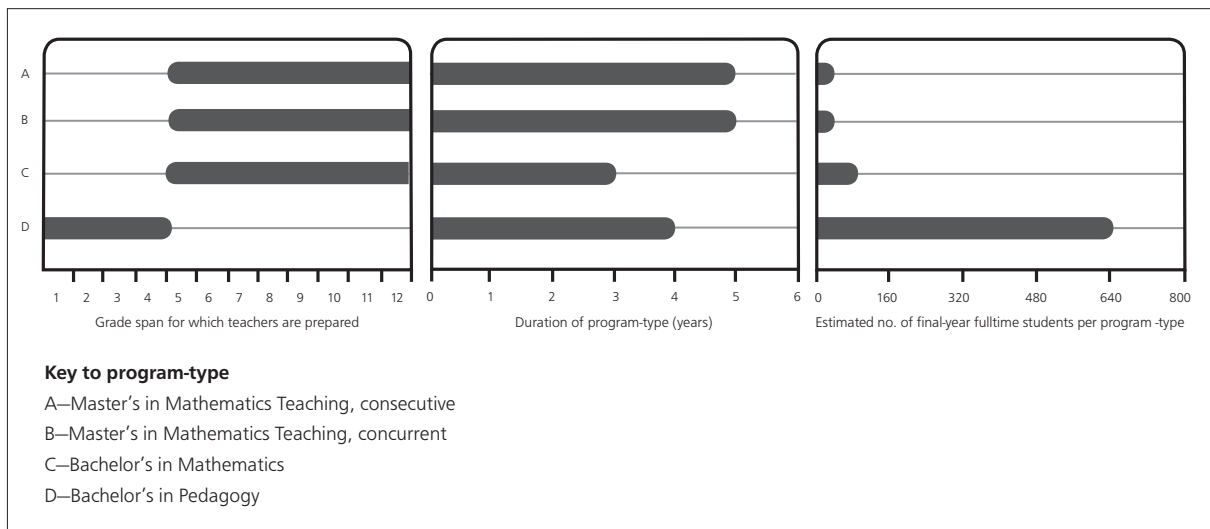
⁸ This section is based on the country report written by N. Mzhavanadze and T. Bokuchava.

⁹ Out of 10 institutions, nine offered four-year programs while one institution offered the same program-type as one five years in duration.

The traditional Bachelor's degree in education in Georgia typically takes 36 months to complete and includes two phases, an academic phase and a nine-month practical training phase. However, the practical training phase has fallen into disuse.¹⁰

Although examinations are administered semester by semester throughout the program-type, there is also a national examination that candidates must take in order to complete their Bachelor's degree. Practical training, when it was implemented, was also supposed to be sanctioned by an examination administered by the institution. However, as mentioned above, the new system will have an entirely new teacher certification test, consisting of a professional skills test and a subject-matter test.

Exhibit 2.7: Teacher education program-types in Georgia



Note: During the current transitional period of educational reform in Georgia, future teachers in the Bachelor of Mathematics program will be qualified to teach Grades 1–12. However, according to the national research coordinator for Georgia, these students are typically found in Grades 5–12 and therefore the TEDS-M classification of level needed to be secondary, not primary–secondary. The Master's in Mathematics is a very small program that exists in only two institutions. It is listed twice in this figure because in one institution it is consecutive and in the other is concurrent. The Russian and Azeri sections of the targeted institutions have been excluded from this figure, but they accounted for only 1.4 percent and 1.7 percent of the TEDS-M primary and lower-secondary fulltime student cohorts, respectively.

¹⁰ Chavchavadze State University, for example, decided to discontinue the period of practical training. Its instructors have compensated for this by using case studies, open lessons, and other practical experiences during the academic year.

Germany¹¹

German teacher education differs markedly from teacher education in the other TEDS-M countries in a variety of important respects. Also, because education policy in Germany is basically the responsibility of the 16 federal states, and because the primary and secondary school system is highly differentiated, the system also varies.¹²

Institutions and governance

Because the federal government does not make educational policy, the development and coordination of common features are fostered by the Conference of [State] Ministers of Education and Cultural Affairs (KMK). In teacher education, the KMK has facilitated a national agreement (although with some allowance for variation) on the structure and duration of teacher education program-types, required coursework, and general contents of the program-types. The agreement also covers the main features of the two state examinations that future teachers must pass.

Notably, Germany is the sole TEDS-M country that appears to offer consecutive program-types only. All future teachers begin their preparation in one of the German universities with program-types that emphasize academic, theoretical study. This approach ensures a relatively advanced level of academic preparation for all future teachers given that university entrance is still selective in Germany, and especially so when compared to countries where universities reach a much larger proportion of the age cohort. Germany has 74 universities providing preservice teacher education. This first phase also contains a great deal of required education coursework that is characteristic of concurrent program-types in other systems, albeit with a heavy emphasis on theory.

Most of the practical preparation is provided in a second phase in special, generally small, institutions operated by state governments and known as *Studienseminare*.¹³ Thus, despite appearing to have only consecutive program-types, Germany should be understood as having program-types that are not purely consecutive but rather a hybrid of concurrent and consecutive types.

Program-types and credentials

In Germany, teaching careers and, therefore, teacher education program-types, differ from one type of primary or secondary school to another. The German *Grundschule* or primary school ends at Grade 4 in most German states, and is shorter than the international norm. All *Grundschule* students attend the same type of school; there is no stratification at this point. However, at Grade 5, students are stratified into four very different types of school: (1) *Hauptschule*,¹⁴ (2) *Realschule*,¹⁵ (3) *Gymnasium*,¹⁶ and (4) *Gesamtschule*.¹⁷ In some states, the *Hauptschule* and *Realschule* are combined.

11 This section is based on the country report written by J. König and S. Blömeke.

12 The integration of Germany into European higher education, according to the Bologna Accord, is changing some of these traditional characteristics. This account represents the situation at an earlier point in time.

13 Two states do not have these institutions; instead preuniversity schools take responsibility for the second phase.

14 This is the least academic and most practical type of lower-secondary education for Grades 5 to 9, accounting for 26 percent of eighth graders in 2006, according to the *TIMSS 2007 Encyclopedia*. On completing their schooling at this level, *Hauptschule* students either combine work with parttime vocational training or go straight to a fulltime vocational school.

15 This is a more selective form of secondary education for Grades 5 to 10, with 27 percent of eighth graders attending these schools. *Realschule* is considered an appropriate basic education for lower levels of white-collar and technical occupations.

16 This constitutes the elite form of secondary education, with 33 percent of eighth graders preparing for the *Abitur*, which is required for university entrance.

17 This, a comprehensive school, provides differentiated programs otherwise offered in separate schools. Comprehensive schools take in about nine percent of eighth graders, but do not exist in all German states.

In order to staff these different types of school,¹⁸ the KMK has classified teaching qualifications into four categories:¹⁹

- Type 1: Primary (*Grundschule*) only, Grades 1 to 4;
- Type 2: Primary (*Grundschule*) or lower-secondary schools, Grades 1 to 9/10;
- Type 3: All types of lower-secondary school, Grades 5 to 9/10;
- Type 4: Grades 5 to 12/13.

Under the TEDS-M configuration of program-types, the first two types in the German terminology were each subdivided into two TEDS-M program-types. These were future teachers with mathematics as a teaching subject and those teachers without, thus producing six program-types in all, as featured in Exhibit 2.8. Before entering any of these program-types, all future teachers have to earn the *Abitur* secondary school completion diploma, which requires passing a high-stakes examination in at least four subjects.²⁰

Curriculum content, assessment, and organization

Because Type 1 teachers teach all subjects, the study of mathematics as well as other subjects is usually compulsory for future primary teachers. Type 2 teachers preparing for Grades 5 to 10 and all Type 3 and 4 future teachers are more specialized than their Type 1 colleagues and undertake study that allows them to teach two subjects. Before the Bologna Accord, future teachers did not progress through this phase in cohorts, nor were they required to attend classes. This first university phase typically lasts from 42 months for primary to 54 months for secondary future teachers. These time periods include breaks and vacations.²¹

The second phase lasts 18 to 24 months, depending on the state and level of teacher education. Future teachers in this phase teach parttime in schools, assuming all the responsibilities normally expected of a classroom teacher. They simultaneously attend courses in general pedagogy (*Hauptseminar*) and subject-specific pedagogy (*Fachseminar*) organized by their *Studienseminar*.

During teacher education, future teachers must pass two state examinations to be considered qualified to teach. They undertake the first state examination at the end of the first university phase. It consists of several written and oral examinations related to the subjects studied in the first phase, as well as a long essay. Successfully passing this examination constitutes a first university degree at ISCED Level 5A.

The second state examination is less academic and more practical than the first. Future teachers are required to teach lessons that are observed and assessed by a board of examiners. An essay on a practical issue is also required. One or more oral examination sessions may be included as well. Successful completion of the second state examination constitutes attainment of an ISCED Level 5A second university degree.

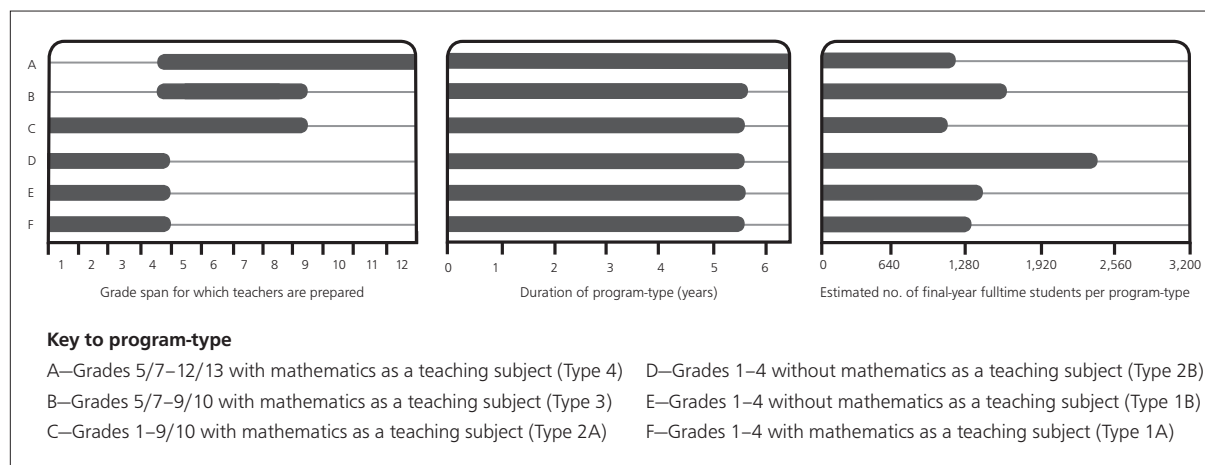
¹⁸ Excludes vocational and special education because TEDS-M does not include teachers prepared for these programs.

¹⁹ There is no longer a direct correspondence between types of school and types of teacher education in the sense of drawing *Gymnasias* teachers solely from one type, for example. Nevertheless, new teachers in *Gymnasias* are more likely to come from Type 4 programs than from other types.

²⁰ The nature and organization of this examination vary from state to state, but some commonality has been established through an interstate compact between the federal states.

²¹ Breaks are counted because future teachers have assignments to complete during their breaks (seminar papers or school-based experiences).

Exhibit 2.8: Teacher education program-types in Germany



Note: For organizational reasons, one small federal state could be included only at the institutional level. No further teacher data were collected, but this information would have accounted for only 3.7 percent of the TEDS-M primary population and for a similar percentage at the lower-secondary level. The grade span for primary school teachers is Grades 1 to 4, except in two states where primary school includes Grades 1–6. The duration of Type 1A and Type 2B programs is the same (3.5 + 2.0 years) in all federal states except one. The duration of Type 2A and 2B programs varies across federal states from 3.0 to 4.5 years for Phase 1 and 1.5 to 2.0 years for Phase 2. The values shown in the graphs are modal values. The duration of Type 3 is the same (3.5 + 2.0 years) for all but three federal states. In two of these states, the duration of Phase 1 is 4.0 years. In the other two states, the duration is 1.5 years. The duration of Type 4 is the same (4.5 + 2.0 years) for all federal states except one. Estimates for final-year fulltime students per program-type were calculated as the means of the estimate from the two split-half samples for Program-Type 2A.

Malaysia²²

In time, Malaysia wants all of its primary and secondary teachers to be university graduates with degrees (i.e., “graduate teachers”) rather than teachers who have teacher college diplomas only (i.e., “non-graduate teachers”). However, at the time of the TEDS-M survey, the non-graduate Malaysian Teaching Diploma was by far the largest of the program-types preparing primary school teachers (Exhibit 2.9).

Institutions and governance

Initial teacher education in Malaysia is conducted at two levels—public and private universities, and teacher training institutes.²³ While all public and private universities produce graduate teachers, the teacher education institutes still award non-graduate diplomas as well as Bachelor’s degrees. The Ministry of Education has set a target of having, by 2015, all teachers in secondary schools and at least 50 percent of teachers in primary schools with the status of graduate teachers.

²² This section is based on the country report written by R. Nagappan, N. Ratnavadivel, O. Lebar, I. Kailani, S. Malakolunthu, and M. Karim.

²³ The teacher education institutes are former teacher education colleges, which used to prepare teachers for primary and lower-secondary schools, credentialing them with certificates and later diplomas, but are now empowered to award Bachelor’s degrees to their graduates.

Program-types and credentials

Future teachers of mathematics intending to teach in Malaysian primary and secondary schools have at hand five different preservice program-types: three for primary Grades 1 to 6 and two for secondary Grades 7 to 13 (Exhibit 2.9). At the secondary level, the universities offer two concurrent program-types, the Bachelor of Science (Education) and the Bachelor of Arts (Education).²⁴ At the primary level, the concurrent Diploma in Education, for future teachers who already have a degree, and the Bachelor of Education are both offered to prepare future primary teachers at the graduate level. The Malaysian teaching diploma is offered to future primary teachers at the non-graduate level.

Curriculum content, assessment, and organization

The Teacher Education Division of the Ministry of Education, with approval from the ministry's Central Curriculum Committee and the Malaysian Qualification Agency (which has been responsible for accrediting all higher education offerings since 2007), sets the curriculum requirements for teacher education institutes (i.e., the former teacher colleges). The Teacher Education Division also sets requirements for ongoing implementation of the goals of two important documents—the *National Philosophy of Education* (formulated in 1988)²⁵ and the *Philosophy of Teacher Education* (formulated in 1982).²⁶ The focus in these documents is on national unity, national culture, science and technology, and individual development.

All teacher education institutes follow a common curriculum, which has six basic components: teacher dynamics,²⁷ knowledge and professional competence,²⁸ subject options and specialization (major and minor subjects), self-enrichment,²⁹ co-curricular activities, and practicum. The universities are responsible for their own curricula, but are required to develop these within guidelines set by the Malaysian Qualification Agency and the Ministry of Higher Education. Practicum requirements differ somewhat among universities and institutes. Ten to 12 weeks of practicum are the norm.

The last major policy reform affecting the teaching of mathematics was introduced in 2003, when it was decided to teach mathematics in English instead of Malay (or Chinese or Tamil in the vernacular schools) in Grades 1 to 13. Because teachers had never been expected or prepared to do this, the decision had major implications for both preservice and inservice teacher education. The policy has now been rescinded, and since the beginning of 2012 mathematics has again been taught in the other languages.

Testing and assessment in Malaysian teacher education is multifaceted. For purposes of selection, all future teachers are required to pass assessments, comprehensive examinations (oral and written) in each of the required subjects, the Malaysia Teacher Education M-Test, and the Malaysian Educators Selection Inventory (MEdSI). In addition, each institution requires its future teachers to submit a portfolio and to pass an assessment of their classroom teaching competence. Future teachers furthermore experience continuous assessment of their knowledge and skills during each of their courses.

24 A Post-Graduate Diploma in Education (PGDE) is also offered, but it was not included in TEDS-M because of a lack of students working toward this qualification.

25 See <http://unesdoc.unesco.org/images/0019/001931/193184e.pdf>

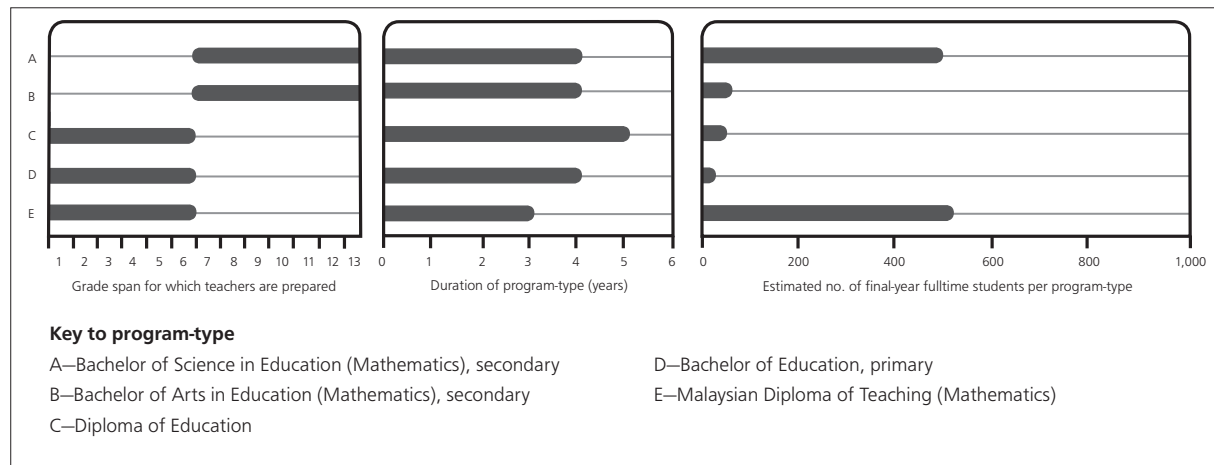
26 See http://aadvice.hiroshima-u.ac.jp/e/publications/sosho4_2-08.pdf

27 That is, language skills, thinking skills, environmental education, Islamic civilization, Islamic education or, alternatively, moral education for non-Muslim students.

28 Learning about Malaysia, psychology, pedagogy, guidance and counseling.

29 Art, physical and health education.

Exhibit 2.9: Teacher education program-types in Malaysia



Note: The Bachelor of Education Teaching English as a Second Language (TESL) with mathematics program-type was not included in the TEDS-M target population. The Malaysian Postgraduate Diploma of Teaching (Mathematics) was also excluded because it had no eligible future teachers at the time of testing.

Norway³⁰

Norway has a national framework (*rammeplan*) for teacher education, which all institutions follow. However, each institution has a great deal of autonomy with regard to organizing the content and the structure of the subjects taught, although there is less autonomy than before.

Institutions and governance

Norway has seven universities and 27 university colleges. Two universities and 17 university colleges (*lærerhøgskoler*) offer the general teacher education program-type (*allmennlærer-utdanning* or ALU), designed to prepare future teachers to teach mathematics (as well as other subjects) in both primary and lower-secondary schools.

All seven universities provide preparation for lower- and upper-secondary school teachers.

Program-types and credentials

Norway has four major program-types for teacher education (Exhibit 2.10). The ALU program-type for primary and lower-secondary school teachers is concurrent; it provides future teachers with four years of general subject knowledge, pedagogy, and subject didactics. Teaching practice is included every year.³¹

³⁰ This section is based on the country report written by T. Breiteig.

³¹ Note that the numbers do not correspond to the number of institutions in the TEDS-M database. This is because, unlike the practice in regard to the practice in other TEDS-M countries, TEDS-M counted an institution in Norway offering more than one program-type as more than one institution.

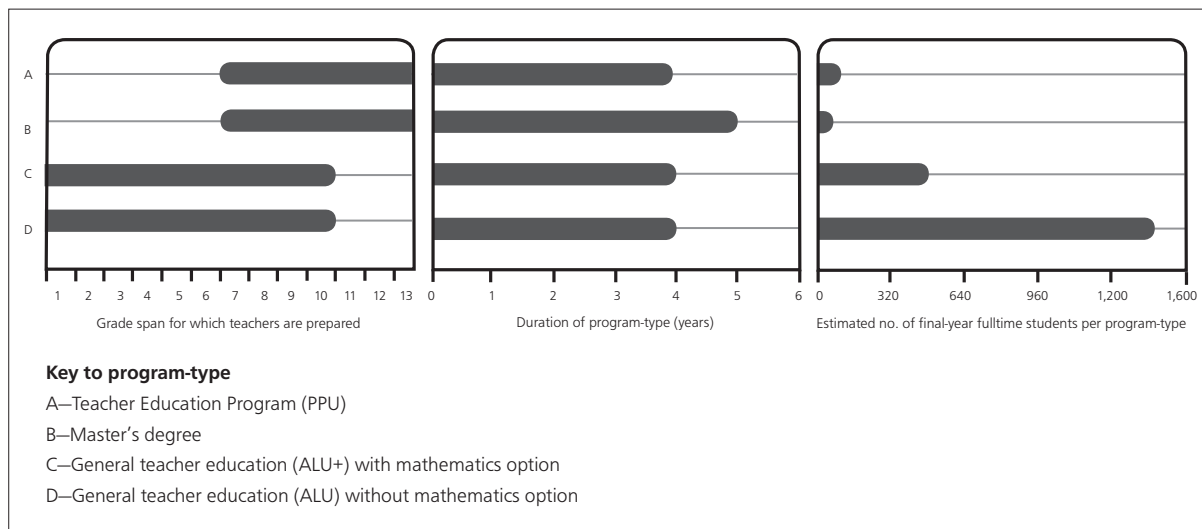
All ALU students choose optional subjects during their third and fourth years, providing students with opportunity to obtain more depth in one of the subjects. Some students choose mathematics. In TEDS-M, these students were considered a population of their own and were tested two years later than the ALU future teachers who had not yet reached the year when they could opt (or not) to choose mathematics. These two program-types have an extended grade range (1 to 10), which coincides with the compulsory school system in Norway and includes the lower-secondary school phase of basic education.

The third program-type is a concurrent five-year Master's degree offered by the universities. The fourth program-type is consecutive. It provides future teachers with a subject-specific education (*adjunkt* or *lektor*) that prepares them for work in lower- and upper-secondary schools (Grades 8 to 13). The final year (PPU) contains pedagogy, subject-matter didactics, and teaching practice. The last two program-types normally provide qualification in two teaching subjects. However, as Exhibit 2.10 shows, these two program-types prepare very few future teachers when compared to the ALU.

Because Norwegian institutions enjoy a high level of autonomy, they are responsible for the quality of what they offer. The links between internal and external quality assurance are maintained through the Norwegian Agency for Quality Assurance in Education (NOKUT). However, there is no requirement to test or check particular skills or knowledge at the end of the teacher education program-types.

The 2003 national curriculum framework addresses the competencies teachers should acquire; they do not specify subject-matter content. The institutions themselves are responsible for designing the content that enables future teachers to acquire the competencies. They are also responsible for demonstrating compliance with the frameworks. Nevertheless, universities typically resemble one another in terms of teacher education by offering an ordinary academic degree followed by "practical pedagogical education" (PPU). In university colleges, teacher education takes four years. Compulsory subjects such as pedagogical theory, mathematics, Norwegian, and religion account for half of the program-type. These required courses include subject-matter didactics. The rest are elective courses. Guided practice takes place during the 20 to 22 weeks of the program-type.

Exhibit 2.10: Teacher education program-types in Norway



Note: The most common PPU program-type is one in which future teachers first complete a Bachelor’s degree in mathematics and another subject (three years) and then continue on with the PPU course (one year). However, students can elect to complete a Master’s degree (five years) before taking the PPU course (one year). The Master’s and PPU program-types formally qualify graduates for Grades 5–13, but almost all graduates end up teaching Grades 8–13. Future teachers in the ALU without extra mathematics were tested at the end of the second year of the program whereas the full-time students in the ALU without mathematics were tested at the end of the fourth and final year of the program. Thus, these two program-types overlap because those students in the ALU without extra mathematics in Year 2 can choose ALU with mathematics in Years 3 or 4. Estimates for final-year fulltime students per program-type were calculated as the mean of the estimates from the two split-half samples for Program-Types C and D.

Oman³²

A small number of institutions with evolving roles are responsible for teacher education in Oman. All graduates of program-types that fit the TEDS-M population have Bachelor’s degrees, but the program-type offered by colleges outside the university differs in certain respects from that offered at the university (e.g., language of instruction and practicum requirements).

Institutions and governance

Oman currently has no initial teacher education provision for Grades 1 to 4. The reason is insufficient demand for new teachers at this level. TEDS-M, therefore, encompassed Grades 5 to 12 only. Recently, Oman’s six colleges of education were converted to more comprehensive applied colleges of science. Five of them no longer offer teacher education, but at the time of the TEDS-M data collection, all six still had teacher education students in their final year and therefore participated as part of the target population. Teacher education is currently offered at only a few institutions—Sultan Qaboos University, one college for females under the Ministry of Higher Education, and three private universities.³³

³² This section is based on the country report written by M. Al Ghafri, A. Al Abri, and M. Al Shidhani.

³³ The private universities had so few graduates in teacher education that they were not included in TEDS-M.

Program-types and credentials

In Oman, all secondary teachers of mathematics prepare for just one teaching subject, although they are actually required to study other subjects as well. Oman has three major program-types for preparing these mathematics teachers. One is a concurrent program-type at a college of education, leading to a Bachelor of Education (Exhibit 2.11). The second program-type also leads to a Bachelor of Education, but it is offered at Sultan Qaboos University, and the third is a consecutive program-type, consisting of a Bachelor of Science in Mathematics followed by a professional education diploma.

The Bachelor of Education that the university offers takes an average of five years to complete. In part, this is because most of the mathematics students have to spend one or two semesters studying English, given that English is the language of instruction for most of their courses. In the college of education, the Bachelor of Education takes four years to complete because there is less of an emphasis on English. Arabic is the language of instruction.

The Bachelor of Science in Mathematics program-type includes the normal two phases of a consecutive course of study. During the first phase, students are enrolled in the College of Science for five years, after which they receive a Bachelor's degree in mathematics. During the second phase, students enroll in the university's college of education for one additional year and then receive the Professional Educational Diploma in Mathematics. All these graduates are qualified to teach Grades 5 to 12.

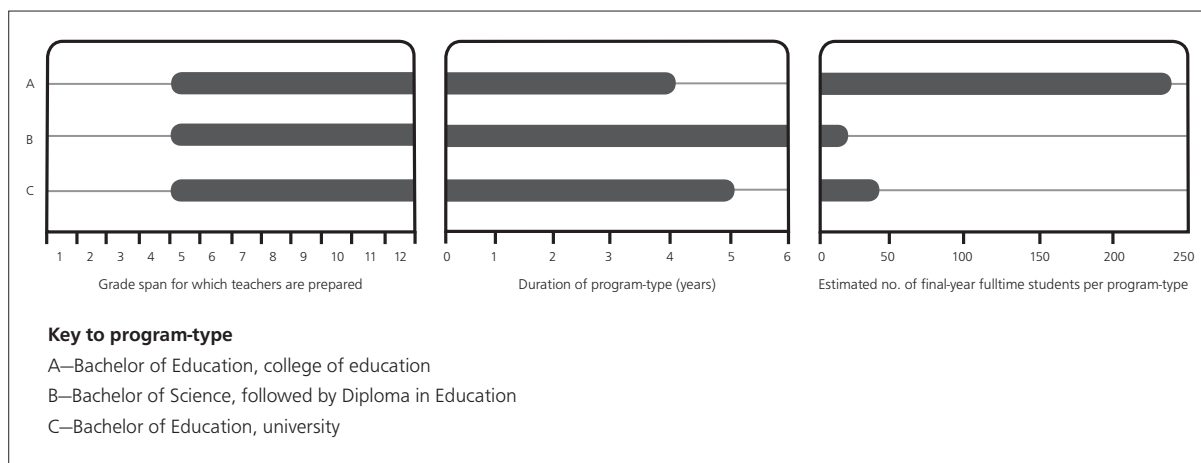
Curriculum content, assessment, and organization

The future teachers in the concurrent Bachelor of Education program-type have a heavy schedule of coursework. It includes:

- A “cultural component” of seven courses, with an emphasis on the nature of Omani society and its Arabic and Islamic origins, plus English language and elective courses;
- Specialized coursework in mathematics, physics, and computer science (20 to 21 required courses); and
- Eleven courses in education.

At the university, the practicum takes place in the final year of Bachelor of Education study (one day a week in the first semester and two days a week in the second). In the consecutive program-type, the practicum is scheduled for the last semester only and for two days a week. In the college of education, dispersed requirements for field experience that began in the third semester and continued to the end of the program-type were discontinued and replaced with the two-days-a-week requirement in the final year.

Exhibit 2.11: Teacher education program-types in Oman



Note: At the time of testing, Oman was not offering preservice teacher training for Grades 1–4 because of insufficient demand for new teachers at that level. Programs at private universities were not included because they had very few students.

Philippines³⁴

In contrast to most TEDS-M countries, the Philippines has a large number of teacher education institutions, both public and private. Key requirements, however, are set at the national level.

Institutions and governance

The Philippines has a total of 323 primary-level institutions offering mathematics for future teachers (72 public, 251 private) and 546 at secondary level (139 public, 407 private). Although these institutions have considerable autonomy, the Commission on Higher Education (CHED) has the legal authority to set minimum standards, evaluate what is offered, and establish policies and guidelines for the creation of new institutions.

The Technical Panel for Teacher Education reviews teacher education curricula as well as the overall capabilities of teacher education institutions.

Program-types and credentials

As Exhibit 2.12 shows, the Philippines has a very simple structure of one primary program-type (Bachelor of Elementary Education) for Grades 1 to 6 and one secondary program-type (Bachelor of Secondary Education) for Grades 7 to 10, both of which take four years to complete and are concurrent. The Bachelor of Secondary Education requires candidates to take a major subject, and sometimes a minor specialization; a few institutions require two major specializations.

Because secondary school in the Philippines ends at Grade 10, students are eligible for vocational training or university. Future teachers, therefore, go into teacher training after Grade 10, but they continue with basic general education courses in their first year, before beginning to specialize.

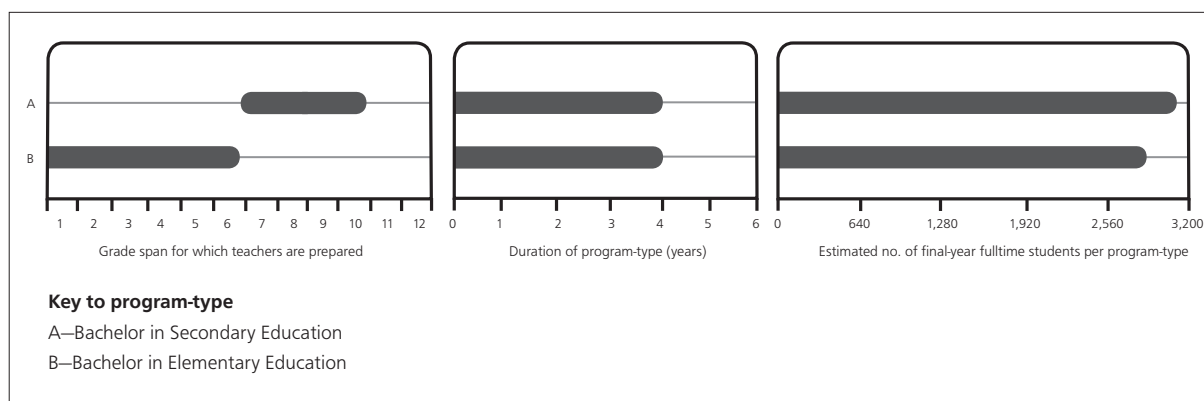
³⁴ This section is based on the country report written by E. B. Ogena, F. G. Brawner, and M. D. Ibe.

Curriculum content, assessment, and organization

In 2004, a CHED directive required implementation of a new curriculum in 2005/2006.³⁵ This includes a 6- to 12-week student teaching requirement. Student teaching includes both on- and off-campus components. Although there are guidelines for assessing this practicum component, much of the assessment is ad hoc, according to the authors of the country report.

All primary and secondary teaching candidates are required to take the Licensure Examination for Teachers (LET). The LET includes three main tests—professional education, general education, and the field of specialization—and is weighted 40 percent, 20 percent, and 40 percent, respectively. The syllabus is publicized and made known to teacher education institutions.

Exhibit 2.12: Teacher education program-types in the Philippines



Note: Sixty-one institutions in the target population were excluded because they were very small (fewer than five primary future teachers and fewer than three lower-secondary teachers).

Poland³⁶

In Poland, specialists teach mathematics from Grade 4 on. Poland thus differs from the norm in other TEDS-M countries with respect to the knowledge expected of teachers who staff most of the basic education grades.

Institutions and governance

Higher education plays a major role in teacher education in Poland. Although teacher training colleges, which are not considered to be a part of higher education, also offer teacher education, they produce only a small number of teachers. Students in teacher training colleges follow a curriculum that is very similar to the curriculum of Bachelor-degree studies. Their graduates are awarded a diploma (*dyplom ukończenia kolegium nauczycielskiego*). Recent reforms have raised the qualification levels required for entry into teaching, but there is no licensing; qualifications are defined solely in terms of required higher education degrees. Teacher education operates within the

³⁵ The earlier curriculum, at the beginning of the 1990s, was thought to be too heavy in general education courses, without enough specialized coursework or enough field experience. More subject-matter content was added to the program-types in the subsequent reform. The new curriculum also emphasizes curriculum development, lesson planning, instructional materials development, assessment, and innovative teaching, and gives greater emphasis than previously to experience in the field and in classrooms.

³⁶ This section is based on the country report written by M. Sitek.

general legal and institutional framework of higher education. Special regulations of the sort developed for all fields of study set out the requirements for the curriculum and practicum of teacher education.

Program-types and credentials

The organization of primary and secondary education changed in 1999. Primary schools in Poland now offer six years of general education, with a further three years in lower-secondary schools. Primary school has two stages: a stage of integrated learning in Grades 1 to 3 and a stage of specialist subject teaching in Grades 4 to 6.

Future teachers wanting to teach mathematics in Grade 4 must complete a higher education degree in mathematics, which also includes required teacher education content.³⁷ Graduates in mathematics education from the teacher education colleges can teach only in Grades 4 to 6 of the primary schools and in basic vocational schools. In contrast, there is no distinction in Grades 1 to 3 between school subjects; teachers must be qualified in “integrated teaching”—a qualification acquired through pedagogical study program-types at Bachelor’s and Master’s levels in universities or at diploma level in teacher education colleges. The pedagogical-study program-types include very little opportunity to learn mathematics, but provide substantial academic knowledge in general pedagogy.

A two-cycle structure has been introduced as part of Poland’s implementation of the Bologna Accord—a three-year Bachelor of Arts (second and fourth bars in Exhibit 2.13) and a two-year Master of Arts. The first-cycle (Bachelor’s) degree in mathematics qualifies graduates to teach in primary and lower-secondary schools, while the second-cycle (Master’s) degree in mathematics qualifies graduates to also teach in upper-secondary schools. The pedagogy degrees usually qualify teachers to teach in kindergartens and Grades 1 to 3. The old five-year Master’s has been phased out (first and third bars in Exhibit 2.13). While this program-type is no longer offered, it was included in TEDS-M because students were still completing their final year of study in 2008. Graduates of the first cycle (Bachelor’s) programs may enroll in second-cycle (Master’s) programs. For this reason, second-cycle program-types were not included in the TEDS-M study because they are offered mostly to persons already qualified to teach.

In the first-cycle Bachelor’s program-type, future teachers prepare to teach two subjects. The more advanced degree prepares them for even more specialization in just one subject (although they still may also teach two). Exhibit 2.13 shows that the top two program-types (or bars) preparing future teachers for Grades 4 to 12 and 4 to 9, respectively, are relatively small program-types compared to those represented by the third and fourth bars in the exhibit, which focus on Grades 1 to 3. This pattern reflects the popularity of pedagogy program-types for Grades 1 to 3, which are less selective and less demanding than the mathematics program-types.

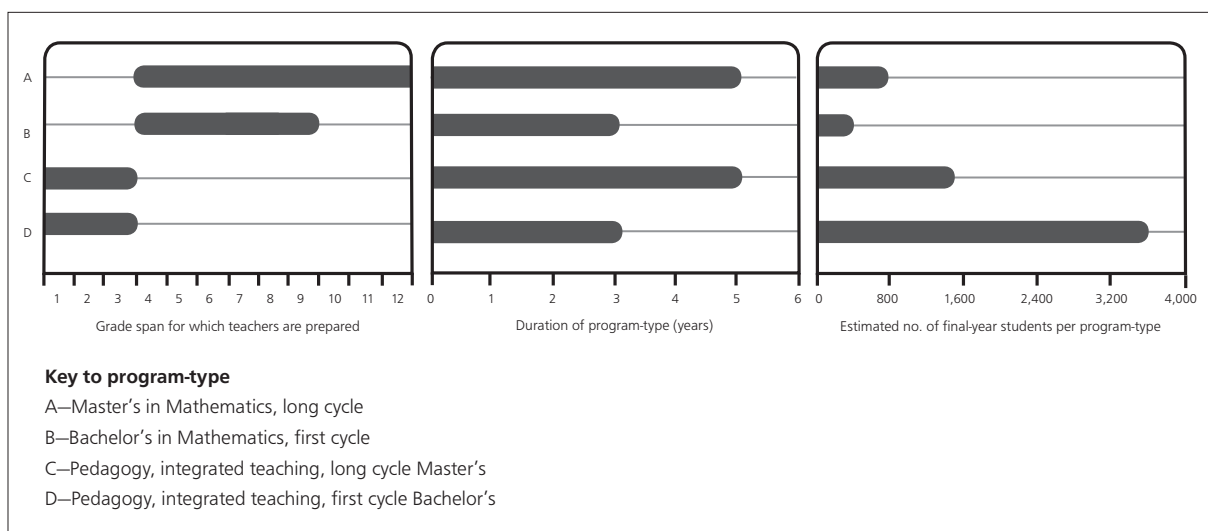
Administrative and survey data show that most teachers in Poland hold Master’s degrees. A survey of specialist mathematics teachers in primary and lower-secondary schools indicates that 95 and 97 percent, respectively, hold Master’s degrees. However, many teachers of mathematics major in other fields of study. As many as 31 percent of the primary school mathematics teachers and 25 percent of the lower-secondary mathematics teachers had qualified in this subject through post-graduate study. A large majority of them had previously taught other school subjects, mainly physics or other science subjects.

³⁷ Majoring in a degree with substantial mathematics content can also be considered satisfactory. This determination is made by the school principal, who is responsible for teacher employment.

Curriculum content, assessment, and organization

Teacher education is offered as a specialization within other higher education program-types, which means that a major part of the future teachers' curriculum is the same as other tracks within the mathematics field of study (or pedagogy, in the case of future teachers for Grades 1 to 3). In addition to meeting the standards set for all graduates in mathematics, students in the teacher education track must complete required coursework in pedagogy, psychology, didactics, and practicum, as defined in a decree put out by the Minister of Education. According to the TEDS-M national center in Poland, teacher education suffers from the “academic drift” of higher education (Fulton, Santiago, Edquist, El-Khawas, & Hackl, 2007). There is a greater emphasis on academic subject-matter content than on knowledge of teaching practices and related knowledge of the schools in which future teachers are likely to teach.

Exhibit 2.13: Teacher education program-types in Poland



Note: Postgraduate programs and institutions with consecutive programs only were not covered (9 out of 105 institutions, making for 23.6 percent of the TEDS-M future primary teacher population and 29 percent of the lower-secondary population). Programs in teacher training colleges are not separated out from Bachelor of Arts programs in universities in the program-types because their programs are so similar and the proportion of future teachers in them is very small. Earlier in the study, a distinction was made between fulltime and parttime program-types. However, in this exhibit, the fulltime and parttime programs have been combined, again because the differences are not great enough to constitute separate program-types. In addition, the second-cycle program-type (Master's), which was originally considered part of the target population, was ruled out of scope because most of its students had already become eligible to teach after completing the first cycle (Bachelor's). Estimates for final-year full-time students per program-type were calculated as the mean of the estimates from the split-half samples for Program-Types A and B.

Russian Federation³⁸

The Russian Federation is transitioning from the system of teacher education that existed in the Soviet Union to a double-level system that complies with the principles of the Bologna Accord, which are being applied in many European countries. Thus, in similar vein to the situation in Poland, the old program-type of unified five-year teacher preparation, in which all of the TEDS-M sample were enrolled, has been largely replaced by a Bachelor's degree followed by a Master's degree. At the same time, most of the former pedagogical universities have become faculties of education situated in more conventional university settings.

Institutions and governance

In the Russian Federation, public universities, established at national, regional, or municipal levels, are responsible for qualifying teachers of mathematics. There are no private institutions preparing mathematics teachers in the federation. Changes made in response to the Bologna Accord have been rapid. When the TEDS sampling frame was prepared in 2006, 162 higher education institutions were preparing teachers for work in primary schools and 120 were preparing teachers of mathematics for work in basic and secondary schools. Among them were 111 pedagogical universities or institutes and 54 state universities. However, by 2009, the number of pedagogical universities preparing mathematics teachers had dropped sharply—to 62. By that time, many universities had started offering the new Bachelor's plus Master's program-type, but others were still offering the traditional five-year program-type surveyed in TEDS-M. Some universities at the time were offering both the old and the new program-types.

Program-types and credentials

At the time of the TEDS-M data collection, students in the new Bachelor's/Master's program-type, established in 2005, had not reached their final year of study and therefore did not belong in the TEDS-M target population. The population also did not include students in the pedagogical colleges whose programs were due to be phased out. These colleges offered either four years of teacher education at secondary school level (starting at Grade 10) or three years starting immediately after secondary school (Grade 11). The number of colleges and future teachers in these college program-types at the time of data collection was unknown (the number of remaining colleges was estimated to be about 80).

According to the Russian Federation TEDS-M national research coordinator, many of the graduates of these colleges have continued on to the pedagogical universities, starting at these institutions in their second or third year of study. Also, at the time of data collection, an estimated five percent of newly qualified teachers were people who had a first university degree but had not studied education in any form. After a special short course, they received their qualification to teach. The TEDS-M target population, however, was defined only in terms of two program-types, both five years in duration: one for primary schools, Grades 1 to 4, and the other for secondary schools, Grades 5 to 11 (see Exhibit 2.14). Today, the universities educate both future primary school and future secondary school teachers. However, one department is responsible for the primary teachers and a different department for the secondary.

³⁸ This section was written with the assistance of G. Kovaleva.

Curriculum content, assessment, and organization

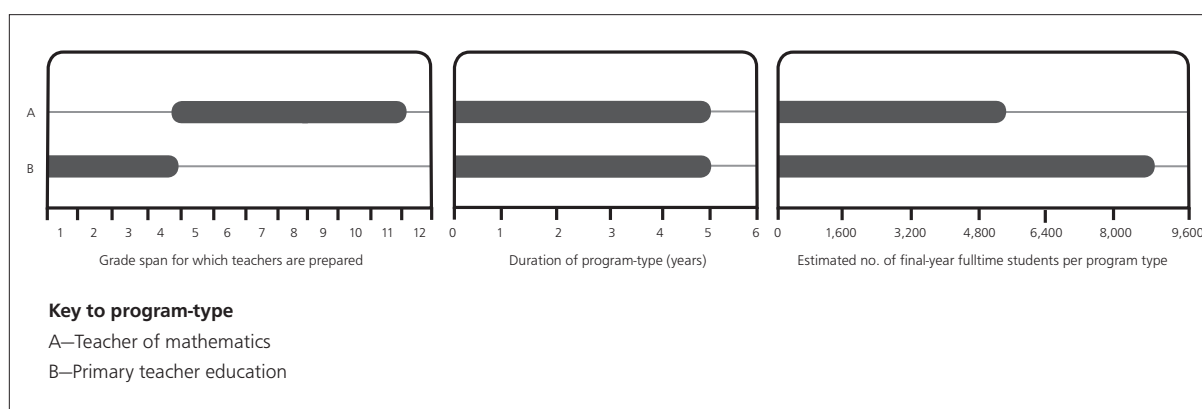
The new Bachelor's plus Master's and the old TEDS-M program-type are still based on the model developed during the Soviet era. Although the national government has a set of state standards for teacher education, each institution can select from these standards to tailor the curriculum to its own requirements and emphases, which are mediated by such factors as subject-matter specializations, research capability, and regional traditions. However, the Ministry of Education and Science must approve this choice.

The mathematics content in the state standards for teacher education is very similar to mathematics standards for other mathematics-focused professions. For example, the standards for the mathematics department of the pedagogical universities, at the Bachelor's degree level, include a two-year course in classical mathematical analysis (calculus) and its applications, a five-term course in algebra and geometry, a course in probability theory, and electives in mathematics. Special attention is paid to elementary mathematics courses during the first and seventh terms of study. There are also demanding requirements throughout the program-type for computer literacy, computer architecture, computer programming, informatics, mathematical modeling, and multimedia.

In addition, during their first two years of this program-type, students experience three terms of pedagogy and psychology. They study didactics and mathematics pedagogy during their second and third years and teaching methods specific to lower- and upper-secondary school in their third and fourth years. One month of teaching practice is scheduled in both the third and fourth years.

Under the new Master's degree program, offered during the fifth and sixth years of study, students generally have three days of instruction at the university and two to three days of practical experience at school each week. This same mixed format was used during the last academic year of the former five-year program-type. At the end of both the old and new program-types, future teachers must pass two state examinations and defend a thesis.

Exhibit 2.14: Teacher-education program-types in the Russian Federation



Note: Coverage of the TEDS-M target population did not include pedagogical colleges, the programs of which were about to be phased out. Nor did the population include the new Bachelor's/Master's program-types because their students had not reached their final year. Another estimated five percent of the target population that was not covered consisted of the university graduates who became qualified to teach after a special short training course.

Singapore³⁹

The city-state of Singapore has only one teacher education institution, the National Institute of Education (NIE), which is an autonomous institute of Nanyang Technological University. As a result, the institution has maintained a high degree of control over teacher training and certification in the nation. Teachers are recruited by the Ministry of Education and sent to NIE for training. NIE offers a number of different program-types.

Institutions and governance

Graduating from NIE automatically qualifies candidates recruited by the Ministry of Education to teach in Singapore's public schools. The permanent secretary of Singapore's Ministry of Education chairs the NIE's governing council. In general, NIE works very closely with the ministry.

Program-types and credentials

Although only one institution offers teacher education in Singapore, the structure of the program-types provided is complex (see Exhibit 2.15). Teacher education aligns with the grade split between primary and secondary education: primary education in Singapore includes Grades 1 to 6; secondary includes Grades 7 to 10. Post-secondary education includes Grades 11 and 12. Most future teachers go into teacher training after Grade 12 (A-level), but some acquire a polytechnic diploma and generally enter this course of study after completing Grade 10.

Teachers are trained in four concurrent and four consecutive program-types. The concurrent program-types include two variants of a general diploma program-type (two years) as well as a Bachelor of Arts (Education) or a Bachelor of Science (Education) degree (four years). The diploma program-type is the only concurrent TEDS-M program-type requiring fewer than three years in an institution of higher education. The primary diploma has A and C options. Students studying under the A option are trained to teach two subjects, while those studying under the C option are trained to teach three subjects.⁴⁰

Students completing the consecutive program-types receive a postgraduate diploma in education (PGDE), one form of which qualifies graduates to teach in primary schools and the other in secondary schools. The diplomas cater to future teachers who have already gained a degree and then enroll in NIE for this one-year second phase of the program-type. The top four bars in the middle chart in Exhibit 2.15 refer to the diplomas but include the four years of degree study plus one year of teacher education training, giving a typical duration of five years for this program-type.

³⁹ This section is based on the country report written by K. Y. Wong, S. K. Lim-Teo, N. H. Lee, K. L. Boey, C. Koh, J. Dindyal, K. M. Teo, and L. P. Cheng.

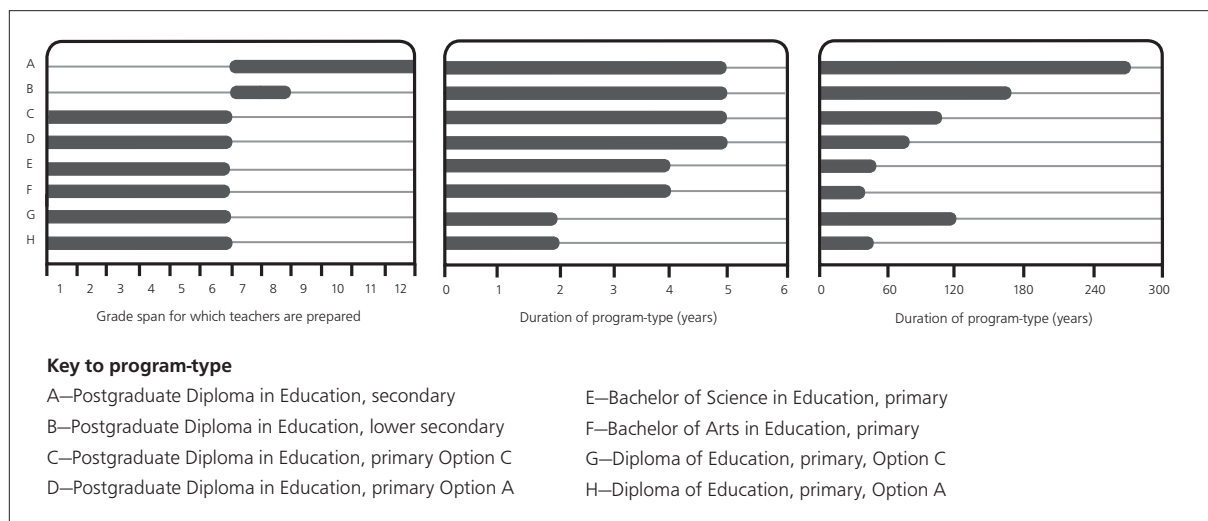
⁴⁰ The diploma program-type is not officially recognized as being a university-level course, even though it takes place within a university. In particular, these future teachers do not complete university-level mathematics. However, those future teachers who receive the non-degree diploma are considered officially qualified to teach, even though other future teachers who obtain a university degree have a higher level of academic achievement.

Within the school system, about 75 percent of the teaching-force are graduates and the remaining 25 percent are non-graduates. The program-type enrolments in Exhibit 2.15 are based on the numbers of future teachers who took part in the TEDS-M survey in November 2007 and May 2008. The numbers enrolled in the various program-types in Singapore tend to change considerably from one year to the next.

Curriculum content, assessment, and organization

All teacher education candidates are required to complete core courses in education studies, subject knowledge (primary only), curriculum studies, academic studies (degree only), practicum, and what are termed language enhancement and academic discourse skills (LEADS). LEADS courses are unique to Singapore. They focus on developing the skills required to use English for communication, in general, and academic and professional purposes, in particular. Emphasis on the practicum varies by program-type: diploma, 23 percent of total preservice education; Bachelor's degree, 16 percent; and postgraduate diploma, 25 percent.

Exhibit 2.15: Teacher education program-types in Singapore



Note: There is only one institution of teacher education in Singapore. All eight program-types co-exist in the same institution.

Spain⁴¹

In Spain, state-issued guidelines direct much of the teacher education curriculum of all universities. This situation has been in force since the creation of Spain's education system in the 19th century. Multiple laws and royal decrees continue to define and develop the complex framework of this system.

Institutions and governance

Teachers in public schools in Spain are civil servants. To prepare these teachers, as well as teachers in private schools, Spain has 76 public and private institutions for primary teacher education (in faculties of education or schools of teacher education) and 28 for secondary mathematics teacher education (in faculties of mathematics). Private institutions must meet minimum conditions laid down by the Spanish government, but those not receiving public funds are free to establish their own internal rules, guidelines, and regulations. Before 2002, public institutions had to have their teacher education curricula approved by the Ministry of Education. After 2002, another public agency (the National Agency for Accreditation) took on this responsibility. Even the curriculum requirements established by and specific to individual universities must ultimately be validated by the national authorities and published in the official state gazette.

Program-types and credentials

At each level, the academic requirements for teaching are consistent throughout Spain, varying only with respect to the level of education taught. Primary education in Spain includes Grades 1 to 6. Compulsory secondary education includes Grades 7 to 12. Teacher education is aligned with these two school types. At present, a degree commonly called the teacher certificate and offering specialized preparation in primary education is required to teach students 6 to 12 years of age. Teachers at this level are generalists, usually teaching all subjects except foreign languages, physical education, musical education, and religion.

Until 2010, the teacher certificate took three years to acquire and was awarded by university schools of teacher education and associated entities. The curriculum and guidelines for this certificate dated back to 1995, and changed little in subsequent years. Secondary education candidates before 2010 were required to complete a five-year university degree and then to obtain a Certificate of Pedagogical Aptitude (CAP) at the end of a short-term course.

Note that TEDS-M in Spain was limited to primary education because of special difficulties anticipated in collecting data from dispersed and difficult-to-reach future teachers at the secondary level. Due to this omission, Exhibit 2.16 shows the simplest structure in TEDS-M, with only one program-type. This program-type is currently being modified and aligned with the Bologna Accord, adopted in order to "Europeanize" the continent's universities.

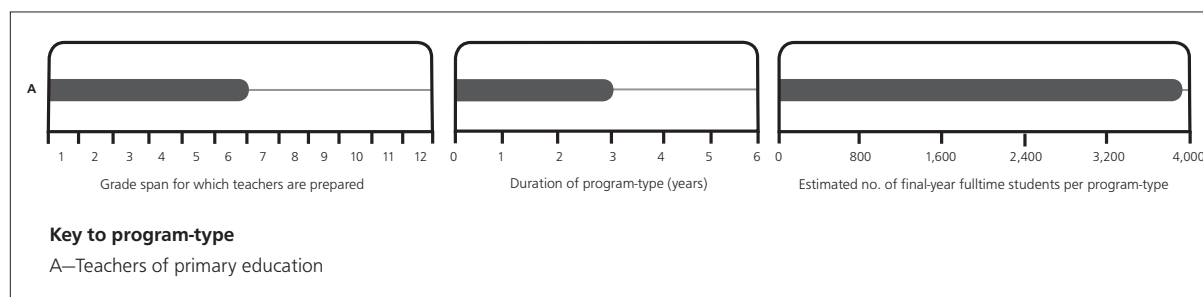
41 This section is based on the country report written by E. Castro Martínez and P. Flores Martínez.

Curriculum content, assessment, and organization

The common core subjects for the primary teacher certificate are psycho-pedagogical foundations of special education, general pedagogy, organization of educational institutions, educational and developmental psychology and school-age development, educational sociology, educational theory and contemporary educational institutions, and use of ICT in education. The specific core subjects are natural science and its didactics, social science and its didactics, artistic education and its didactics, physical education and its didactics, foreign languages and their didactics, and language and literature and their didactics. Mathematics and its didactics vary considerably from one university to another. Students must also complete a practicum. National guidelines specify that the three years of study include two weeks of practicum in the first year, one month in the second, and two months in the third.

According to national policy, in order to be appointed to a teaching position in a government school, teacher certificate graduates must pass a fixed-quota competitive state examination, established to govern entry into the national civil service. The fixed quota is based on the number of vacancies in teaching available in a given year.⁴²

Exhibit 2.16: Teacher education program-type in Spain



⁴² This selection process takes place in three phases. The first involves a written and oral test to assess knowledge of the curriculum to be taught, as well as of pedagogical and teaching resources. The second is an evaluation of the candidates' additional qualifications (their average grades during academic studies, teaching experience outside the civil service system, and even aspects such as participation in conferences). Candidates who successfully complete these two phases continue with another period of teaching practice, for at least three months, to further verify their aptitude for teaching.

Switzerland⁴³

Switzerland's teacher education system has changed in fundamental ways in the last two decades, moving toward integrating teacher education in higher education, a process experienced in other countries long before this. At the same time, the Swiss have reduced, but by no means eliminated, important differences between cantons. In addition, Switzerland remains exceptional in the number of different subjects that future teachers have to study.

Institutions and governance

According to the country report, Swiss teacher training was not only diverse in the early 1990s (before the higher education integration process started) but also, in many respects, "arbitrary." There were virtually no mechanisms for coordinating and harmonizing teacher education from one canton to another. At that time, teacher training took place in 153 different institutes. Under the reform, a limited number of teacher training schools began the transformation into universities of teacher education, a process that is now almost complete.⁴⁴

Future teachers are typically required to qualify for university entrance by gaining the *Matura*, a qualification awarded on the basis of passes in final examinations and students' academic record in the final year of secondary school. Students who do not have this diploma can still gain admission by sitting and passing a special entrance examination.

As a result of this reform, cantonal parliaments have lost some of their power over teacher education while rectors of universities of teacher education, who can now draw on increased institutional autonomy, are playing a more decisive role. The federal government has no role in teacher education other than for vocational schools.

Previously, each canton decided whether to recognize the certificates of other cantons. However, the Swiss Conference of Cantonal Ministers of Education (EDK) has agreed that teaching certificates from EDK-approved teacher education institutions are now valid in every canton.

Program-types and credentials

Despite cantonal autonomy and variation, the overall structure of Swiss teacher education in the TEDS-M survey (carried out only in German-speaking institutions in Switzerland) is relatively simple. It consists of the following program-types, as portrayed in Exhibit 2.17:

- Teachers of secondary school Grades 7 to 9;
- Teachers of primary school Grades 3 to 6;
- Teachers of primary school Grades 1 to 6;
- Teachers of primary school Grades 1 to 2/3.

⁴³ This section is based on the country report written by S. Brandt, F. Oser, H. Biedermann, M. Kopp, S. Steinmann, S. Krattenmacher, and C. Brühwiler.

⁴⁴ In 2004, the older teacher training schools issued 60 percent of the teaching certificates at the preschool and primary school levels, while the universities of teacher education issued 31 percent and the traditional universities 9 percent. Since 2006, however, teacher education for preschool, primary school, and lower-secondary school has been mainly offered at 13 universities of teacher education, and at three of the traditional universities.

Curriculum content, assessment, and organization

Primary teachers teach the core primary subjects as well as music, art, physical education, and other such subjects. Lower-secondary teachers also teach multiple subjects, but they usually choose between a language–history-oriented cluster and a mathematics–science-oriented cluster. Future teachers preparing for primary school generally take six to eight subjects, thus putting more emphasis on a wider range of subjects than countries that concentrate on only a few core subjects. Most primary teacher education includes German, French, English, and/or Italian,⁴⁵ mathematics, art, physical education, history, information technology, geography, science, and instrumental (music) instruction. Additional coursework in education is integrated into the program-types from their beginnings.

Secondary teaching candidates generally become qualified to teach three to five subjects. The combination of subjects is mandated in some institutions and is elective in others.⁴⁶ The practicum ranges from 2 to 12 weeks, with an average of seven. Some universities add on-the-job training in the social or business sectors, or foreign language study trips, to this practicum requirement.

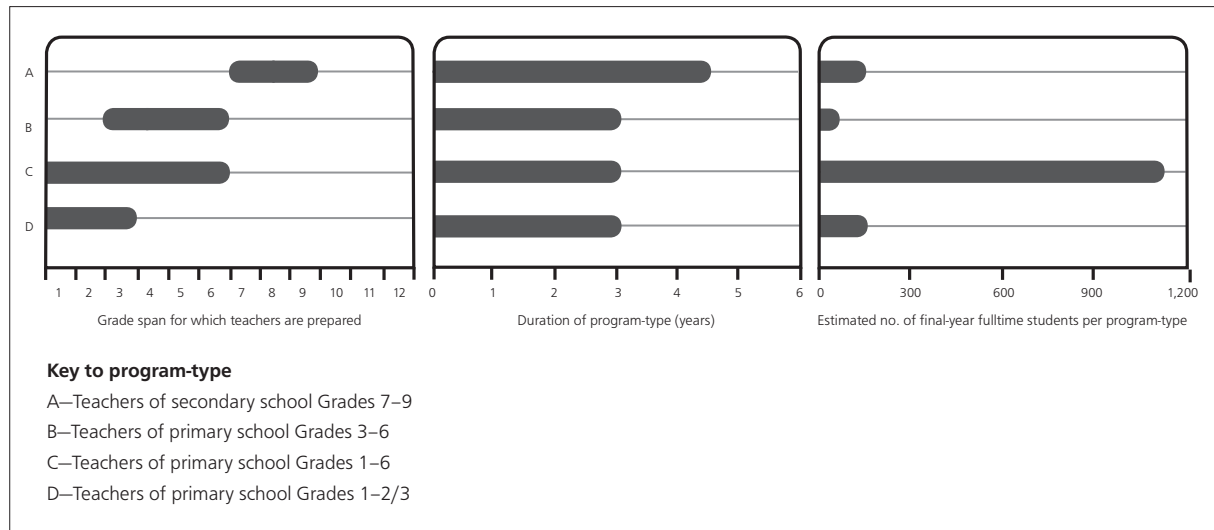
In primary school teacher education, interim and final examinations are handled quite differently by the cantons. Some cantons have no real final examinations. In most cantons, though, examinations for primary future teachers are held for up to 10 subjects. The timing and modalities of these examinations also differ.⁴⁷ Success on a teaching test consisting of one or two lessons is required. Likewise, there are major differences in assessment across the universities offering education to lower-secondary future teachers. However, oral and written final examinations for at least three subjects take place almost everywhere. The practicum and the dissertation components of the degree are also assessed.

⁴⁵ Italian is only required within the Italian-speaking cantons.

⁴⁶ In either case, this combination is drawn from a comprehensive set of subjects from the humanities and mathematics/natural sciences (mathematics, biology, chemistry, physics, and, in rare cases, information technology). Subject-matter content and subject-specific pedagogy are expected to comprise at least 40 percent of the program-type, the education sciences at least 20 percent, and practical training at least 10 percent.

⁴⁷ They include not only written but also oral examinations, covering the general education and the profession-related parts of the program-type, which means inclusion of at least the mother tongue, one other language, mathematics, pedagogy, psychology, didactics and music, but often also drawing, physical education, history, and the natural sciences.

Exhibit 2.17: Teacher education program-types in Switzerland



Note: The TEDS-M target population in Switzerland included only institutions where German is the primary language of use and instruction. It did not include institutions operating in other national languages. Also, the distinction between primary and secondary schools varies by canton: in 20 cantons, Grades 1–6 are defined as primary and Grades 7–9 are defined as secondary. However, in a number of other cantons, primary school ends at Grade 4 or 5. Some program-types at primary level qualify future teachers for kindergarten, but because this level of the education system was outside the scope of TEDS-M, no distinction was made between K–Grade 6 and Grades 1–6 programs, for example.

Thailand⁴⁸

Although Thailand has a comprehensive regulatory framework for teacher education, institutions continue to enjoy considerable curricular and instructional autonomy.

Institutions and governance

In academic year 2007, 46 Thai institutions had mathematics teacher education students. Thirty-seven of these institutions offered a five-year degree, one institution offered only a one-year graduate diploma in the teaching profession, and eight institutions offered both these program-types. The Ministry of Education's Commission on Higher Education oversees Thai universities.⁴⁹ The Teachers' Council of Thailand is responsible for accrediting degrees and certificates, subject to guidelines set out by corresponding professional associations.

Program-types and credentials

Thai basic education follows the 6–3–3 system—six years of primary school followed by three years of lower-secondary school and three years of upper-secondary school. Nine years are compulsory. Universities with a faculty of education are responsible for preparing future teachers for both primary and secondary schools. Future teachers who have earned a Bachelor's degree outside of education must take one additional year,

⁴⁸ This section is based on the country report written by P. Dechsri and S. Pativisan.

⁴⁹ The Bureau of Standards and Evaluation supervises all internal quality assessments at the universities in three domains: standards for graduation, standards for educational management, and standards for developing a knowledgeable society. In addition, the Commission on Higher Education establishes a national framework and standards for academic and professional degrees for the country's universities. That office also provides broad entry prerequisites, structure, total credits, attendance length, registration, evaluation, and graduation standards/requirements. Each institution, in turn, is responsible for specific details.

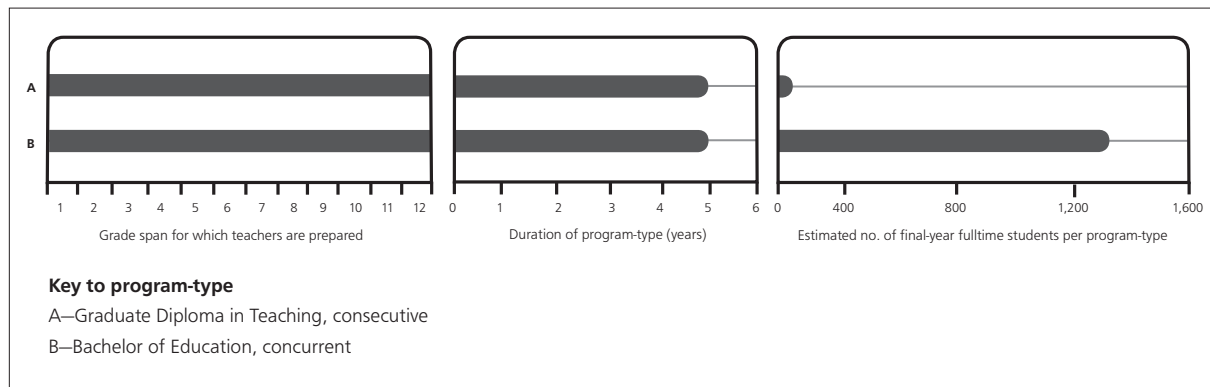
fulltime, in a modified university program-type, which leads to a graduate diploma—the second of the two program-types included in TEDS-M for Thailand. The earlier four-year program-type was changed to five years after the 2007 class graduated. There is no differentiation between preparation of teachers for the lower grades and secondary grades up to Grade 12.

All future teachers within the Thai TEDS-M target population were specializing in mathematics, in line with a recent policy requiring teachers throughout compulsory education to be competent in mathematics. Thus, as Exhibit 2.18 suggests, the two program-types in Thailand differ only in that one is concurrent and one is consecutive.

Curriculum content, assessment, and organization

Most Thai curricula for mathematics teacher education have a core of basic professional courses. The contents of these core courses are extracted from nine areas: language and technology, curriculum development, learning management, psychology, measurement and evaluation, classroom management, educational research, innovation and IT, and teacher characteristics. There is also an allowance for special topics and electives. Students must also complete a 180-day practicum during the two semesters of their last year of the five-year concurrent program-type. Students completing the graduate diploma of teaching must undertake a full-year practicum, but there is some variation in how this is implemented.

Exhibit 2.18: Teacher education program-types in Thailand



Note: Program-types producing primary generalist teachers existed on paper, but at the time of testing and afterwards had no students. All future teachers in the TEDS-M target population were mathematics specialists. Estimates for the final-year fulltime students per program-type were calculated as the mean of the estimates from the two split-half samples for Program-Types A and B.

United States⁵⁰

The United States has gradually shifted from local control toward centralization of the teacher licensure or certification policy at the state and, to a lesser extent, the national level. At the same time, teacher education program-types, licensure requirements, and program accreditation requirements for primary school and lower-secondary mathematics teaching have continued to vary significantly both within and across states.

Institutions and governance

In the United States, more than 1,300 public and private colleges and universities as well as school districts, state agencies, and private organizations offer teacher education for future primary and secondary teachers. All states require teacher education institutions to obtain state approval for what they offer, but approval standards vary across states.

Program-types and credentials

In the federal No Child Left Behind legislation, the “highly qualified” teacher requirement mandates teachers to demonstrate knowledge of the subjects they are assigned to teach but does not impose specific national curriculum requirements.⁵¹

Exhibit 2.19 does not attempt to portray all the variations in levels of certification offered by universities and colleges in the 50 American states. Instead, it gives an overview of the six main program-types—primary, lower-secondary, and secondary, each of which is offered in both a concurrent and a consecutive version. Note, however, that the grade spans overlap: teachers in grades generally identified with primary school can thus be prepared in a lower-secondary program-type, and teachers in grades usually identified with lower-secondary can be prepared in either a lower-secondary or a lower- plus upper-secondary program-type. The content that these prospective teachers at any of these grade levels study can therefore vary considerably.

Aside from the mandatory completion of upper-secondary school, teacher education applicants in the United States have to comply with the additional and varying requirements set by both teacher preparation institutions and the states. These include, for example, minimum grade point average, previous course requirements, scores on university entrance examinations (SAT/ACT), and, in some cases, state licensure test scores.

In addition to the more traditional program-types in higher education, alternate routes to licensure have grown significantly. States have differentially defined these routes in order to meet the demand for teachers in specific high-need subject areas or high-need locations. Alternate routes provide professional training to individuals who have been hired as the official teacher or teacher of record in a classroom and who therefore fall outside the scope of TEDS-M. Since 1998/1999, the number of teachers licensed

⁵⁰ This section is based on the country report written by P. Youngs and E. Grogan.

⁵¹ Instead, primary candidates can demonstrate knowledge of mathematics (and other subjects) by completing a Bachelor’s degree and passing tests of subject-matter knowledge and teaching skills in mathematics, reading/language arts, and writing. Secondary mathematics teaching candidates can demonstrate subject-matter knowledge by passing a subject-matter examination, majoring in mathematics as an undergraduate, earning a graduate degree in mathematics, completing the coursework equivalent to an undergraduate degree, and/or holding advanced board certification from the National Board for Professional Teaching Standards (NBPTS) or the American Board for Certification of Teacher Excellence (ABCTE).

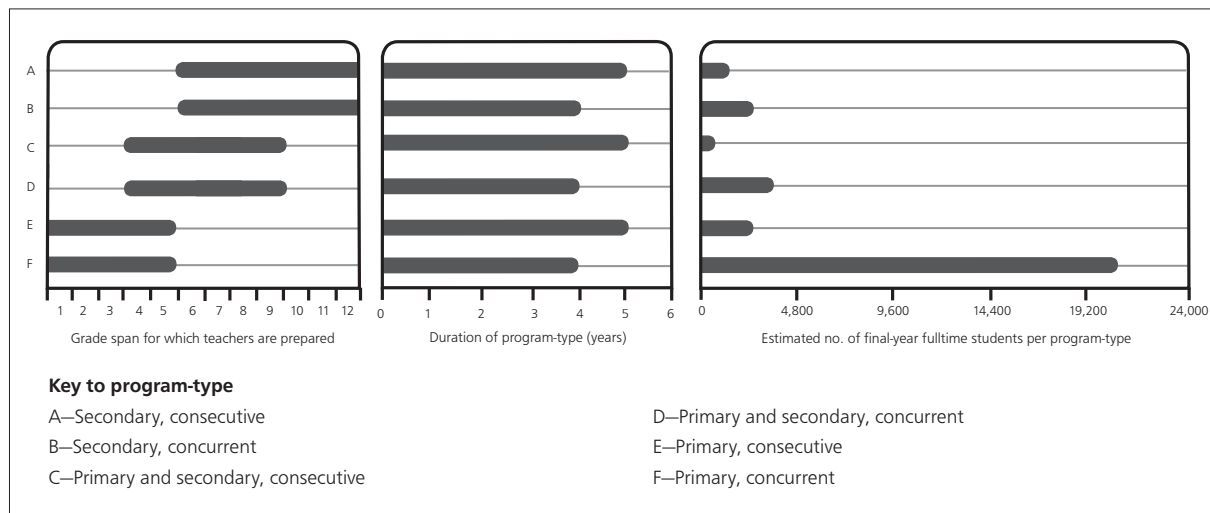
through alternate routes has climbed steadily: in 2004/2005, approximately 50,000 teachers (about 33% of all teachers hired that year) entered through such routes. Local school districts, intermediate school districts, state agencies, private organizations, and institutions of higher education offered these options.

Curriculum content, assessment, and organization

In general, the primary and lower-secondary program-types differ substantially from program-types providing secondary mathematics preparation. The latter are specialist program-types that primarily emphasize coursework in mathematics, mathematics pedagogy (methods), and some additional education courses (e.g., special education, social foundations of education, multicultural education). Primary school and middle-grade program-types prepare generalists and include pedagogy (methods) courses for language, arts, social studies, and science (as well as mathematics), along with other education courses. They offer fewer courses in mathematics content than do program-types that prepare teachers for up to Grade 12.

Program-type requirements vary in other respects as well. Some states provide general guidelines, while others mandate specific requirements concerning liberal arts courses, subject-matter courses, and pedagogy courses. Teacher preparation programs, program-types, and states also vary with regard to requirements for practicum experience. As of 2007/2008, 39 of the 50 states required 5 to 18 weeks of student teaching, 38 required candidates to pass tests of basic literacy and numeracy, and 41 mandated that candidates pass tests of content knowledge. Three states did not require candidates to pass either type of test.

Exhibit 2.19: Teacher education program-types in the United States



Note: The enrolments in the graphs are for public institutions only. Because of limited funding, the sample of future teachers was drawn from all public colleges and universities with teacher-education programs. The sample represented just over 60 percent of the total production of both future primary and future secondary teachers from all types of colleges and universities. Exclusions included (a) private institutions of teacher education and (b) alternate routes of preservice education conducted outside institutions of higher education. The different grade spans in this exhibit reflect the fact that grade spans are regulated by the certification requirements of each state. Some United States program-types at primary level qualify future teachers for kindergarten, but because kindergarten was outside the scope of TEDS-M, no distinction was made between K–Grade 5 and Grades 1–5 programs, for example. Estimates for final-year, fulltime students per program-type were calculated as the mean of the estimates from the two split-half samples for Program Type C.

Conclusion

The main point of this chapter has been to show that, notwithstanding commonalities in the major organizational parameters, employment conditions, and quality assurance policies examined in Chapter 1, the TEDS-M teacher education systems differ in many other relevant ways. Understanding these differences is essential if we are to give valid interpretations of the findings of the TEDS-M curriculum analyses and surveys of institutions, teacher educators, and future teachers. However, understanding this diversity at the national level is only the first step. As the curriculum analysis and survey data show, there is much more variation within countries. Understanding these other differences is important in terms of understanding the opportunities to learn and outcomes at the program-type, program, and future teacher levels. All this is analyzed and reported in the remaining chapters of this publication as well as in other TEDS-M reports. This material is explored in particular depth in the national reports written and released by the participating national centers.

References

- Fulton, O., Santiago, P., Edquist, C., El-Khawas, E., & Hackl, E. (2007). *Review of tertiary education: Poland*. Paris, France: Organisation for Economic Co-operation and Development (OECD).
- Organisation for Economic Co-operation and Development (OECD). (2005). *Teachers matter: Attracting, developing and retaining effective teachers*. Paris, France: Author.
- Tatto, M. T., Schwille, J., Senk, S. L., Ingvarson, L., Rowley, G., Peck, R., Bankov, K., Rodriguez, M., & Reckase, M. (2012). *Policy, practice, and readiness to teach primary and secondary mathematics in 17 countries: Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M)*. Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement.

CHAPTER 3:

HISTORICAL PERSPECTIVES ON THE POLICIES AND ORGANIZATION OF TEACHER EDUCATION

John Schwille

This chapter discusses, from an historical perspective, four fundamental trends and countertrends in the policies and organization of teacher education. They are:

1. The role of teacher education in increasing access to and attainment of universal schooling, first at the primary and then at the secondary level;
2. The tension between local initiative and centralized control of teacher education;
3. The integration of teacher education within higher education; and
4. The extent of specialization for which teachers are prepared.

For the last 200 years, teacher education has been a work in progress, and there is little sign that this will change. An historical perspective is needed to render more understandable the mixture of new and old organizational forms, each subject to normal fluctuations of growth and decline as well as varying degrees of implementation. One of the clearest examples of this situation in TEDS-M is Georgia, where the authors of the country report describe all that exists today as purely transitional between what was and what is intended to be. According to the authors, the “teacher profession, and consequently the teacher employment system, is undergoing a number of crucial reforms. This means that all the policies and procedures currently in place are temporary and relevant only to the so-called transitional period, which will gradually reach its end [four years] after the first certification examination is conducted.”

Currently, some of what we report as of 2008 is being superseded as the Bologna process takes its course throughout the European Union and other participating non-EU members (e.g., Georgia, the Russian Federation, and Switzerland). In Spain, for example, important changes in teacher education program-types were introduced during the period 2006 to 2010 (changes which did not affect Spain’s implementation of the TEDS-M design). For Spanish primary teachers, the duration of the program-type was extended for an additional year, and the generalist aspects of teacher education were emphasized. Consequently, the time spent on mathematics and mathematics pedagogy was not increased. For Spanish secondary teachers, even though the duration of the program-type remained at five years, it now consisted of a Master’s degree acquired after an initial four-year degree in mathematics. The Master’s degree is focused on mathematics pedagogy.

In some cases, knowledge of history leads one to predict effects of what has happened on TEDS-M test scores. For example, in the Spanish example just given at the primary level, we might expect that the test results would be more generalizable to the current time than some time after the Bologna reform had seen Spain increase its emphases on mathematics content and pedagogy in its teacher education programs. However, in most cases it is important to know the history simply to understand what the differences in teacher education mean both within and across countries. For example, what does it mean for teacher education to be more or less integrated within higher education? An historical perspective can also indicate how difficult it might be to change certain characteristics of a system.

The Roots of Teacher Education in the Spread of Mass Education¹

Teacher education is grounded in one of the most profound revolutions of the 19th and 20th centuries, namely, the spread of mass education throughout the world, first at the primary school level and then at the secondary level. Before this movement took root in various countries, formal schooling was, with few exceptions, the preserve of a privileged elite, and the demand for teachers was relatively small. This need could be satisfied in an ad hoc way by persons who learned on the job how to cope with the demands of teaching. In so doing, they drew on their natural talents, plus whatever education they had acquired, whatever textbooks they could put their hands on, and whatever they could glean from what other teachers had done.

Mass education, which required the schooling of a larger and larger proportion of the relevant age cohort and eventually all children, was an entirely different affair, requiring such an army of teachers that satisfying the demand became increasingly difficult. Today, the number of practicing teachers is huge and constitutes one of the larger occupations throughout the world. And although there are those who argue that more emphasis should be placed on recruiting those for whom good teaching comes readily and naturally and/or on learning to teach on the job, no country is currently able to rely solely or even principally on either of these approaches.

Each TEDS-M country report is a lens with a somewhat different focus on how teacher education took root in the context of this extraordinary expansion of educational opportunity. The reports generally reach back into the 19th century and even beyond to explain the origins of their teacher education systems. Although the spread of mass education is often thought of in an Eurocentric way (despite the fact that, for example, literacy in Japan was already highly developed before Japanese exposure to the West), the country reports indicate that almost every TEDS-M country has had long experience with teacher education.

In this section, the discussion of countries is arranged by region—first Europe, then Asia, and finally Botswana in Africa. This arrangement of countries within regions enables the chapter to demonstrate not only the long history of teacher education in Asia as well as in Europe, but also to make clear the importance of the colonial experiences for several of the Asian countries and how they have dealt with this inheritance since independence. Botswana, which follows next in this section, also has a colonial past, which it shares with the Asian countries, but, in addition, it is a particularly recent example of how teacher education is tied to the spread of mass education.

Overall, the countries discussed are those that gave the most emphasis to this history in their country reports. For example, the three TEDS-M countries in the Americas (Canada, Chile, and the United States) are not included because their reports say very little about the history of the spread of mass basic education. This history lies too far in their past. They have far more to say about the other issues dealt with later in this chapter.²

1 This section is based primarily on country reports by K. G. Garegae, T. J. Mzwini, & T. M. Keitumetse (Botswana); F.-J. Hsieh, P.-J. Lin, G. Chao, and T.-Y. Wang (Chinese Taipei); N. Mzhavanadze and T. Bokuchava (Georgia); J. König and S. Blömeke (Germany); R. Nagappan, N. Ratnavadivel, O. Lebar, I. Kailani, S. Malakolunthu, and M. Karim (Malaysia); M. Al Ghafri, A. Al Abri, and M. Al Shidhani (Oman); E. B. Ogena, F. G. Brawner, and M. D. Ibe (Philippines); K. Y. Wong, S. K. Lim-Teo, N. H. Lee, K. L. Boey, C. Koh, J. Dindyal, K. M. Teo, and L. P. Cheng (Singapore); E. Castro Martínez and P. Flores Martínez (Spain); P. Dechsri and S. Pativisan (Thailand).

2 Throughout this chapter and the following chapter, country reports that have more to say about a certain issue are given the most emphasis and those with less to say are treated more summarily or not included at all under certain headings. Because the 16 countries that submitted TEDS-M country reports are self-selected and not representative of any population of countries with particular characteristics, there is no reason to report all the countries under any given heading.

TEDS-M Countries in Europe

Germany

Germany is recognized as one of the birthplaces of the global mass education system, having already begun to implement universal primary schooling in the 18th century and then maintaining it regardless of the regime in power and periods of war and economic hardship. The formal preparation of teachers has a shorter history. Formal German teacher education originated in the 19th century when access to primary education was already widespread relative to other countries and the need for better preparation of teachers could no longer be ignored.

The core characteristics of the German teacher education system developed at both primary and secondary levels during the first decades of the 19th century. By the end of the 1820s, teachers for elementary schools were receiving two or three years of preparation at teacher training institutions, and throughout the 19th century, these teacher training institutions and their courses continued to expand. Examinations were also introduced to signify completion of this training.

Likewise, in the same era, in the more elite part of the education system, the German federal states started to require future teachers of secondary school to undergo a university-based teacher education program-type sanctioned by a state examination. For Germany, according to the country report, this policy marked the starting point of the teaching profession as a formal, recognized career (see also Blömeke, 2002). However, while universal primary education was taken for granted in Germany long before TEDS-M and extensive teacher education was required, the same was not true of all European countries. Spain, especially, was different, as the following section illustrates.

Spain

The Spanish country report goes into considerable detail to show how difficult it was for Spain to achieve mass education and teacher education. According to the report, “universal basic education arrived late in Spain. Although compulsory schooling was promulgated in 1857 and extended in 1964 from the age of 6 to 14, this law did not become a reality until the middle of the 1980s. The realization of the proposed objective, a quality education for all, has yet to arrive.” Nevertheless, the first teacher education college (normal school) in Spain was founded long ago, in 1839, and became a model of teacher education that lasted for more than a century. By 1845, 42 normal schools had been established in as many provinces. Their curricula consisted of humanistic, historical, and religious subjects and placed little importance on scientific, mathematical, and technical subjects. This early program-type included a practicum in the primary education schools attached to the normal school. However, normal schools remained lacking in many other respects and were neglected by successive governments in the years 1875 to 1931.

Primary school access remained limited throughout most of the 20th century. In 1908, a shortage of 9,536 schools was reported throughout the country. The number of teachers was also insufficient; generally speaking, teachers got along despite having limited professional competence, salaries, and social prestige. An enormous but short-lived effort to provide more school buildings and improve teacher education was made during the Second Republic between 1931 and 1936.

Later, under the dictatorship of General Franco, 6,000 schools were built in the years 1939 to 1951, and yet the shortage of school places still surpassed one million. There was also a shortage of teachers, with teacher education being given short shrift. The number of normal schools remained the same, and admissions standards were lower than they had been before. For example, individuals wanting to be primary school teachers no longer had to attain the Baccalaureate certificate, which signified completion of secondary schooling.

It was not until the General Law on Education of 1970 that the inadequacies of access began to be overcome and a truly universal system of schooling put in place. Two further laws continued this process. The Organic Law Regulating the Right to Education (LODE) of 1985, and the more recent Organic Law on Education (LOE) of 2006, aimed to achieve a quality education for every young person in Spain.

Georgia

Georgia is another of the TEDS-M countries whose reports are largely silent on the challenges of achieving mass primary schooling. Nevertheless, the report speaks of meeting the need for teachers through institutions established in the 19th century and even refers to a more distant past. In Georgia, for example, the first teacher preparation took place in a theological seminary founded in 1817 as well as in boys' gymnasia. The first specialized pedagogical institution was established in 1866. Later called the Teachers' Institute, it never grew very large, preparing only about 700 teachers during its existence (1866 to 1919). At the end of this period, the institute became part of Tbilisi State University. This development was followed by similar pedagogical institutions throughout the country, in such towns as Kutaisi, Tskhinvali, Sokhumi, Batumi, Gori, Telavi, and Zugdidi.

TEDS-M Countries in Asia

In general, the development of mass education and the institutions producing the needed teachers also has a very long history in the Asian countries that participated in TEDS-M. The reports from these countries are among the country reports that give the most attention to the lengthy struggle to ensure sufficient numbers of competently prepared teachers. Development of a mass education system with adequate teacher preparation was further complicated in most of these countries by their experiences under colonial rule. Here we consider four countries, the Philippines, Malaysia, Singapore, and Chinese Taipei, whose modern history of teacher education started in the early 20th century under colonial occupation—American, British, or Japanese. Following these cases are two countries less marked in education by the colonial experience. They are Thailand and Oman.

Philippines

The rich rendition of the historical context of teacher education given by the authors of the Philippines country report deserves to be retold in some detail. In the Philippines, higher education extends back four centuries to 1611, when, under the Spanish regime, a college seminary was established, later to become the University of Santo Tomas. The establishment of other colleges followed, some of which still exist. Higher education at that time was intended only for the sons of the Spanish colonial elite. From this beginning, a university or college education became a status symbol, highly prestigious, and socially very desirable to the Filipinos themselves.

The first steps toward a mass education system came much later. The first known policy to create a public school system at the primary level was embodied in the Royal Educational Decree of 1863 enacted under Spanish rule. It mandated the creation of a teacher training school to make it possible for male laypersons, not just clergy, to teach. Another royal decree from a little earlier, in 1845, ordered the creation of a public school system at secondary level. None of these mandates was fully implemented, however, and the education system remained limited to a small elite.

Despite higher education generally not being accessible to Filipinos under Spanish rule, a new group of intellectuals emerged, composed of upper-class Filipinos and “mestizos” (the children of mixed marriages of Filipino natives and Spaniards and other foreigners), who obtained degrees at the University of Santo Tomas, or attended university in Spain or other European countries. They formed the class of Filipinos who led the revolutionary movement and proclaimed the first Philippine Republic in 1898.

This republic did not last, however. On August 13, 1898, Spain, then at war with the United States, had to surrender Manila to the Americans. Another colonial era began. Just a few days later, the U.S. military government reopened schools, with U.S. Army soldiers as teachers. For a time, these soldiers taught Filipino children basic reading and arithmetic, with English as the medium of instruction.

This use of military teachers soon ended. A more enduring change took place in 1901, a landmark year for Philippine education. A Department of Instruction, and with it a whole new system of education, was established for the country, with the adoption of Act 74 by the U.S.-Philippine Commission in January 1901. During August of that year, the U.S. Army Transport ship *Thomas* arrived with many experienced teachers on board. The teachers (later known as “Thomasites”) were a select group recommended by American school officials. They were deployed in Manila and in various provinces.

In the same year, the first school for training teachers, the Philippine Normal School, was established. It provided a two-year secondary teacher preparation program. The new education system brought with it a need to train and produce teachers to teach in the different parts of the country. To cope with the shortage of teachers, other normal schools, patterned after the Philippine Normal School, were created in the provinces in 1902. These normal schools became prestigious, in part because they were highly selective in admitting students.

This policy of reaching the masses through free and secular education made striking progress, growing from a small number of students in 1903 to nearly two million primary school students by 1941. This period also marked the beginning of the public-private split, which became such an important characteristic of the Philippine education system. Sectarian colleges and universities established under Spanish rule resumed operations, and as free and secular basic education expanded, more and more private sectarian and non-sectarian colleges were also established. A milestone in education during this period was the passing of the Education Act of 1940.

During World War 2, from 1941 to 1945, schools were closed temporarily due to low enrolments and irregular attendance, as well as lack of teachers and materials. However, the Japanese did establish an education system during their years as occupiers of the country. It was Asian and nationalist in perspective, and vocational, technical, and scientific in emphasis at all levels.

Once Philippine independence from the United States had been declared on July 4, 1946, the education system again began growing rapidly, offsetting the declines experienced during the war and attempting to meet the accumulated social demand for education. Many more tertiary institutions, especially private ones, were established because at that time all available government resources were totally absorbed in meeting the needs of primary and secondary schools. Government could do little to meet the aspirations of higher education. The strain that this rapid expansion put on the education system led to growing concern over the quality of educational provision.

The 1960s were marked by growing nationalistic fervor and a demand for better-quality education. This was addressed in a study by the Philippine Presidential Commission to Survey Philippine Education (PCSPE, 1970). According to this study, one of the strengths of Philippine education was the high regard the population had for education, resulting in relatively high enrolment rates compared to countries with similar levels of economic development, and higher levels of public and private expenditure on education. Nevertheless, the Commission, as stated in the Philippines country report, took note of “serious distortions or imbalances between expectations and standards; facilities and standards, supply and demand for specific manpower skills and needs; location of educational facilities and regional development needs, and national investments in economic enterprise.”

As a result of this study, the Philippine government passed the Educational Development Act of 1972 in an attempt to tie educational efforts to national development goals—likewise the Education Act of 1982. Both Acts set down guidelines to facilitate the attainment of national development goals, including economic and social progress, more intense participation in national affairs and concerns, and promotion of the cultural, social, and moral values of the populace. Basic education and teacher education had, by this time, come a long way, but challenges remained.

Malaysia

Malaysia and Singapore share a common peninsula and some of the same history. Their British colonial experience influenced their respective education systems, and both countries have gone on to make much of education after independence. In Malaysia, the British introduced teacher education in 1907 by opening a teacher training college in Malacca. It provided a two-year course for training Malay school teachers. In 1913, another college began at Matang. Both of these colleges merged in 1922 into the new Sultan Idris Training College (SITC) in Tanjung Malim.

SITC offered a three-year program with four components: academic content, practical activities (gardening, basketry, and other handicrafts), educational theory, and teaching practice. The language of instruction was Malay. In addition, future teachers received two hours of Islamic religious instruction per week throughout the program. Having evolved and grown over the years, this institution became what is the current Sultan Idris University of Education.

Before independence in 1957, Kirkby Teachers Training College and Brinsford Lodge were temporarily set up in England in 1951 and 1955 respectively in order to supplement the limited capacity for teacher education in Malaysia. These institutions trained teachers for English-medium schools in Malaysia.

Since that time, teacher education has gone through more changes and transformations. After the Federation of Malaya attained self-governing status in 1955, the country’s leaders saw the need for a systematic, good-quality education system for the country

and set up a committee to design it. This led to the Razak Report (Federation of Malaya, 1956), which made 17 recommendations dealing with national development and national unity. The report also offered recommendations for unifying the teaching profession and the education of primary school teachers. These recommendations, among others, were the basis of the Education Ordinance of 1957. That year also saw the establishment of day training colleges/centers (DTCs) and reorganization of the two premier Malay training colleges—SITC and the Malay Women's Training College (MWTC)—as primary training colleges under the new education policy. The training courses of these organizations varied from two- to three-year courses depending on the entry qualifications of the trainees.

The Razak Report also called for a review of the report's implementation no later than 1959, leading to yet another report—the Rahman Talib report of 1960. One of its important recommendations was to expand teacher education. The recommendations of the two reports became the basis of the Education Act of 1961.

The Razak Report also recommended that future teachers of lower-secondary classes should undergo training for a two-year period in Malayan training colleges (MTCs). By 1964, there were six of these. By 1967, a more coordinated pattern of teacher training had been developed, with a commensurate raise in the minimum academic qualifications that individuals aspiring to work as primary school teachers needed to have. In fact, the Ministry of Education decreed that there should be parity between MTC and DTC training. These systematization and standardization measures led to the government taking full control of education in general and teacher education in particular by 1970.

Singapore

In contrast to the multiple institutions and territorial expanse characterizing teacher education in its neighboring country, teacher education in Singapore is the story of one institution in one city in the form of a nation state. The story is a significant one because, as the authors of the country report point out, Singapore has been able to transform its colonial past into a position of leadership in teacher education and related fields of study, not only in the region but also in other parts of the world.

The institution in question is currently known as the National Institute of Education (NIE). Although dealing with a relatively small school population (26,804 teachers in 354 schools in 2006), the NIE has to prepare teachers for schools with students from very diverse racial, religious, cultural, and economic backgrounds. This diversity of the student population of about half a million is a microcosm of the multiracial, multireligious, multicultural, and multilingual society that is Singapore. Today, the population of Singapore is 77 percent Chinese, 14 percent Malay, 8 percent Indian, and 1 percent other. English is the main working language of the country and the medium of instruction, but the three main mother-tongue languages (Chinese, Malay, and Tamil) are also official languages. With the exception of the courses that focus on the teaching and learning of such languages and their literature, all teacher education courses are conducted in English.

From the early 1900s to the beginning of World War 2, different types of schools coexisted in Singapore. They included English-medium schools established by the colonial British government, privately owned schools with teaching conducted in other languages, and mission schools. These schools recruited their own teachers on an ad hoc basis, probably requiring that these individuals hold only qualifications in the subject disciplines. In 1928, however, the government established Raffles College, which offered

diplomas in arts and science subjects. Ten years later (1938), the college began offering a diploma in education program as an additional fourth year of study in education for university graduates who wanted to go into teaching under the British regime.

After World War 2, school enrolments increased substantially, making it necessary to train a larger number of nongraduate and graduate teachers. In 1950, the Teachers' Training College (TTC) was established. It offered a two-year, fulltime, concurrent certificate program to qualify students for primary school teaching. In the same year, the School of Education was founded at the then University of Malaya (established in 1949, later to become the University of Singapore in 1962, and the National University of Singapore in 1980). The School of Education offered a diploma in education program (one-year, fulltime, and consecutive) to prepare university graduate teachers to teach in secondary schools.

Given its early history, NIE today has a capability which allows it to play an international leadership role in the final stages of the spread of mass education—that is, making primary and lower-secondary education universal throughout the world. For example, NIE not only hosts major international conferences on educational research and policy but also helps provide continuing education for educators and teachers from overseas countries, such as Abu Dhabi, Bahrain, Indonesia, the Philippines, and Thailand. Educational leadership and pedagogy, including that relating to mathematics education, are particular spheres of this provision. In 2007, NIE became one of the founders of an alliance of leading university schools of education in North America, Europe, and Asia.

Chinese Taipei

In Taiwan, teacher education began in the colonial era. The foreign rulers in this case were the Japanese and their imperial government, which began to seek a place among the world powers after Japan's opening to the West in 1854. The first formal teacher-training institution in Taiwan—the Kokugo Gakkou (Japanese Language School)—was founded in 1896. It prepared teacher educators, primary school principals, and primary school teachers for careers in the colonial service, and stressed teaching the Japanese language to the Taiwanese people and trying to inculcate Japanese culture and views of life among the general population.

In 1899, the colonial government established three normal schools to prepare Taiwanese teachers to teach the various primary school subjects, including arithmetic. This development marked the first time that the Taiwanese people had a chance to be educated as teachers and to be equipped to teach mathematics.

For most of the colonial period, the teacher education system had two distinct branches: one for Japanese people and one for the Taiwanese. This segregation in teacher education did not come to an end until the last four years of the colonial period (1941 to 1945). In addition to establishing teacher education institutions, the Japanese colonial authorities enacted the first official regulation on teacher education, the full title of which was Official Regulation of Taiwan Governor-General Normal School.

In 1946, not long after the end of Japanese rule, a new page in Chinese Taipei's teacher education was written with the establishment of the first institution to prepare secondary school teachers—the Provincial Taiwan Normal College. It became Chinese Taipei's first teacher education institution catering for the higher levels of the country's education system.

The Nationalist Party (KMT), having been driven out of mainland China, remained the ruling party of Chinese Taipei. The KMT wanted to break down the existing education system, which had been designed to instill “Japanization” in people’s minds and to legitimize Japanese as the official language. Because primary schools had been required to teach Japanese during the colonial period, and because, in the immediate post-World War 2 period, only about 32 percent of Taiwanese primary school graduates were going on to junior secondary or vocational schools, the government, in addition to promoting primary school education, spent a great deal of effort encouraging secondary school enrolments as well. This development was prompted, in good measure, by the KMT’s conclusion that the best way to teach the Taiwanese to refute Japanization and to speak Mandarin was to encourage students to continue their learning at secondary schools where they could study, in more depth, the Chinese language and be steeped in anti-communist ideas.

The government accordingly promoted a regenerated Taiwanese culture based on Chinese culture combined with a doctrine known as the Three Principles of the People. This doctrine emphasized the rights and livelihoods of all Taiwanese people, in contrast with the earlier doctrines of the dynastic periods, which were concerned only with the elite sectors of society. Thus, as in other countries, organizing schools in order to service an emerging or resurrected national identity went hand in hand with expansion of access to schooling.

The government ultimately established nine years of compulsory education in 1968, giving all young people the right and obligation to pursue nine years of free, formal education. During the same period, President Chiang Kai-shek, maintaining that the success of an education system depends on its teachers, began in 1955 to use the motto Teachers First, Normal Education Foremost to promote efforts directed at improving the quality of teachers.

Thailand

The two remaining Asian countries in TEDS-M—Thailand and Oman—did not experience such a direct colonial influence as the preceding countries on their teacher education systems. Thailand is distinctive for having avoided prolonged European or Japanese colonialism. Nevertheless, as in the post-colonial countries, the history of mass formal schooling in Thailand dates back to the 19th century.

The country report outlines four major periods of educational reform. In the first period, King Chulalongkorn (Rama V 1868–1919) introduced the Western system of education to Thailand. This visionary reformer not only launched the country’s first education reform but also established the first teacher training school in 1892. Earlier, formal teaching and learning had been left largely to the temples, with monks as teachers. This first reform period was punctuated by the proclamation of four years of compulsory schooling by King Rama VI in 1921, but it took until the 1930s for there to be some enforcement of this decree throughout the kingdom. In 1960, compulsory education was extended to seven years, and during the following decade, many new teacher education colleges were established (Hsu & Rurk Khum, 2009).

The second period of national reform did not begin until 1973, when a political revolution started by students resulted in educational policies striving for equity, unity, and freedom of expression. The third period of reform took place during the decade starting in 1987. It emphasized Thailand’s need to adapt to globalization and

internationalization. The fourth—and current—period of Thai education reform came about as a result of the Asian economic crisis of 1997. That crisis led first to political reform and then to the drafting of a new Thai constitution. Promulgated in 1997, it called for education reform and decentralization of power. The intention underlying the subsequent National Education Act of 1999 was to make education a lifelong, continuous, and learner-centered process.

The rationale driving the fourth period of reform also derived from the perceived need to improve the country's competitive position relative to other Asian countries such as China, India, Malaysia, Singapore, and Vietnam. From this perspective, according to the national report, the Thai education system was judged to be ineffective and its centralized governance and management poor. One major concern was an absence of opportunities, especially for students in rural areas, to receive a quality education. In the past, compulsory education was enforced only for the first six years of primary school. Under the 1999 Act, this period was extended to nine years, that is, through to the end of lower-secondary school. At present, children from about age seven are required to attend schools up to Grade 9 or age 16, whichever comes first.

Oman

Oman, the other Asian country in TEDS-M, differs greatly from the five Asian countries just discussed because access to mass education and the development of teacher education are both of very recent origin. Despite the fact that Oman has an ancient history, modern education in Oman started only about 40 years ago when His Majesty Sultan Qaboos bin Said came to power in 1970. Before that year, only three schools for boys existed in the country, and there were no schools for girls. However, from 1970 on, education became progressively more accessible to all people, spreading gradually to villages and rural areas. According to the Ministry of Education, the total number of government schools reached 1,053 in 2007.

To accommodate the recent implementation of mass education, teacher education in Oman has already gone through several phases. At the beginning, some Omani nationals who had completed secondary school or even lower-secondary school were trained for one to three years to become teachers. For example, in 1978, a three-year program-type in specialized teacher training institutes was established for lower-secondary school graduates. This provision gave these individuals a secondary completion certificate and qualified them to teach Grades 1 to 6. These institutes continued to take students until the 1984/1985 academic year.

In that year, the institutes were converted into intermediate colleges of education, nine of which were established throughout the Sultanate. The institutes accepted general secondary certificate holders to study for two academic years at the end of which graduates obtained a diploma that certified them as qualified to teach, again in Grades 1 to 6. These intermediate colleges continued to admit students until 1995/1996.

By then, the greatest demand for teachers had shifted to the lower- and upper-secondary levels of the school system. A royal decree was therefore issued in 1995 to convert six of these intermediate colleges into university colleges under the supervision of the Ministry of Higher Education. Two were for females only, three for both males and females, and one for males. These colleges took in secondary school graduates for four years, at the end of which students received a Bachelor's degree in education. This program-type mainly prepared teachers for secondary schools, although a few of the specializations covered primary education as well.

After a few years, this program-type had served its purpose and was gradually discontinued at the various colleges. Five of the colleges were converted into colleges of applied sciences, and only one college of education was left to produce teachers. Although the last cohort of students specializing in education graduated from the converted colleges at the end of academic year 2007/2008, it nevertheless met the target population criteria for inclusion in TEDS-M. Due to labor market conditions and a lack of need for new primary teachers, no primary school teachers are being produced at the present time, so Oman participated in TEDS-M at the *secondary level only*.

In addition to these colleges of education is the College of Education at Sultan Qaboos University. The college opened in 1986, the year the university was founded. It continues to produce secondary teachers and is part of the TEDS-M target population.

TEDS-M Country in Africa

Botswana

Botswana, the only African country to participate in TEDS-M, is noted for being relatively well off economically in comparison with other Sub-Saharan African countries as well as for its advances in democratic government. For our purposes, Botswana also serves very well to illustrate the links between expanding access to mass education and the development of teacher education.

Botswana's teacher education system, like that of the other TEDS-M countries, is the result of a long history. The work of Christian missionaries led to the creation of primary schools in the 19th century during the British colonial period in what was then called Bechuanaland. The national primary schools in villages such as Kanye, Tlokwen, Serowe, Molepolole, and Mochudi became the backbone of educational development in the country. In contrast, secondary and tertiary schooling was initially sought outside the borders of Bechuanaland, especially in South Africa and the neighboring colony then called Rhodesia. A tertiary institute for Bechuanaland was to be established at Palapye in 1902, but it never materialized. In another setback, South Africa started imposing restrictions on the entry of foreign black students into its institutions of higher education.

After independence in 1966, Botswana's authorities realized that the system inherited from the colonial era could not meet the political, cultural, and socioeconomic needs of the country. Few primary schools existed and there was almost no infrastructure for secondary schools. As a result, the country had very few citizens with the formal schooling needed for economic development. Teacher education likewise had been of virtually no concern to the colonizers. Therefore, after independence, the Government of Botswana began to transform what it had inherited from this restricted colonial past, leading not only to expansion of the primary and secondary school systems, but also, after a number of transitional phases, to the establishment of a national university.

Botswana's education system has since been shaped, in large part, by two national commissions on education whose deliberations produced two policy reports, the National Policy on Education of 1977 and the Revised National Policy on Education of 1994. The mandate of these two commissions was to specify the goals of education and development, formulate the philosophy on which education and training would be grounded, and recommend how these goals could be achieved.

While the first policy report emphasized quantitative improvement in access, especially at the primary level, the second one focused on the quality of educational services. Both had important implications for teacher education. The report of the first commission, *Education for Kagisano*, which gave birth to the first national policy on education, recommended an increase of access at primary level in order to achieve universal basic education. Primary education was seen as a foundation for further learning; if it were strengthened, more students would enroll in secondary schools. Policymakers realized that the problem of untrained teachers that would accompany this expansion was unavoidable and that overcoming it would take an extraordinary effort from the government. Given the shortage of resources, a sufficiently massive training of future teachers or development of existing ones was not feasible, and thus a national service scheme (*Tirelo Sechaba*) was introduced as an interim measure.

Under this scheme, young people who completed Form 5 (Grade 12) spent 12 months, mostly in rural areas, in order to gain more experience of the challenges of rural life. The majority of these participants taught in primary schools until sufficient numbers of qualified teachers became available. Also, because teacher education was slow to expand, the government recruited teachers, especially those qualified to teach in secondary schools, from other countries.

By the time independence came, two primary school teachers' colleges were already in existence. One was Lobatse College of Education, which opened in 1947 at Kanye and moved to its present site in 1956. The other, Serowe College of Education, created in 1963, was originally for women only. After independence, in a project funded by the Swedish government, a third teacher training college was established at Francistown. It provided a five-year program of professional development for teachers. The program included correspondence work, residential study, and radio broadcasts. In the belief that much could be learned from practical work, preservice and inservice training was strengthened and emphasis was placed for the first time on practical subjects such as home economics, wood and metal work, agriculture, and science.

In 1973, the three colleges at Lobatse, Serowe, and Francistown were affiliated with a center at Botswana's national university. Eleven years later, in 1984, Tlokweng College of Education had its first student intake. In 1993, that college became the first primary teacher training institution to offer a three-year Diploma in Primary Education (DPE). Finally, the National Commission on Education of 1977 suggested that teachers specializing in junior secondary school be prepared to meet the demands of the rapidly expanding junior secondary sector. This recommendation led to the creation of Molepolole College of Education.

Of all the country reports, it is the Botswana report that makes the most explicit reference to the effect that increasing access to lower levels of the education system has on what teachers need to know and should be able to do. According to its authors, "The recommendation of universalizing basic education also posed a challenge to teacher education. Teachers were to be able not only to teach large classes, but also to handle large mixed-ability classes and those with special needs." Quoting from Recommendation 35 of the Revised National Policy on Education (1994, p. 22), the authors went on to declare:

With respect to the wide range of ability in junior secondary schools, the Commission recommends that: (a) As an immediate step, an inservice training ... [program-type] program-type in mixed ability and remedial teaching should be developed for serving

teachers. (b) All preservice training should include adequate training in mixed ability and remedial teaching. (c) The Ministry of Education should formulate a policy which ensures that slow learners receive maximum assistance from teachers.

However, as teacher education institutions in Botswana strove to implement these recommendations, other constraints, such as time and human resources, proved to be major obstacles. Again according to the country report, “teachers who were unable to handle mixed ability and remedial classes were and are still produced especially for the secondary school level.”

Importance of These Developments to TEDS-M

What, readers may ask, is the importance of this story of more than two centuries of educational development for TEDS-M, a study that focuses on mathematics teacher education at the present time. The answer is that it helps the reader understand how the demand for teachers became so massive and difficult to meet, except under unusually favorable circumstances. As will be explained in Chapter 4, this difficulty is particularly acute in mathematics where the pool of suitably qualified applicants in most countries is smaller than it is for other school subjects. In addition, the increasing need to teach all children, whatever their background, talent, and motivation, has made teaching more complex and the organization of teacher education more challenging.

Local Initiatives Versus Centralized Control³

Increases and Decreases in Central Control

The tension between local initiative and centralized control is one of the central dynamics of education (as well as of other organizational) systems. In Chapters 1 and 2, we observed that the TEDS-M countries vary greatly in terms of whether they emphasize local initiative more than centralized control or vice versa in their systems of teacher education. This section goes into more depth on these issues in order to avoid giving a one-sided view to a tension that can never be completely resolved. We concentrate on only a few countries from across this spectrum, the ones for which the country reports provided the most revealing detail.

The section begins with countries that have more local control and autonomy, moves on to those that are, or have been, more centralized, and ends with a revealing discussion of how national policy is established in federalized countries, even countries with no federal ministry of education. Throughout this section, emphasis is given to increases and decreases in central control during the periods in question as well as to any exceptions that can be found in these general trends.

Chile

This country report provides an example of extreme decentralization. Chile initially had neither established government policies nor coordination mechanisms for a system of teacher education. However, in the mid-1990s, the government took one exceptional step toward improving the quality of teacher education as outlined in President Eduardo

³ This section is based primarily on country reports by R. Crocker and H. Jodouin (Canada); B. Avalos Davidson (Chile); F.-J. Hsieh, P.-J. Lin, G. Chao, and T.-Y. Wang (Chinese Taipei); J. König and S. Blömeke (Germany); T. Breiteig (Norway); E. B. Ogena, F. G. Brawner, and M. D. Ibe (Philippines); M. Sitek (Poland); S. Brandt, F. Oser, H. Biedermann, M. Kopp, S. Steinmann, S. Krattenmacher, and C. Brühwiler (Switzerland); and P. Youngs and E. Grogan (United States).

Frei's 1996 address to the nation. This step resulted in the allocation of around US\$25 million to university teacher education programs on a competitive basis. Seventeen universities received funds to improve their programs, and a national coordinating mechanism was established for the life of the project (from 1997 to 2002).

However, after the project ended, the Ministry of Education ceased to have this kind of involvement. From that time on, it has maintained only an informal relationship, mostly with the public universities traditionally known for teacher education, but also including a few of the private institutions. The responsibility for this network is assigned to a section in the ministry's Center for Inservice Training (CPEIP). Among the institutions themselves, the deans of faculties of education in traditional universities have a long-standing organization that meets regularly two or three times a year. At least two other networks also involve deans or heads of education departments in private universities who meet regularly.

Finally, a network of traditional universities and a few private ones was initially organized by the Minister of Education in 2005 to review the teacher education system. Known as the National Committee on Initial Teacher Training, it consisted of representatives from the universities and schools of education, which belonged to the Council of University Presidents, as well as six private universities not belonging to the council. It also included representatives from the Teachers' Union and the Ministry of Education. The network produced a report endorsed by rectors of all the public universities and most of the private universities and professional institutes. However, the Ministry of Education had no power to monitor implementation of the suggested and agreed-on changes.

United States

The United States has a well-deserved reputation for extreme decentralization of educational policymaking and decisionmaking. At the primary and secondary levels, authority is constitutionally invested in the states, not the federal government. In practice, it devolves much further, in many respects, to school districts, schools, and even individual teachers. Likewise, in higher education, an exceptionally diverse set of institutions enjoys considerable autonomy. They, too, share their autonomy in important although limited ways with their faculty members and students. But despite this tradition and reputation, control over teacher education has gradually shifted over the course of two centuries toward the state and federal governments and away from local authorities and individual institutions of teacher preparation.

Ironically, this story is one of fluctuation that begins and ends with external examinations, separated by a period in which the institutions gained considerable autonomy to decide, without much regard for or interference from outside authorities, whether future teachers were qualified to teach or not. Now largely forgotten, requirements for aspiring teachers to qualify through external examinations were widespread in the 19th century, only to fall into disuse for many decades when the authority to qualify new teachers was delegated directly to the institutions in which they were enrolled.

During the 1840s, most United States teachers received their teaching license from local officials, with awarding of the license based on their performance on examinations that focused on the candidate's character and/or subject-matter knowledge. Over time, this use of purely local examinations faced growing opposition from the public, state

officials, and teachers. They argued that in order to raise educational standards, states had to take more control by introducing state licensure requirements. Thus, by the 1860s, it was state authorities, in many cases, setting the requirements future teachers had to meet in order to pass such examinations. As demand for teachers grew, so, too, did state departments of education and normal schools (teacher education institutions that provided teacher education at the level of either secondary school or the first two years of university).

During the second half of the 19th century, some states moved away from external examination of candidate knowledge and integrity. Angus (2001) reports that, by 1897, “twenty eight states certified teachers based on graduation from a normal school” (p. 5). Opposition from the education establishment (i.e., administrators and faculty in teachers’ colleges and normal schools) was a primary reason for the reduced reliance on teacher examinations. Many of these individuals strongly criticized the examinations, viewing them “as a ‘back door’ into teaching through which people with inferior training and talents ‘infiltrated’ the profession” (p. 19).

Throughout the first half of the 20th century, as the use of licensure examinations declined, the states centralized and raised other requirements. Then, in the second half of the century, the movement for program accreditation took root and grew. By the 1980s and 1990s, new efforts to “professionalize” teaching were evident. This development meant giving teaching more of the attributes associated with traditional professions, such as formal recognition for higher levels of expertise and knowledge (through, for example, the National Board for Professional Teaching Standards) and programs of teacher education that combine university study and long periods of clinical internship similar to medicine (e.g., the Holmes Group, founded by a group of education deans).

However, the political and intellectual climates within which these efforts to promote teacher professionalization took place remained skeptical and, to some extent, hostile. By the 1980s and ’90s, the American public was voicing strong suspicions about the quality of public school teaching and demanding more accountability. This point of view is perhaps seen most clearly in the reemergence of mandatory basic skills and entry-level teacher tests. By 2001/2002, 37 states required future teachers to pass basic skills tests in order to earn a teaching license, 33 states required them to pass tests of subject-matter knowledge, and 26 states required them to pass tests of pedagogical knowledge.

At about the same time, there was a significant shift toward a “hands-on” federal role in defining teacher quality, including requirements for teacher preparation. When Congress reauthorized the Higher Education Act in 1998, it sought to hold institutions of higher education accountable for teacher preparation by requiring them to report passing rates for candidates on state licensure examinations. Subsequently, the No Child Left Behind (NCLB) Act, enacted in 2002, called for “highly qualified teachers” in every classroom by 2005/2006. These teachers were expected to demonstrate strong subject-matter knowledge and to pass a licensure examination. More generally, in the past 10 to 15 years, nearly all states have adopted or revised teaching standards that delineate the general knowledge and skills that candidates should demonstrate in order to be qualified to teach.

Norway

In Norway, as well, there has been a gradual, although less pronounced and coercive, movement toward more centralized national policy on teacher education. To understand this trend, it is necessary to know something of Norwegian history. In the 19th and 20th centuries, Norway not only achieved successive periods of independence but also developed a national identity distinct from its neighbors in Sweden and Denmark, each of which had ruled Norway for long periods of time.

For purposes of this chapter, the story can start in 1814 when Denmark was forced to cede Norway to a union of Norway and Sweden in which Sweden held power—a union that lasted until 1905. However, because Norway had its own constitution and parliament during this era, a movement to establish a separate Norwegian identity took hold, with increasing emphasis placed on national culture, including history, folklore, folk music, folk art, architecture, and literature.

After independence in 1905, the quest to establish Norway's individual identity and culture continued, with particular emphasis on a school system able to foster national as well as individual development. Initially, the aspect of this movement most relevant to teacher education was development of a national curriculum for primary schools. In 1922, Norway introduced its first national curriculum for elementary schools in rural areas and in 1925 in urban areas. In 1939, it adopted a revised version of this curriculum.

This 1939 curriculum remained in place for over 30 years, making for a remarkably stable period, considering that there have been five major revisions to the school curriculum since 1970. In part, this stability may reflect the quality of the curriculum and the fact that, according to the national report, it was based on serious research and sound pedagogical ideas. But stability also had much to do with social and economic stagnation during and after World War 2, first while Norway was occupied by Nazi Germany and then for a substantial period of reconstruction following liberation. A contributing factor to this stability, according to the country report, was the fact that, up to about 30 years ago, Norway was not an oil-rich country (today, the discovery of oil makes it one of the world's richest countries), but relatively poor and dependent mainly on fishing and subsistence farming.

Nevertheless, by 1960, Norway was ready for a new step in educational reform—a national curriculum to be tried out in its elementary schools, which were extended at this time from seven to nine years of compulsory attendance. In the following years, the content and organization of the nine-year compulsory school continued to be an issue, with revisions of the national curriculum for primary and secondary schools in 1971 and again in 1974. However, none of these curriculums set down minimum standards of performance.

Norway also has a national curriculum framework (*rammeplaner*) for teacher education. The current framework (from 2003) is rather general and does not prescribe the content of courses. There are no explicit national and verifiable criteria for each subject against which students may be evaluated. It is the institution's responsibility to implement the framework and to design content to meet the general competencies established by it.

More generally, institutions of higher education enjoy a high degree of autonomy and are themselves responsible for the quality of their programs. They must be able to demonstrate how this responsibility is operationalized through management of an internal quality assurance system that complies with nationally set criteria. The links between internal and external quality assurance are maintained through the Norwegian Agency for Quality Assurance in Education (NOKUT). In carrying out institutional audits, it acts independently of both government and the institutions of higher education. NOKUT also carries out special evaluations of higher education in Norway, including, for example, two evaluations of general teacher education in 2001/2002 and from 2004 to 2006 based on the curriculum frameworks of 1998 and 2003 respectively.

Chinese Taipei

In contrast to the other countries examined in this section, Chinese Taipei provides an example of strong national policy driving the teacher education system, tied, in this case, to the very successful economic development and democratization of the country. After World War 2, the government maintained that quality teachers could improve both thought and character among their students, and thereby, in the long term, work to the benefit of politics, the economy, and national defense. This line of thought became the rationale for educating teachers at government expense, as with civil servants. Moreover, in a weak economy, teacher education financed by government was thought to be the best way to attract talented people to work in education.

The establishment of teacher education institutions and the enactment of government regulations laid the foundation for a “protective” teacher education system, based on guaranteed and lifetime employment for teachers and encompassing generous salaries and other benefits. The resulting system, closely controlled by the Ministry of Education, would endure for several decades. Its rise and decline can be traced to the political, economic, and social changes taking place in Chinese Taipei. It began with a KMT government, which, having originated in mainland China, venerated the Confucian tradition, emphasized the importance of education, and believed that education could affect the rise and fall of a nation.

The protective system was an education system dominated by the national government, but with execution left to the normal universities/colleges or schools. From the 1960s to 1980s, the government decided which institutions could educate teachers. It also determined when to increase or decrease the number of teacher education institutions, the number of teachers being educated, and the locations to which novice teachers were assigned.

During this same period, Chinese Taipei’s economy improved rapidly, along with people’s living standards. As a result, teachers’ salaries increased very substantially. However, by the end of the 1980s, the protected, ministry-controlled teacher education system, criticized by scholars and interest groups, had fallen into disrepute. It no longer aligned with the newly prevalent ideas of a free society and a free economy. In the late 1980s, the death of Chiang Kai-shek led to major political changes in Chinese Taipei. Later presidents gradually improved the country’s infrastructure, lifted martial law, and officially terminated the so-called “Period of Communist Rebellion.” Multiparty politics took hold, expression of opinion was given freer rein, and the legislative system was strengthened.

These developments repeatedly clashed with the protective beliefs that characterized the old teacher education community. To make matters even more difficult for the system, the economy began to slump in the early 1990s. As a consequence, the supply of college graduates exceeded the number of jobs available. However, stakeholder demand for a more open system gave more universities opportunity to prepare teachers. This tide of change finally crushed the decades-old protected system.

As a consequence of this pressure to open up teacher preparation, the government enacted, in 1994, the Teacher Education Act (TEA), which created multiple pathways to teacher education and teaching. This Act was a milestone in the history of teacher education in Chinese Taipei. Transforming the protective system, the TEA made changes in recruitment, training, and employment. For example, all four-year universities or colleges were allowed to offer teacher education for primary and secondary teachers, provided they met the requirements for becoming a teacher education institution. The government no longer took responsibility for assigning jobs to teachers. A qualified teacher had to apply for a teaching job and undergo onsite screening and selection in a school-based or city/county government-based context. There was no requirement at all for minimum service except for the very small pool of future teachers receiving free tuition. Thus, although Chinese Taipei's employment system was still classified as a career-based teacher employment model (OECD, 2005), it was starting to move toward a position-based model—a change bound to have major consequences for teacher education.

Within this new system, in order to ensure the quality of teacher education and prevent poor performance by teachers, the Ministry of Education carried out systematic evaluations of the teacher education programs offered by particular universities. The first phase of these evaluations lasted from 1997 to 2004, and the second phase from 2005 to the present. The results of the first round were used to improve the programs, not to make decisions about possible reductions in or terminations of the programs. Then, in 2005, the Teacher Education Certification Committee decided to adjust the quota of preservice teachers to be admitted to particular teacher institutions in light of regular evaluations of their teacher education programs.

Poland

In contrast to countries where the trend has been toward more central control, Poland and Germany have moved in the opposite direction. In Poland, regime change has profoundly reduced the degree of national control. Up until July 1991, every aspect of schooling was regulated in detail by the state administration. In July, passage of a new School Education Act started to reverse this policy. The law mandated a gradual decentralization of responsibilities over schools and an increase in the autonomy of schools and teachers. In particular, religious and other private organizations were given opportunity to establish schools.

More recent reforms have also contributed to transforming higher education in Poland. Before 1989, the government tightly controlled all aspects of this sector of education. The Higher Education Act of 1990 provided the legal framework for a new and different system. It limited the competencies of the Minister of National Education by granting more autonomy to both individual higher education institutions and faculties within institutions. The financing of state universities was henceforth to be based on the number of students. The government introduced the possibility of charging fees for students enrolled part time and allowed private institutions to provide higher education. Today, some 34 percent of all higher education students in Poland are now enrolled in private institutions.

Germany

In federal systems, the relationship of federal to state/provincial authorities and the influence of both levels over local schools have together constituted a very delicate issue in education. In Germany (as in Canada and Switzerland), the solution has been to keep the federal government away from any significant role in educational policy and to rely instead on other mechanisms of national coordination. The TEDS-M country report for Germany described this mechanism as follows:

In 1948, the *Ständige Konferenz der Kultusminister der Länder* (KMK, or Conference of Ministers for Education and Cultural Affairs) was established to coordinate educational issues as well as issues of research and cultural affairs between the federal states. Since 1948, the KMK has served as a forum of permanent cooperation. Its resolutions only have the status of recommendations until they are enacted by the parliaments of the federal states (*Landtage*) and implemented into regulations on the level of the federal states.

In the past, in law and practice, the federal states exercised authority over schools and second-phase teacher education institutions. However, German universities (i.e., the first-phase institutions) have always enjoyed a high level of autonomy—autonomy that recently has even increased in certain respects. But when this delegation of power is examined carefully, it is apparent that it is not an unqualified, unconditional one, and that even at the federal level, there have been new requirements. Remaining state control is now taking shape in more formal accountability mechanisms. Each state currently controls universities on a more global level, defined by goals that can be used as the basis for evaluation and funding decisions. New mechanisms of funding according to criteria of productivity—drop-out rates, success in securing research funds, use of citation indices, and so on—have become common.

In 2004, the KMK developed nationwide standards for teachers and teacher education in order to make teacher education more comparable across federal states and in order to express outcome expectations more clearly. Other measures were aimed at the teaching staff in teacher education. Steps on their career ladder were no longer to be based on seniority but on measures of merit. This change meant developing examinations for promotion into real tests of knowledge, skills, and competencies.

Switzerland

Switzerland, as in Germany and Canada, but unlike the United States, has no federal ministry of education, and it keeps the federal authorities out of the educational policy sphere. Each canton has its own legislation governing teacher education structures, including the different universities of teacher education. As a general rule, the cantonal parliament establishes the legal framework for teacher training, regulates the profession, and defines the conditions of teacher employment (recruitment, working hours, compulsory teaching load, salaries, and so on). To provide for shared jurisdiction by several cantons, the parliaments in question have to reach agreement in the form of treaties.

Nevertheless, as a result of recent reforms, the cantonal parliaments have lost some of their direct control over internal organization and coursework in universities of teacher education. Direct control of teacher training at cantonal level by policymakers and educational administrators has gradually been replaced by indirect control in the form of performance mandates, diploma recognition, rules of admission to the profession, and employment market policy in the field of education. At the same time, rectors

belonging to the Swiss Conference of Rectors of Universities of Teacher Education are expected to play a more influential role due to the increased autonomy of their institutions.

At the highest level, the Swiss Conference of Cantonal Ministers of Education (the EDK) is responsible for the political coordination of teacher education. It essentially assumes the role of a Switzerland-wide controlling body for such areas as teacher mobility, certificate/diploma recognition, cost transparency, and structure uniformity. The recent drafting of an education constitution has strengthened the role that EDK has for bringing consistency to teacher education throughout Switzerland. Nevertheless, except for its authority over recognition of teaching certificates and diplomas, most of its influence is limited to making recommendations.

Teacher Mobility

In federal systems, the ability of teachers to move from state to state and to have their qualifications recognized in the new jurisdiction cannot be taken for granted. It is the states, provinces, or cantons that determine certification rules and that may or may not develop agreements with one another to recognize their respective certification decisions. Examining the specifics of teacher mobility from one federal entity to another, as discussed in the TEDS-M country reports, therefore provides a good example of how decentralization in such countries works.

Switzerland

In the past, teaching certificates/diplomas for the primary and lower-secondary levels of the country's education system were generally valid only in the canton in which they were issued. Each canton decided whether to recognize the certificates of other cantons. Some agreement among cantons was achieved, but it was limited. Because each canton had its own policy for teacher qualification and employment, the movement of teachers across cantons was rare. However, after the recently completed reform of teacher education, all teaching certificates admitted by the Swiss Conference of Cantonal Ministers of Education (EDK) became valid in each canton. How this development will influence teacher movement among cantons is not yet known.

United States

The United States also has in place a special mechanism that allows states to agree on and thereby provide recognition of the credentials of teachers who move from state to state to take up new teaching positions. The National Association of State Directors of Teacher Education and Certification (NASDTEC) facilitates the movement of teachers across states. Participating jurisdictions signed the NASDTEC Interstate Agreement, which makes it possible for a teacher who has completed an approved preparation program and/or who holds a teaching license in one state to earn a license in another state or jurisdiction. The word *earn* is important because states, in addition to giving credit for prior teaching qualifications and experience, are free to—and in many cases do—require teachers from other states to take additional coursework or to meet other requirements not mandatory in their former states.

Germany

In Germany, the KMK has in place a published agreement (*Gegenseitige Anerkennung von Lehramtsprüfungen und Lehramtsbefähigungen*) whereby all regional states recognize the first and the second state examinations, no matter where future teachers take them. This agreement is based on more general regulations dealing with the structure and the intended length of the teacher education program-type, the number of courses future teachers have to take (*Semesterwochenstunden*, literally hours per week), other content requirements of the program-type, and the general components of the state examinations.

Canada

Although Canada has no legal framework guaranteeing freedom of movement of teachers across provinces, teachers move without difficulty from one province to another. This practice leaves local school authorities to determine whether the teachers' qualifications meet the requirements of particular teaching positions.

The Tension Between Centralizing and Decentralizing Tendencies in TEDS-M Countries

Understanding variation in teacher education policy and organization requires knowing at what level teacher education policy is made and whether and how this level has shifted over the years. This understanding also relies on knowing whether such change reversed, for example, earlier policy decisions taken at other levels of the education system.

In highly centralized systems, policy tends to be uniform throughout the system, whereas in decentralized systems account has to be taken of policy differences and variation among local agencies. This local variation led TEDS-M to collect data from institutions and programs as well as at the national level, providing survey results that go beyond what we are able to report in this volume.

Incorporation Within Higher Education⁴

One of the most visible long-term trends in teacher education worldwide has been the integration or incorporation of teacher education into institutions of higher education. At earlier stages in the development of mass education systems, primary teachers were generally prepared in institutions that lacked university status. The diplomas or certificates given to these teachers were not recognized as the equivalent of any higher education degree. Many of the normal schools that prepared primary school teachers at that time were, in fact, secondary—not postsecondary—schools. The highest level of diploma that these schools could provide was the equivalent of a full secondary education. However, in many cases, the holders of certificates issued by normal schools at secondary level were not permitted to enter universities.

⁴ This section is based primarily on country reports by F.-J. Hsieh, P.-J. Lin, G. Chao, and T.-Y. Wang (Chinese Taipei); N. Mzhavanadze and T. Bokuchava (Georgia); J. König and S. Blömeke (Germany); T. Breiteig (Norway); E. B. Ogena, F. G. Brawner, and M.D. Ibe (Philippines); M. Sitek (Poland); K. Y. Wong, S. K. Lim-Teo, N. H. Lee, K. L. Boey, C. Koh, J. Dindyal, K. M. Teo, and L. P. Cheng (Singapore); E. Castro Martínez and P. Flores Martínez (Spain); and S. Brandt, F. Oser, H. Biedermann, M. Kopp, S. Steinmann, S. Krattenmacher, and C. Brühwiler (Switzerland).

In some TEDS-M countries, this incorporation in higher education occurred long ago. Taken for granted today, this change is therefore little discussed in these countries' TEDS-M reports, which focus instead on the current state of the institutions of higher education that offer teacher education. For example, the report from Canada addressed this issue very briefly by noting only that

... up to the middle of the 20th century, teacher education usually took place in institutions offering specialized teacher education programs; some were affiliated with universities while others more closely resembled branches of the ministries of education. By the 1960s, most teacher education programs were integrated into faculties of education in universities, but vestiges of the earlier system remained in some jurisdictions until the 1990s.

Variations on the Theme of Incorporating Teacher Education in Higher Education

The nine countries discussed in this section illustrate a variety of arrangements for incorporating teacher education within higher education—one of the most important organizational changes to have taken place since teacher education was first systematically provided to serve the purposes of mass education. In these countries, incorporation is more recent or more of a current issue and is therefore discussed in greater depth in their country reports than in the reports from the other TEDS-M countries.

These nine countries are of particular interest not only because their country reports regard issues of university organization as current enough to discuss, but also because most of them have adopted mixed forms of teacher education, or variations on this theme of incorporation into higher education. Thus, none of them has stayed completely with the model prevalent in primary education for long periods of time, namely, the independent normal school of education, preparing teachers for primary school, unaffiliated with comprehensive universities, and often operated by ministries of basic education, not higher education. But neither have they gone to the other end of the spectrum in which a school of teacher education is but one of the faculties in a comprehensive university, as is common in North America. In a comprehensive university, teacher education students are in the same institution as students preparing for other occupations, usually taking some or many classes together and sharing a common institutional identity as students and alumni. In short, differences in whether and how teacher education is incorporated into universities could have important consequences for the subsequent careers of their graduates (although little is known empirically about this matter).

Spain

In Spain, preparation of primary school teachers took a long time to be transformed from secondary-school level into an integrated form of higher education. The Moyano Law of 1858, which set the standard for teacher education up until the end of the 19th century, treated normal schools as vocational schools, not to be confused with either general secondary schools or universities. It was not until more than 100 years later, in 1970, that the General Law on Education incorporated primary teacher education into the university system. From then on, teacher education schools were established within universities to train prospective basic general education teachers. During the 1990s, these institutions were updated into faculties of education.

This form of teacher education has now run its course and is changing again due to changes imposed by the European Higher Education Area. In 2005, after considerable debate, the Spanish Parliament passed a new Organic Law on Education. Among other provisions, it provides for changes in initial teacher education that are needed to adjust the system to the agreed-upon graduate and postgraduate requirements of the new European two-cycle system.

Norway

Norway provides a particularly relevant illustration of the classic division of labor between colleges preparing primary school teachers and universities preparing secondary school teachers and how this situation evolved during the 20th century. During most of the century, a program-type for general teacher education (*allmennlærer-utdanning*) was offered at Norwegian teachers' colleges. This program-type is a concurrent one in which subject-matter knowledge, pedagogy, subject didactics, and field experience are integrated throughout the program of study from start to end. Aimed at educating teachers of primary and secondary school children up to age 16, it used to be a four-year program-type with entry after the *realskole* (lower-secondary school for non-university-bound students) or similar schools and open to applicants from age 17. It has gradually changed to a policy of admission after the *gymnas* or upper-secondary school, therefore not admitting students until they are 19 years of age or older.

Secondary teachers usually complete a first university degree (*Bachelor, Cand.mag, Cand.scient*), followed by a practical pedagogical education (PPU) in a post-graduate school of education. Completion of this program-type leads to the title *adjunkt* (for those who already have a Bachelor's degree) or *lektor* (for those who have a Master's degree).

Traditionally, the colleges of education (*lærerhøgskolene*) have educated teachers for primary school, and the universities for upper-secondary school. However, the extension of compulsory education from seven to nine years in 1969 reopened the question in terms of what type of institution should be responsible for teacher education for lower-secondary school. Norway's answer has been to allow both types to do this. Today, teachers teaching at this level may have been trained in either universities or university colleges. In 2002, the Ministry of Education decided that students graduating from PPU should be qualified to teach from Grade 5 on; in actual fact, however, almost all of them teach in either lower- or upper-secondary schools.

Poland

From the early 1990s, Poland experienced a dramatic increase in access to higher education. The number of students grew from about 800,000 in 1990/1991 to nearly two million in 2007/2008. The increase was the result of explicit policy decisions to increase the participation rate in higher education without substantially increasing public funding. The government saw expansion of the nonpublic sector as a way to increase access, especially in geographically disadvantaged areas. However, there are still problems of inequitable access, because students from lower socioeconomic backgrounds are more likely to enter the less costly programs.

Over the last two decades, the educational attainments of practicing teachers have increased substantially. In the late 1980s, only about 55 percent of teachers had higher education degrees, but now such teachers represent 97 percent of the total. Also, because until recently most teachers were the products of the long-cycle Master's degree program-type, most of today's practicing teachers hold a Master's degree.

The current structure of program-types in Poland reflects the country's gradual move toward the two-cycle structure called for by the Bologna process. Bachelor's degree program-types were established in the early 1990s, but it was not until after 1999 that the process of transition to the two-degree structure really accelerated. Under the 2006 Regulation of the Minister of Science and Higher Education on fields of study, the two-cycle structure became mandatory, from academic year 2007/2008, in most of the 118 existing fields.

Within this system, teacher education is provided not only by universities but also by separate teacher education colleges. Although, from a strictly legal point of view, they are not a part of the higher education system, the colleges have established close links with higher education institutions and, if not legally part of the higher education system, they operate as such (internationally, they are classified as ISCED 5B). The curriculum, specified in separate regulations by the Minister of Education, closely follows the requirements set for regular teacher studies. Graduates are awarded a diploma of completion of education by a teacher training college (*dyplom ukończenia kolegium nauczycielskiego*), which enables them to teach in primary and basic vocational schools. However, most of the students continue their education and gain the title of *licencjat* (Bachelor's degree) which opens the way to second-cycle studies and the *magisterium* (Master's degree).

Postgraduate studies are thus a significant means by which many Polish students qualify to teach. In a survey of primary and lower-secondary school teachers of mathematics in 2008, 31 percent and 25 percent of these teachers, respectively, reported gaining the qualifications to teach mathematics during postgraduate studies. The postgraduate option is available both to university graduates who have no qualification to teach and to practicing teachers, although the large majority of those who choose this option already have teaching qualifications. As a result, 39 percent of teachers who were reported to teach mathematics in primary schools and 32 percent of teachers in lower-secondary schools had experience teaching other subjects before they started to teach mathematics.

Philippines

The first seven normal schools established in the Philippines in the early 1900s trained teachers for primary schools according to a two-year curriculum that developed ability to teach numeracy, reading in English, and practical arts. Most of these original normal schools have since been transformed into universities in which teacher education is just one of the Bachelor's degrees offered. Thus, at the present time, the Philippines is one of the countries where teacher education occurs in two different types of university. In the first type, teacher education is, as just mentioned, one of many offerings. The second type—normal schools or universities—offers only teacher education, but frequently at more than one level, typically from Bachelor's or Master's to doctoral degrees. They prepare primary school teachers, secondary school teachers, or both. Philippine institutions of teacher education also have a program-type for individuals who already have their first university degree. Thus, graduates of nursing or engineering, for example, who may wish to teach, need take only 18 or more education units to qualify them for a certificate in teaching.

Singapore

Policy in Singapore has varied widely in terms of whether or not to incorporate teacher education in a more comprehensive institution at university level. An earlier option, practiced in many other countries as well, was to train graduate teachers at university level and nongraduate teachers at college level. Singapore maintained this dual system for about 20 years and then implemented a marked change in 1971. It closed the School of Education at the then University of Singapore, and sent many of the teacher educators in that school to the Teacher Training College. The training of graduate teachers was likewise transferred to the training college, but under a unique certification arrangement, whereby the training college conducted the professional Diploma in Education and postgraduate degrees in education but the University of Singapore awarded the qualifications. This arrangement continued from 1973 to 1991.

In 1973, the Teacher Training College became the Institute of Education, and almost 20 years later, in 1991, it merged with the younger College of Physical Education to create the National Institute of Education. On the same day, the Nanyang Technological University was established as the second university in Singapore by combining the then Nanyang Technological Institute with the national institute. Under this arrangement, still in effect, the National Institute of Education became an autonomous institute of Nanyang Technological University.

From 1950 to 2006, these teacher preparation institutions were an intrinsic part of the Ministry of Education. In 2006, Nanyang Technological University was incorporated (or “corporatized” in Singaporean terminology), which means that it became a nonprofit, self-governing public organization, autonomous from Ministry of Education control. However, the National Institute of Education is still governed by a council chaired by the permanent secretary of the ministry. This form of governance for the institute has the advantage of ensuring a strong link between it and the ministry, which, in turn, ensures the policy relevance of the institute’s teacher education program-types while maintaining its corporate status and some autonomy. Today, the National Institute of Education offers its teacher education program-types under Nanyang Technological University rather than through its former link with the National University of Singapore.

In 1991, the certificate program-types were upgraded to the current Diploma in Education (concurrent) for nongraduates, and the previous Diploma in Education was upgraded to the current Postgraduate Diploma in Education (PGDE, consecutive) for graduates intending to become secondary school teachers. Two major program-types were also added in 1991—a one-year consecutive PGDE (primary) program-type and the concurrent four-year Bachelor of Arts or Bachelor of Science with Diploma in Education. Also, for the first time, the one-year PGDE (primary) program-type was introduced to train university graduates to teach in primary schools. The aim of this program-type is to raise the quality of primary school teaching by supplying primary schools with university graduate teachers. In a sense, these changes have been simply a further step toward giving primary teacher education full university status. But the process is not complete. The National Institute of Education continues to offer a two-year Diploma in Education program-type that does not have university status.

Chinese Taipei

Chinese Taipei no longer has a university that offers only teacher education and related courses. Earlier, young people who wanted to become teachers had to attend *normal* universities/colleges. The only exception to this rule involved a very limited number of departments at comprehensive universities, which were also allowed to offer teacher education.

Because the admission requirements of top normal universities were usually high, those who got admitted were at or near the top of their class. Now, however, reform has created more pathways to teaching. Universities set up, one after the other, teacher education programs, which meant normal universities/colleges no longer had a monopoly on this market. The system of teacher education thus became, over time, more open to a variety of institutions. Given this new situation, the Ministry of Education actively encouraged normal universities/colleges to collaborate or merge with other universities, and since 1994 has allowed comprehensive universities to apply to establish their own teacher education centers. After the 1994 reform, many universities did establish new teacher education programs—22 universities in the next year alone. The number reached a peak in 2004, with 75 universities providing preparation for at least one level of teacher.

Thus, the number of universities offering teacher education in Chinese Taipei is no longer limited. Any university that meets the criteria can apply to offer teacher education. If it meets the criteria, it is approved. But the Ministry of Education still has the option of later using its evaluation results to cancel this permission. And, in any case, an excess of certified teachers is currently tending to keep the number of teacher education institutions down.

Georgia

In Georgia, too, teacher education has become more of an open market for institutions to offer programs. Georgia's transition to the post-Communist era profoundly changed the organization of higher education and teacher education. Existing state teacher training institutions were converted into pedagogical universities in the 1990s. In addition to this transformation, independent and private institutions were founded. Virtually unregulated in this transitional phase, they started to prepare teachers for preschool, primary, and basic schools. However, according to the country report, the fact that a much higher degree of regulation is in the offing could again change this situation in major ways.

Germany

In Germany, incorporation of primary education into universities, accompanied by increased pedagogical training for secondary school teachers, is a relatively recent phenomenon. When it happened, the form it took was distinctive. As a first step, Germany enhanced the status of teacher education by declaring the second-phase institution (*Studienseminaren*) a part of higher education. Further reforms strengthened the subject-matter preparation of intending elementary teachers, and in the 1970s the teacher education system for primary schools was finally structurally brought into line with the teacher education system for secondary schools. At the same time, teacher education for secondary schools, which had long been university-based, but still exclusively subject-matter oriented, was complemented by at least some coursework (called "lectures" and "seminars") in subject-matter pedagogy and general pedagogy. Since that time, all future teachers have had to first enroll in teacher education at the university, the first phase of German consecutive program-types.

These program-types are very different from the typical consecutive program-type in other countries, where the first phase has no pedagogical component, and where it is usually impossible to identify from official records the students who actually aspire to become teachers and go on to the second phase. In Germany, these first-phase students are certainly, if not dealt with as a cohesive cohort, an identifiable group whose special needs as future teachers are of major concern during both phases. This hybrid concurrent first phase and the distinctive consecutive second phase position Germany as a striking contrast to all the other examples of integration of teacher education into higher education evident in the TEDS-M countries.

Switzerland

Switzerland was the last participant amongst the TEDS-M countries to integrate teacher education into its university system. As late as 1992, according to the country report, Swiss teacher training was “not only diverse, but in many respects also arbitrary.” There were virtually no mechanisms for intercantonal coordination. As a result, Switzerland had 145 different institutional structures for basic teacher education in 153 different institutes. Teacher education thus differed substantially from one place to another. But, generally, as in other countries, before teacher training schools became integrated into higher education, they were still upper-secondary schools responsible for training primary and preschool teachers.

Preparation of secondary school teachers, however, took place in university faculties that offered specially tailored courses for this purpose. Their students also took educational sciences and practical training at a separate teacher training school. As a rule, this course of studies at the secondary teacher training school took six semesters.

However, by the end of the 1980s, transfer of primary teacher training to the tertiary level was already getting under way. As a result, the 1990s brought about a profound reform of Swiss teacher education. Objectives such as giving recognition to teaching as a profession and gaining Switzerland-wide recognition of cantonal teaching certificates/diplomas were the forces driving this change. Although some former teacher training schools remained secondary schools under the name of *Matura* schools, others became universities of teacher education (*Pädagogischen Hochschulen*). From then on, only those individuals who had successfully completed the required qualification for university entrance (the *Matura*) or accomplished a similar upper-secondary education could become teachers. Most of the discontinued training courses completed their last year of study in 2005/2006.

At the present time, the universities of teacher education continue to experience radical change. A number of them are still in the process of converting from teacher training schools to universities. Some have just recently started the first courses of study for teachers at the lower- and higher-secondary levels.

Relevance of This Movement to TEDS-M

Understanding mathematics teacher education requires knowing how teacher education programs fit within higher education and whether the graduates receive university degrees or not. Obtaining an all-graduate teaching force, all of whom have higher education degrees (not just diplomas), has been one of the main goals of teacher education policy in many countries over the years. This reform is important not only as a change meant to make teachers more knowledgeable and competent, but also in its potential effects on recruitment to teaching and the subsequent experience of these persons once they are employed as teachers.

Giving teachers opportunity to earn higher education degrees is a strategy for making teaching more attractive to high-ability and ambitious young people. Also, when teachers are members of a nationwide civil service, the possession of a higher education degree can mean higher salaries and privileges of other sorts. But however desirable these degrees might be, incorporating all future teachers into higher education remains an incomplete process in some TEDS-M countries. And even in countries where all teacher education graduates do have higher education degrees, the way this is organized differs from one country to another—so much so that in some cases achieving the Bologna Accord goals of harmonizing higher education has been or continues to be a considerable challenge.

Specialization of Teachers and Teacher Education⁵

The Worldwide Trend Toward Limited Specialization

As indicated in Chapter 1, the degree and nature of teacher specialization is one of the key organizational parameters of teacher education. In this section, we look at specialization from an historical perspective in order to understand better how it developed and what it means for teacher education. Specialization means here not only the number of teaching subjects for which teachers are prepared, but the grade spread for which they are qualified (both of these parameters were discussed in Chapter 1). One might think that, as in medicine, the movement toward increased professionalization of teaching would lead to greater and greater specialization, but in fact there is little indication worldwide that this has been the case.

Instead, there has been convergence, across countries, toward a relatively limited degree of specialization, with important exceptions. Most countries distinguish very clearly between primary and secondary school teachers. Primary school teachers most often specialize in teaching Grades 1 to 6. However, in some systems, this grade-spread specialization ends as early as Grade 4 and in others as late as Grade 7. Specialization in terms of teaching lower-secondary school as opposed to the whole of secondary school is somewhat less common. As is discussed below, some countries avoid the distinction between primary and secondary altogether and require future teachers to prepare to teach across all the grades of basic or compulsory education.

⁵ This section is based primarily on country reports by R. Crocker and H. Jodouin (Canada); B. Avalos Davidson (Chile); F.-J. Hsieh, P.-J. Lin, G. Chao, & T.-Y. Wang (Chinese Taipei); N. Mzhavanadze and T. Bokuchava (Georgia); J. König and S. Blömeke (Germany); T. Breiteig (Norway); M. Sitek (Poland); K. Y. Wong, S. K. Lim-Teo, N. H. Lee, K. L. Boey, C. Koh, J. Dindyal, K. M. Teo, and L. P. Cheng (Singapore); P. Dechsri and S. Pativisan (Thailand); and P. Youngs and E. Grogan (United States).

In regard to the number of teaching subjects typically assigned to each teacher, the norm for primary school is clearly the generalist teacher, which usually means teaching four or more of the core subjects in these lower grades. However, at secondary school, and sometimes earlier, teaching assignments narrow to one or two subjects. Teaching two subjects is common in lower-secondary schools.

The TEDS-M design took account of the possibility that teachers were being prepared to teach in different types of primary schools, on the one hand, or secondary schools, on the other. But having different types of schools in basic or compulsory education has become relatively rare and is represented in TEDS-M only by Germany (with its *realshule*, *hauptshule*, and *gymnasia*) and Malaysia.

In Malaysia, teacher specialization means being trained to teach in schools serving the country's different ethnic/language groups. According to the country report, in the early years of teacher education, teachers for Chinese schools were not only trained in Malaysia but also brought in from Hong Kong and China. Similarly, teachers for Tamil primary schools were trained locally and also brought in from India and Sri Lanka. The country report summarizes the situation regarding teacher specialization as follows:

In short, the practice in teacher education was to organize specific training courses for specific groups, purposes and levels of teaching in schools. Thus, there emerged different types of training courses for different types of schools using different [languages] ... of instruction. In fact, within the same type of school, there were different types of training programs, each geared to a particular need or purpose.

The Razak report, discussed above, led Malaysia to develop a standard form of teacher education for the four types of schools, each with a different language of instruction (Malay, Chinese, Tamil, and English).

The following discussion of other types of specialization in particular countries is organized to illustrate a series of contrasts focused on the following questions:

- To what extent is teaching a career with defined specialized competencies and career conditions?
- How much distinction is made within this career between the preparation of elementary teachers and that of secondary school teachers?
- What is the degree of subject-matter specialization at both these levels, that is, are future teachers prepared to teach one, two, or three or more subjects?
- In cases where mathematics is one of those teaching subjects, how much mathematics content is studied and what sort of mathematics is studied?
- Finally, how does this differentiation and specialization of teaching and teacher education change over time?

In the European systems of education, as they developed in the 19th century, primary school teaching and secondary school teaching were generally considered entirely separate occupations with widely differing status, education, compensation, and responsibilities. Since that time, the dividing line between the two levels of teaching has become less clear cut and has been adjusted in complex ways as the mass education system has continued to develop.

Germany

The German national report makes clear how fundamental the distinction between primary and secondary school teachers was in traditional European systems. However, in Germany, as in other countries, a third intermediate level gradually developed:

In the last decade of the nineteenth century . . . the school system was expanded, as middle schools developed on the lower secondary level. Elementary school teachers taught at middle schools for which they could obtain relevant qualifications by taking additional courses. However, it was not until the 1970s that individual courses of study were tailored to middle school teachers in Germany.

Nevertheless, the distinction between *primary* and *secondary* remains so taken for granted in Germany that the national report had little more to say about how it evolved other than to state the obvious organizational consequences.

Norway

While teacher education in Norway in earlier times was similar to teacher education in Germany in some respects, it evolved in a substantially different direction, minimizing differences between teachers in the early grades and in the upper grades at the end of compulsory education. As a result, specialized mathematics teachers were not thought to be needed in a seamless basic education system. Thus, within TEDS-M, Norway is one of the countries with the least specialization in mathematics for future teachers. In primary schools, mainly experienced generalist teachers teach mathematics. Forty percent of these teachers either had no mathematics study during their teacher education or took just a minor course (of about 25 to 30 hours' duration) on how to teach mathematics. Among those teachers teaching mathematics in primary school, only 14 percent had undertaken indepth study of 60 credits or more, a percentage that is lower than that for any other school subject.

The question of how much to differentiate between preparation of primary and secondary teachers remains a burning issue in Norway. When compulsory schooling was extended to nine years in 1969, deciding which teachers should teach within the extended grades became a topic of debate in terms of whether more specialization was needed in the upper grades. That debate has continued to this day. In recent years, some individual institutions have even applied to and been supported by the Ministry of Education to develop different teacher education programs for primary and lower-secondary teachers, even though such a change is not in accordance with current regulations.

According to the national report, the emphasis on preparing teachers broadly qualified enough to cover all subjects as well as all grades from 1 to 10 is on the way to being replaced by more specialized and more indepth qualifications. The current requirements have been increasingly viewed as out of date. The aim is to refocus teacher qualifications on more specific levels and subjects of schooling, and hopefully thereby improve teaching and learning. But obstacles to this policy remain, such as the fact that the many schools in rural and sparsely populated areas have difficulty attracting generalist teachers let alone highly specialized ones.

In analyzing these issues, the Norway country report gives the most detailed account of any country report of how the specifics of mathematics education reform have figured in decisions about teacher specialization. The impact of efforts to reform the mathematics

curriculum is especially well illustrated and explained. Until 1975 in Norway, the four-year teacher education program-type contained a substantial amount of mathematics content, with that content similar to the mathematics provision in the upper-secondary school track known as *engelsklinjen* (a track concentrating on languages). In 1973, Norway adopted a new law on teacher education, under which mathematics was no longer among the compulsory subjects in the revised teacher education curriculum, unlike the study of Norwegian, pedagogy, and practical/aesthetical subjects. Mathematics remained optional in teacher education program-types until the Norwegian Parliament changed the law in 1990 (see below).

What explains the weak position of mathematics over the course of these three decades? Possible reasons include the following: educational stakeholders having a particular view of what mathematics in school should be; the cultural norms of teacher education in Norway; and the fact that very few teacher educators in Norway in the 1970s had a Master's degree in mathematics.

Gradually, the situation changed. From 1990, the Norwegian government required future teachers to take a compulsory basic course of 15 credits in mathematics. In 1998, the government increased this provision to 30 credits, or half a year's study, in recognition of the facts that mathematics was a central subject in school and that the mathematics background of teacher education students was generally weak.

These developments were closely tied to three curriculum reforms that took place in basic education in 1986, 1997, and 2006. The curriculum stability of school mathematics since the 1920s had begun to erode as early as the 1960s. One of the challenges to this longstanding curriculum was the modern mathematics movement that originated in the United States and which had its roots in concerns about the quality of mathematics and science education in that country.

Responding to such challenges, the Norwegian public began debating the place and importance of mathematics education. In the wake of this debate, the most recent curriculum reform (2006) in Norway focused on mathematical literacy and on elaborating the competencies that students should develop in different areas of mathematics, such as number and algebra, geometry, measurement, statistics, probability, and combinatorics. The reform also formulated competencies to be addressed at different grade levels. The implementation of this reform in the classroom was to be monitored by national tests at Grades 5 and 8, designed to assess the desired competencies and other aspects of learning.

This change constituted a degree of centralized and formal accountability that would have been unthinkable in Norway during earlier decades. The gradual, cumulative effect of these curriculum reforms and public debates was the fomenting of a strong challenge to a system of teacher education that had so far given little emphasis to mathematics. In 2009, a government white paper called for further steps to strengthen teachers' knowledge of mathematics. Eventually, the government decided that to be employed as a teacher of mathematics in Norway at the lower-secondary level, an individual had to have at least 60 credits in mathematics, while a future teacher of a primary school would have to have at least 30 credits.

Chile

Chile, along with Thailand (see below), also has limited specialization with respect to teacher education. Both countries merged primary and secondary grades into a single program-type of preparation in order to qualify future teachers to teach throughout the entire compulsory education cycle. However, in both countries, as in Norway, this policy has not only been questioned, but has been, and is being, modified in important respects.

In Chile, this story can begin with a 1965 reform that restructured the old 6–6 system: a six-year primary school (then terminal for most of the population) and a six-year highly elitist secondary school. The new structure adopted at that time, in line with the UNESCO recommendation that all young people have at least eight years of general education, resulted in an eight-year basic general school, and a four-year secondary school divided into academic and technical/vocational tracks. This reform had an important effect on normal schools. They, too, were restructured so they could be upgraded to tertiary level and were increasingly linked with university faculties of education. This new structure served the nation well in that it worked not only to achieve universal basic education but also to increase enrolments in secondary education. Eventually, however, according to the country report, this once successful reform itself stood in need of change.

In reality, this system never ruled out all specialization for basic education teachers. Teachers prepared under the old system were offered the opportunity to upgrade their qualifications through special diploma courses at universities. Recognizing that it would be difficult for a generalist teacher to be effective in all eight grades, the teacher education curriculum also allowed for some subject specialization.

More generally, the two decades since the return to democratic government in 1990 have produced a mounting challenge to the integrated basic education form of school organization and the associated program-type in teacher education that Chile adopted in 1965. For example, the Presidential Advisory Council on Educational Quality reached an agreement on several resolutions, including one to reorganize the schools with more differentiation in basic education between Grades 1 to 6 and Grades 7 to 10. The country report pointed out that “in the light of this new structure, the teacher education programs will have to reform their curricula and provide teachers with different kinds of specializations.” In fact, the report of the Presidential Advisory Council recommended consideration of a number of new specializations consisting of different grade spans and different numbers of teaching subjects.

Thailand

In Thailand, basic education is defined as Grades 1 to 12. In practice, this definition has meant no formal differentiation between degrees or diplomas in education awarded to future teachers who will teach in the early grades as compared to those who will teach the more advanced grades up to Grade 12 (which in other countries is often the terminal year of upper-secondary school). Nevertheless, as the country report explained, there has been some organizational differentiation within the schools themselves. Basic education follows the 6–3–3 system—six years of primary school followed by three years of lower-secondary school and three years of upper-secondary school.

Currently, according to the country report, this system has produced too many primary generalist school teachers, but not enough specialist mathematics teachers for the secondary level. This oversupply of elementary school teachers is a result of having too

many teacher training institutions, especially those belonging to the Rajabhat group of universities. Again according to the country report, a lack of coherent policies and mutual planning among these institutes is responsible for problems with both the number and the quality of graduates. Although, throughout the last several decades, the Thai birth rate has declined, the capacity for preparing new school teachers has not been reduced, so causing the oversupply. This situation was partially addressed, but not resolved, about 15 years ago by transforming most teacher colleges into the Rajabhat group of institutes and, later on, the Rajabhat group of universities, which became institutions offering many more degrees and courses than did their teacher college predecessors.

As a result, this system, with too many students in general teacher education and too few with sufficient preparation to teach mathematics, has led to most teacher education institutions no longer preparing generalist teachers for primary schools. Although such program-types continue to exist on paper, there are no students enrolled in them (personal communication from the Thai TEDS-M national research coordinator). Instead, Thailand is now producing teachers for the early grades as well as later grades who have a specialization in mathematics.

According to the TEDS-M Thailand team, the extent to which practicing teachers actually specialize in mathematics depends on the school in which each is placed. In Grades 1 to 3, most teachers are generalists, but some are specialists. In Grades 4 to 6, most are specialists, but there are some generalists. In Grades 7 to 12, all mathematics teachers are specialists, except for those in very small schools where the same teacher teaches mathematics and science. The suspension of primary teacher education for generalists meant that the Thai TEDS-M target population was entirely composed of future teachers with a mathematics specialization at both the primary and lower-secondary levels, a situation unique among the TEDS-M countries.

Poland

Poland initiated a comprehensive reform of its education system after its 1997 election and implemented it in 1999. While never enunciated clearly, the goals of the reform were to increase educational attainment, improve the quality of education, and ensure equal educational opportunities for all students. Because this reform was intended to cover all aspects of the school system, it led to a change in school structure.

The former structure consisted of eight years of general education in primary schools, followed by three to five years in the tracks of vocational and general schools. That structure was replaced by six years of general education in primary schools, followed by three more years of general education in lower-secondary schools, and finally two to four years in the vocational or general tracks of upper-secondary schools. The reform thereby extended the total amount of general education by one year. The heavy emphasis on vocational education under the Communist regime shifted toward an emphasis on general education and preparation for entry into higher education. Primary schools were further divided into two stages, with the first stage (Grades 1 to 3) offering integrated learning, and the second stage (Grades 4 to 6) providing a curriculum in which each subject-matter is taught separately by specialized teachers with advanced knowledge of the subject-matter in question.

Teacher education in Poland has traditionally been highly academic, and therefore the curriculum of teacher education for mathematics specialists is heavily oriented toward

mathematics at the tertiary rather than the school level. Even in teacher education for Grades 1 to 3, where subjects are integrated, practical (as opposed to academic) teacher education is only a minor part of the program-type.

The structure and content of the teacher education curriculum was hastily put in place in accordance with a 2003 regulation. Just one year later, it was replaced by a new regulation, which was still in effect during the writing of the TEDS-M country report. The underlying assumption of that regulation was that teacher preparation should aim to prepare teachers who are competent specialists in the content of their teaching subject while at the same time being accomplished in subject-matter didactics and general pedagogy.

Under the regulation, standards for each subject-matter define the content knowledge and competencies that need to be developed in teacher education program-types. For specific types of teacher education, the regulation specifies the minimum number of hours of education coursework (including psychology, general pedagogy, general and subject-related didactics, and additional subjects), as well as the minimum number of hours to be devoted to the practicum.

The regulation also stipulates that this first-cycle program-type should qualify future teachers to teach two subjects. The content knowledge for the major subject is to be studied at tertiary level (as defined by the standards for specific fields, such as biology, physics, and mathematics), and the minor subject is to be studied at a level that meets the standards of the school curriculum. In contrast, second-cycle program-types (and the long-cycle program-types being phased out) can prepare future teachers for either one or two teaching subjects. The regulation also defines the role of the practicum as the acquisition and development of practical skills gained through working with actual classes of students. The practicum is also seen as a means of gaining an understanding of the ways in which schools and other institutions are organized and operated.

At the time the country report was written, the authors of it expected the regulation would be updated in the near future and based on the Higher Education Law of 2005, which authorized increasing the minimum standards for hours spent studying psychology and pedagogy, subject didactics, and applied aspects. However, specialists from fields other than pedagogy objected to this change, fearing that it would limit the time allocated for acquisition of subject-matter content knowledge.

Singapore

Singapore provided more detail on this history of developing specializations than did the other country reports. According to its authors, changes to Singapore's teacher education structure and curricula were made partly in response to new international trends in ideas about teacher education and partly in response to the changing demands of the Singaporean education system.

University studies in education were first introduced in Singapore in 1991. They led to a Bachelor of Arts with Diploma in Education and a Bachelor of Science with Diploma in Education. Both were concurrent program-types that prepared teachers to teach several primary subjects and two secondary subjects. This so-called B-series was a four-year program-type with a fifth year for honors study in a discipline such as mathematics or English.

This program-type was deemed very demanding, and in 1998 it was separated into a primary track and a secondary track. The primary track trained teachers in three curriculum subjects, namely English, mathematics, and science. In 2001, it was changed to a Bachelor of Arts (Education) and a Bachelor of Science (Education), making these four-year program-types a direct honors degree, in which the award of honors was based on overall academic performance rather than on an additional year of study. This so-called C-series for primary school teachers concentrated on four subjects—English, mathematics, science, and social studies. Future teachers had to specialize in one of these academic disciplines. Students in this C-series program-type were included in the TEDS-M target population.

Finally, after a further review of degree program-types, a new A-series of program-types was put in place that allowed student teachers to specialize in primary or secondary school teaching, but not both. The first batch of these student teachers graduated in May 2009 and so were not part of the TEDS-M target population. Nevertheless, mention of these program-types is important with respect to this volume because it illustrates the degree to which Singapore has established within its teacher education system subject-matter specialization at primary as well as secondary level.

United States

In the United States, primary and lower-secondary mathematics teachers are assigned to teach in elementary and secondary teaching contexts, which vary with regard to student socioeconomic status, race/ethnicity, urbanicity, special needs, English proficiency, school size, school governance (e.g., charter schools versus traditional public schools), and the influence of teacher unions and teacher labor contracts. However, certification and licensing are not highly specialized in these respects, except that in many states it is possible for elementary, middle grades, and secondary mathematics candidates to earn a dual license or an endorsement in areas such as special education and bilingual education. In addition, many university-based programs and alternative pathways into teaching (e.g., Teach for America, New York City Teaching Fellows Program) focus specifically on preparing candidates to teach in certain school contexts and/or with certain student populations (e.g., urban, rural, high-poverty, limited English proficiency).

Importance of Specialization for TEDS-M

The above country vignettes make clear that what specialization there is in any one country develops from how it organizes its primary and secondary schools. So how much difference is there between primary and secondary schools? And at what grade do students change from one to the other? How much distinction is made between lower- and upper-secondary schools; or, between lower primary and upper primary?

Teachers being prepared to teach only in the lower-secondary grades are likely to be prepared differently from teachers prepared to teach at both lower- and upper-secondary levels. Likewise, teachers who trained as specialist teachers of the lower-primary grades, say K to 3, are likely to be expected to learn different knowledge from those who trained to teach Grades 1 to 6. Teachers at lower-grade levels logically need less specialization in terms of advanced subject-matter knowledge and therefore can be expected to teach more subjects. But some countries include more advanced mathematics at any given grade level than do other countries, regardless of how many subjects the teachers teach.

Other aspects of how schools are organized are also relevant. Small schools are generally less able than large schools to afford teachers specialized in subject-matter, and very small primary schools may have teachers teaching two and up to eight grade levels in the same classroom at the same time. Some countries have put forward proposals and developed projects to provide special training in multisubject, multigrade teaching for such schools. The Canada country report mentioned a commission in Labrador and Newfoundland that had proposed this approach. An attempt was, in fact, made, but was given up a few years later because of lack of applicants.

Within TEDS, these major issues in specialization can be summarized in two questions of central interest. First, to what extent do future teachers study and specialize in mathematics? And, second, for what grade levels are they prepared to teach? Although the TEDS-M country reports give us few details on how these differences in specialization develop over long periods of time, they do give us windows into systems at very different points in this history of more or less differentiated organizational development and more or less specialization in teacher preparation.

Conclusion

This chapter adopted an historical perspective so that we could see the organization of teacher education in its full complexity, with twists and turns that perhaps were not so evident in the first two chapters. This complexity added greatly to the challenge of the empirical survey work in TEDS-M. The task was to design samples and instruments that would capture the essence of these systems at a given point in time, yet present these data in a way that would not lead readers to presume these systems are more stable or invariant over time than they actually are. But by turning the tables, literally and figuratively, one can say that the results of this empirical survey work should bring a new clarity to the comparison of systems that would not be possible without very careful, systematic, and rigorous research at a particular point in time—2008 in the case of TEDS-M.

References

- Angus, D. L. (2001). *Professionalism and the public good: A brief history of teacher certification*. Washington, DC: The Fordham Foundation.
- Blömeke, S. (2002). *Universität und Lehrerbildung* [The university and teacher education]. Bad Heilbrunn/Obb.: Klinkhardt.
- Federation of Malaya. (1956). *Report of the Education Committee 1956 (the Razak Report)*. Kuala Lumpur, Malaysia: Government Press.
- Hsu, H.-Y., & Rurk Khum, S. (2009). A comparative analysis of HRD in Taiwan and Thailand. In *Proceedings of the 2009 International Conference on Human Resource Development, Taipei, Taiwan* (pp. 1–10). Taipei, Taiwan: Graduate Institute of International Human Resource Development, National Taiwan Normal University.
- Organisation for Economic Co-operation and Development (OECD). (2005). *Teachers matter: Attracting, developing and retaining effective teachers*. Paris, France: Author.
- Presidential Commission to Survey Philippine Education (PCSPE). (1970). *Education for national development: New patterns, new directions*. Manila, the Philippines: Department of Education and Culture.

CHAPTER 4:

THE POSITIONS AND CAREERS FOR WHICH TEACHERS ARE BEING PREPARED

John Schwille and Richard Holdgreve-Resendez

This chapter documents the extraordinary variation in the jobs, careers, and work conditions for which teacher education institutions prepare their future teachers. Here, we synthesize the TEDS-M national reports in terms of the following:

1. Teachers' employment systems;
2. Teachers' working conditions;
3. Teachers' salaries and incentives; and
4. Teacher supply and demand.

In each section, we report on those countries that are best suited to illustrate the variation in contexts for which the TEDS-M countries prepare their future teachers.

Teacher Employment Systems¹

There are two major systems of teacher employment in public schools throughout the world, together with various mixed or hybrid models. The distinction between the two systems is explained in the OECD (2005) report on recruiting, preparing, and retaining teachers. One system is known as career-based and the other as position-based. Career-based refers to systems where teachers are expected to remain in one coherent, clearly organized public or civil service throughout their working life. They are often called civil servants and are subject to many of the same rules as civil servants in other government ministries.²

In such a system, entry normally occurs at a young age, based on academic credentials and/or examinations. Promotion follows a well-defined path of seniority and other requirements, and teaching assignments follow bureaucratic deployment principles and procedures rather than being at the discretion of local school administrators.

In the most highly developed career-based systems, such as was the case historically in France, teachers were recruited to a provincial or national service before training. As teachers in training, they were given the status of and paid as beginning teachers during training and were guaranteed jobs after training, with the Ministry of Education deciding what school to place them in throughout their career (the local school administrators having no say). If these teachers wanted to be transferred, they followed procedures established by the Ministry of Education. They were also evaluated by inspectors in the

1 This section is based primarily on national reports by R. Crocker and H. Jodouin (Canada); F.-J. Hsieh, P.-J. Lin, G. Chao, and T.-Y. Wang (Chinese Taipei); N. Mzhavanadze and T. Bokuchava (Georgia); J. König and S. Blömeke (Germany); T. Breiteig (Norway); M. Al-Ghafri, A. Al Abri, and M. Al Shidhani (Oman); M. Sitek (Poland); K. Y. Wong, S. K. Lim-Teo, N. H. Lee, K. L. Boey, C. Koh, J. Dindyal, K. M. Teo, and L. P. Cheng (Singapore); E. Castro Martínez and P. Flores Martínez (Spain); S. Brandt, F. Oser, H. Biedermann, M. Kopp, S. Steinmann, S. Krattenmacher, and C. Brühwiler (Switzerland); and P. Youngs and E. Grogan (United States).

2 The question of whether teachers should be civil servants has a long history of policy debate. See, for example, two media reports. The first is a *New York Times* article (January 12, 1913), which, in reporting on a meeting of 13 education associations at the University of London, points out that "Should teachers become civil servants?" was the subject most debated." The second is an online article in the *Beijing Review* (April 13, 2009), in which a former president of the University of Science and Technology in Beijing argues that primary and secondary school teachers in China should be entitled to the same rights as civil servants.

ministry, and the ministry decided if and when to promote them, according to rules it had established. The ministry furthermore set teacher salaries for the country as a whole, in negotiation with other agencies of the national or provincial government.

The OECD (2005) report mentions France, Japan, Korea, and Spain as examples of career-based systems. According to that report, countries that can afford career-based staffing generally avoid major teacher supply problems.

Position-based systems take a very different approach to teacher employment. A position-based system is one in which local education authorities play a major role in recruiting and hiring teachers. Not only is selection for these positions decentralized, but local authorities, not provincial or national authorities, set many of the rules governing the teaching career. The more decentralized a system is, the more it can be called position-based.

Although local education authorities may provide, on a smaller scale, much of what career-based systems offer on a national or provincial scale, there is a critical difference. Teachers are not hired into the national civil service or a separate national teacher service. Instead of being hired into a national or provincial service, teachers are hired into specific teaching positions within an unpredictable career-long progression of assignments. Thus, they are not necessarily expected to remain with the same local education authority for the duration of their professional life. In such a system, access is more readily open to applicants of diverse ages and atypical career backgrounds. Movement in and out of teaching, to raise children or pursue other opportunities, is possible. In general, salary scales are flatter than in the career-based system. They start out higher but level off in the early years of the career.

The OECD report cites Canada, Sweden, Switzerland, and the United Kingdom as examples of position-based systems. One disadvantage of these systems is that they often have difficulty recruiting sufficient numbers of teachers, especially in areas such as science and mathematics, where there are attractive opportunities in other occupations. Turnover is often high, especially in less advantaged areas, and retaining highly experienced teachers can be difficult.

In developing countries, the need to expand systems quickly with very limited resources has led to hybrid systems in which some teachers have permanent appointments within a national service and others are hired on contract. In some cases, the contract teachers may be hired regionally or nationally, but also in many cases by individual schools and communities.

The distinction between career- and position-based systems logically has a major impact on teacher education. Because appointment in a career-based system is a commitment to lifelong employment, such systems consider themselves justified in investing in initial teacher preparation, knowing that the education system is likely to realize the return on this investment throughout the teacher's working life. Often, this commitment is made even before the beginner receives any teacher training.

In contrast, in position-based systems, such an investment in initial preparation is less justifiable because the system is based on the assumption that individuals may move in and out of teaching on a relatively short-term basis, and often the graduates of teacher education in such a system never occupy any teaching position at all. In the United States, for example, historians have said that the system of teacher employment and associated training was initially adopted in response to the needs of women who might want to teach for a few years but then leave the profession to raise children, often never to return.

Career-Based Versus System-Based Systems in the TEDS-M Countries

The following sections compare TEDS-M countries with career-based systems with the TEDS-M countries that have position-based systems. We again concentrate on those countries whose TEDS-M reports shed the most light on this distinction. We also discuss the status of teachers in private schools, but only for the purpose of accounting for the employment of all teachers. The status of private school teachers is not germane to the career-based versus position-based distinction, because the focus in TEDS-M is on comparing how teachers are employed and regulated within the *public* sector.

Singapore (career-based)

Teaching in Singapore is largely a career-based occupation. The government employs teachers in public schools. They are civil servants, and a majority of them are employed on a permanent basis. Employment conditions in the education service are determined by the Ministry of Education and not by a collective agreement between employer and teacher unions as in many other countries. Teacher recruitment is conducted centrally by the ministry. All positions are advertised openly. Selection criteria are developed and applied centrally, not by individual schools, and successful applicants are employed initially as “untrained teachers.” Students are then sent to the National Institute of Education (NIE) as “trainee teachers” or “student teachers” for training. They receive a regular stipend to cover their training expenses.

There are three career tracks in the education service in Singapore: the teaching track, the leadership track, and the senior specialist track. The teaching track is for teachers who have demonstrated strengths in teaching and wish to remain as teachers. The leadership track provides education officers with opportunities to take on leadership positions, such as heads of departments in schools, principals, and directors of units and divisions at the Ministry of Education. Those who have developed expertise in specific areas, such as curriculum, assessment, and educational psychology, can opt for the senior specialist track by obtaining higher qualifications and professional training.

There is one sense in which Singapore is characteristic of a position-based system. The Ministry of Education employs relief teachers and adjunct teachers on a contractual basis. Adjunct teachers are teachers who have retired or resigned, but who are re-employed by the ministry under flexible terms. At the end of 2007, there were about 2,000 such teachers.

Spain (career-based)

The status of teachers in Spain depends on whether the educational institution is publicly or privately owned. The teaching staff in state institutions are civil-servant teachers or substitute teachers. They account for 72 percent of the total number of primary school teachers. Teachers in private institutions are employees working on a contractual basis. They make up 28 percent of the primary school teaching force. The two groups vary in major ways with regard to employment rights and obligations.

Teachers in the Spanish public sector belong to a classic career-based national system. They spend their entire careers in the national civil service. Access to the public-sector teaching profession is usually by means of a competitive state entrance examination. However, the General Law on Education of 1970 provides one exception whereby individuals can gain “direct access” to the teaching service. On acquiring civil-servant status, a teacher is appointed to a position according to the vacancies that exist, but only after all civil-service teachers have had an opportunity to apply for a transfer via the nationwide competition to fill these vacancies.

Private schools, whether publicly subsidized or not, are free to select their teaching staff, provided the teachers meet the minimal state-required qualifications. These teachers work on a contractual basis in state-maintained (that is, through a financial grant) or in non-state-maintained educational institutions. The Spanish state pays all teachers in government schools and in private, but state-subsidized, schools. Teachers in non-subsidized private schools are hired on contract and paid from private sources.

Oman (career-based)

The Ministry of Education is the only government agency concerned with hiring teachers and assigning them to government schools, according to the needs of those schools. Owners of private schools first make their own selections and then approach the Ministry of Education for approval to hire the teachers they have selected. Thus, teachers in schools of general education begin their careers on being appointed, after graduating, to a position by the Ministry of Education. The graduates that the ministry hires from within the country will have attended the College of Education of Sultan Qaboos University or other colleges of education of the Ministry of Higher Education. The ministry also employs qualified graduates of other universities and colleges inside and outside the Sultanate of Oman.

Teacher recruitment is subject to the Civil Service Law, as is the case with other government jobs. University graduates are appointed to a pay grade set for civil servants with a similar level of qualifications. All employees are promoted to the next salary grade once they complete four years of service. Promotion to other posts of an administrative or a technical nature is granted to those who work as a teacher for at least four years and who have been nominated to a post of school assistant headmaster, subject supervisor, curriculum officer, school activities specialist, or to any other technical or administrative job.

Although teachers are appointed through the national civil service, they are assigned, if possible, to schools near their home towns or villages. Unlike other civil servants, teachers enjoy annual leave at the same time as when their students go on summer vacation at the end of the school year. They also have mid-year leave (in February) every school year.

Chinese Taipei (career-based)

Of the 143,000 elementary and junior-secondary teachers in Chinese Taipei in 2007, less than one percent were private school teachers; the rest were public school teachers. Public school teachers, military personnel, and civil servants are all grouped together as “Military, Civil Servants and Teachers,” employed and paid by the government, and enjoying a stable income and good benefits. Although this system embodies many of the features of a career-based system, it takes on, at the critical phase of entry into teaching, some position-based characteristics. Instead of being assigned by the Ministry of Education to schools, graduates of teacher education have to apply for specific jobs and undergo onsite screening and selection for those jobs.

Switzerland (position-based)

In contrast to the first four countries just discussed, Switzerland is a position-based system. Personnel selection and management are generally decentralized at the level of schools and local education authorities (LEAs). These schools and LEAs search for the most suitable candidate for each open position, whether from inside or outside the school in question. This system offers access to qualified adults at any time during

their working life. Access from other career paths is relatively common, as are moves by teachers into other careers and their later return to teaching. Although starting salaries may be attractive, they plateau at a relatively early point. Promotion relies on teachers self-identifying and applying for a vacant position. Unlike promotion in a career-based system, promotion up a career ladder is not possible in Switzerland for a teacher who stays in the same teaching position. Moreover, the number of higher positions open for promotion is limited.

Although each canton is responsible for organizing its own school system, this power has not been used to exercise hierarchical control over schools. Nevertheless, the cantonal parliament does adopt a legal framework for overall conditions of employment as well as for admission to the profession and for teacher training. When several cantons want to share jurisdiction in some respect, the parliaments in question have to pass treaties to govern this cooperation.

Each canton determines the number of new teachers to be admitted to school service. The cantons set rules for salaries, number of teaching hours, and types of appointment. Teachers can be appointed on a fulltime or parttime basis. The higher the school level, the lower the proportion of permanently employed teachers.

The Swiss employer–employee relationship for teachers at elementary schools is governed by public law and based on a written contract with each teacher, which is initially valid for a certain number of years with the likelihood of being extended. Teachers are not appointed on a more permanent basis until they have completed a probationary period, after which they are selected for an undefined period or for a four- or six-year period of office. Still, there is no position entitlement due to seniority or otherwise. According to Carnoy, Brodziak, Luschei, Beteille, and Loyalka (2009), “teachers are not offered a lifetime contract, a practice that guards against teachers becoming complacent and motivates them to continuously improve their performance.”

Teachers are allocated to a wage scale based on their qualifications, the school level at which they are teaching, and their experience. Promotion relies on teachers self-identifying and applying for a vacant position. Unlike promotion in a career-based system, promotion up a career ladder is not possible in Switzerland for a teacher who stays in the same teaching position. Moreover, the number of higher positions open to promotion is limited.

A teacher’s salary increases in proportion to the number of years of service. However, starting salaries in Switzerland, compared with starting salaries in other countries, are high, but then they plateau at an early point with little by way of yearly increases. In cantons with regulations governing terms of office, teachers are assured of automatic increases in pay, even if not large increases, as well as special loyalty bonuses, family allowances, wage continuation payments in the event of sickness, and termination payments that are better than those in private industry. Ten cantons have no such terms-of-office regulations, and in a further six cantons they are to be abolished. When that happens, there will be only 10 cantons with these terms-of-office regulations.

Norway (position-based)

Nineteen counties and 434 local communities administer basic education in Norway, another position-based system in which the national government is not the employer of teachers. Communities operate primary and lower-secondary schools while the counties run the upper-secondary schools. The national government is responsible for post-secondary education. Private schools and private education play a small role at all levels. In all cases, except for post-secondary institutions, communities or counties determine budgets and publicly advertise for teachers. They set up a competitive process to hire teachers and consider education level, experience, and the teacher's job description when making appointments.

United States (position-based)

In the United States, teaching is a position-based career because, for example, school districts compete when hiring teachers and there is relatively open access to the profession for candidates judged best qualified to fill teaching positions. This situation not only results in a more market-based approach to recruitment and compensation but also means that teacher recruitment and hiring practices vary widely throughout the United States. The recent growth of alternative licensure program-types has contributed to even more of a position-based approach. Nonetheless, it is important to note that many statewide and district regulations have been set up to govern teacher recruitment and, after recruitment, teachers' work. Most districts have regulated career progression that is similar in certain respects to systems that other countries have put in place at national or regional levels.

Canada (position-based)

Most teachers in Canada are employed by local or regional school agencies, which operate under legislation passed by the provinces and territories. Although provinces make the rules, provincial ministries of education do not hire or employ teachers in public schools. The federal government has no authority at all in these matters. Only a small proportion of teachers are employed by private schools, the schools operated by Aboriginal peoples, and other schools not within the public system.

Because schools operating in both official languages (English and French) are found in all jurisdictions, the ability to use the language of instruction is, in such instances, a requirement for employment. In some jurisdictions, a candidate's religion is also considered during hiring, particularly where separate schools (usually Roman Catholic) exist for particular denominations. But, even so, these denominational schools are deemed to be within the public sector.

For many teachers, according to the Canadian national report, teaching is more a vocation than a career—one that individuals pursue in one form or another throughout their working life, although not within a single established career ladder. Teachers are initially recruited for a specific position requiring a particular set of qualifications. After an initial probationary period, teachers can move up to another position, based on seniority. When vacancies become available, experienced teachers are given preference over new teachers, provided they are sufficiently qualified in other respects. Salary scales are typically based on a candidate's years of education and university degrees. They are not generally differentiated by subject specialization or by assessed competence.

Georgia (position-based)

Schools in Georgia are generally autonomous in terms of recruiting, hiring, and promoting teachers. Thus, candidates are hired by a school's governing body on a contractual basis. The school sets the terms and conditions of the agreement, but in compliance with the minimum requirements of the Ministry of Education and Science. The authors of the country report envisaged that once the ministry formally adopts new certification procedures, these will become central to the hiring of teachers. Other teacher hiring provisions are under development, but they will not be mandatory.

During the current transitional period, the Teacher Professional Development Center, the main agency responsible for reforms concerning the teacher profession, is responsible for registering teachers. On completing a probationary period of work, teachers must obtain recommendation letters from their respective schools and the Teacher Professional Development Center to confirm their readiness to take certification examinations administered by the National Examination Center. Successful applicants receive a certificate that qualifies them to enter the teaching profession.

Poland (hybrid system)

The majority of primary and lower-secondary schools in Poland are public. Most public schools are managed by local governments, which appoint and dismiss school principals. The principals are responsible for hiring, disciplining, and dismissing teachers, but must adhere to strict national-government regulations when making these decisions. Although teachers are not subject to general civil service regulations, they have a special status entitling them to the same protection given to civil servants.

The Teachers' Charter is the main regulatory framework governing the rights and obligations of teachers in Poland. The charter was adopted in 1982 as a result of negotiations between the independent trade union movement, *Solidarity*, and the official teacher union, on the one hand, and the communist government of the time, on the other. The law granted teachers certain privileges, including teaching load reduction and the right to early retirement and increased salaries. This law has been revised several times since, each time igniting fierce conflicts between government and powerful teachers' unions. However, it still provides very favorable terms of employment for teachers.

The charter regulates teacher salaries, appointments, career paths, and teaching load. The revised law of 2000 made important changes to the remuneration and career advancement of teachers, for example, by introducing five levels of professional status: teacher trainee, contract teacher, appointed teacher, licensed teacher, and professor of education. Teachers at the two lowest levels (trainees and contract teachers) are employed under ordinary conditions of employment governing all workers whereas the appointed and licensed teachers are employed under the provisions of the Teachers' Charter. The charter stipulates that professional development and performance must be taken into account as individuals advance through the five levels. At every stage, teachers must document their progress with certificates, student work, and classroom-based data.

Germany (hybrid system)

Once fully qualified, future teachers in Germany can apply for permanent employment. Employment procedures vary among the federal states. Recruitment procedures are under the control of the particular federal state and determined by job vacancies. Teachers apply either to the Ministry of Education and Cultural Affairs (*Kultusministerium*) in their state, or to the regional or local education authority (*Schulaufsichtsbehörde*). The

grades teachers receive on the first and second state examinations serve as indicators of academic achievement and professional performance and therefore play a major role in recruitment and selection. Subject-matter specialty is also considered.

More and more of the federal states are permitting individual schools to select their own teachers. In these instances, future teachers apply directly for a post at the individual school. However, the process is still strictly monitored by state authorities. Individuals not hired have the right to take legal action against the school authorities based on applicable state regulations. Furthermore, even though selected at school level, teachers are not employed by the individual school but by the Ministry of Education and Cultural Affairs or by the federal or local education authority.

In most federal states, teachers are employed as civil servants. Beginning teachers can immediately become civil servants, but it is only after a probationary period that they acquire tenure. The probationary period lasts two and a half years for teachers who are part of what is called the higher service (*gehobener Dienst*, i.e., primary teachers) and three years for teachers belonging to the senior service (*höherer Dienst*, i.e., secondary teachers). The probationary period provides an opportunity to monitor each teacher's performance and to judge his or her suitability for future employment as a permanent civil servant.

In addition to teachers who are civil servants, there are teachers with salaried employee status. They are employed on a contractual basis under general employment legislation, and their probationary period lasts six months. Only teachers with salaried employee status can be employed on fixed-term contracts, and only for a maximum of five years. In states of the former East German Democratic Republic, teachers with salaried contractual status are in the majority. Thus, the states of former West Germany are primarily career-based whereas the states of former East Germany are position-based, a situation which characterizes the country as a whole as a hybrid system.

Because only about five percent of all elementary and secondary students are in private schools, we can estimate that the proportion of teachers employed in private schools is more or less negligible compared to the proportion employed in the government schools.

Teachers' Working Conditions³

In some countries, teaching conditions are relatively favorable and therefore can more readily attract the required number of talented, highly motivated teachers. In other countries, conditions are unfavorable, making it more difficult to recruit enough teachers and to appeal to those future teachers who have good opportunities to enter other occupations. In principle, future teachers have to be prepared to face these conditions—favorable or unfavorable. In some countries, they will enter classrooms where they should be able to use sophisticated ICT equipment effectively and to choose among a rich assortment of supplemental learning materials. In other locations, they need to be prepared to deal, as effectively as possible, with overcrowded classrooms lacking in all kinds of resources—furniture, books, paper, and so on.

³ This section is based primarily on national reports by K. G. Garegae, T. J. Mzwinila, and T. M. Keitumetse (Botswana); B. Avalos Davidson (Chile); F.-J. Hsieh, P.-J. Lin, G. Chao, and T.-Y. Wang (Chinese Taipei); J. König and S. Blömeke (Germany); E. B. Ogena, F. G. Brawner, and M. D. Ibe (Philippines); K. Y. Wong, S. K. Lim-Teo, N. H. Lee, K. L. Boey, C. Koh, J. Dindyal, K. M. Teo, and L. P. Cheng (Singapore); E. Castro Martínez and P. Flores Martínez (Spain); S. Brandt, F. Oser, H. Biedermann, M. Kopp, S. Steinmann, S. Krattenmacher, and C. Brühwiler (Switzerland); and P. Youngs and E. Grogan (United States).

Unfavorable and Favorable Working Conditions in the TEDS-M Countries

The following sections start with the countries in which teachers face the most difficulties in working conditions. We then turn to countries in which conditions for teachers are more favorable—the majority of TEDS-M countries. Once again, it is clear that TEDS-M countries are, in general, relatively affluent, with very low birth rates, and thus not representative of the world's countries.

Philippines

The Philippines is an example of a country where teachers face very difficult conditions due to lack of resources. According to a study of the Civil Service Commission, teachers generally live below the poverty line. Even though their aspirations are low, they are generally dissatisfied with their working conditions. In a 2000 study (Senate Committee on Education, Arts, and Culture, 2000), a profile of Filipino teachers contained many indicators of their difficult working conditions and status. For example, a substantial number of the teachers were teaching more than six hours a day, whereas, according to the national regulation, five to six actual teaching hours are the limit. Many teachers were also working on the side to increase their income and using their personal funds to buy essential classroom instructional materials, which otherwise are not available. Analysis of teacher workloads in Carnoy et al. (2009, p. 136) likewise led to the conclusion that “teachers in the Philippines face a heavy workload in terms of work hours and class sizes.”

In the primary public schools, the average teacher to student ratio is 1:35, while in the public secondary schools it is 1:39. But these ratios vary dramatically across regions. At the extreme, class size can be as big as 80 or 90 students per class, or as small as five. Schools also vary in size. Some elementary schools are complete, meaning that they include all six grades, whereas others schools have fewer than six grades. There are also multigrade schools, where teachers each teach more than one grade level. The challenge of teaching different grade levels at the same time is exacerbated by the remote location of such schools, which usually lack needed transportation and communication facilities.

These are not the only challenges. In 1998, focus groups of experts in science and mathematics education examined the state of these fields in the Philippines. These discussions revealed many problems, including an acute shortage of qualified mathematics and science teachers as well as a need for a more up-to-date and relevant curriculum, quality textbooks and instructional materials, relevant preservice training, and a better overall organization of science and mathematics education (Ogena & Brawner, 1998).

The TEDS-M country report makes clear that these problems are ongoing. Also apparent is that these challenges have existed for a long time. According to Cortes (1991), “... from 1925, and even decades later, problems besetting all levels of education centered on: inadequate funding, poorly prepared teachers, low levels of pupil achievement, heavy dropout rates, high repeater rates, insufficient and poorly equipped laboratories, libraries, facilities and other related problems.”

The Philippine government has long recognized the need to address these problems. One of the first actions of government to improve the working conditions of teachers was the enactment of a Magna Carta for Public School Teachers in 1966. This law was significant in terms of attempting to address teachers' difficult working conditions and their status problems.

Botswana

Botswana is another country where teachers face the extraordinary challenges of a developing country. Challenges include heavy workloads, shortages of teaching and learning resources, large class sizes, shortage of classrooms, and great diversity in student abilities and home languages. Mathematics teachers may have six classes each for five hours per week, making for a total of at least 30 teaching hours per week for each teacher. Also, because classes are overcrowded, with much heterogeneity in student achievement, teachers require extra time to provide needed remedial lessons. The national report predicts that many of these teachers will burn out, with negative effects on the quality of Botswana's education system.

Most learners enter junior secondary school with limited fluency in English, the language of instruction, which makes mathematical concepts difficult for them to understand, compelling teachers to code switch between English and the national language. The shortage of materials also sabotages teachers' efforts. Teachers furthermore find it difficult to teach certain topics, such as graphing, in classes held outdoors. Outdoor teaching areas are open spaces with corrugated iron roofs, constructed to supplement indoor classrooms in junior secondary schools. In these areas, a chalkboard is mounted on a wall, and students sit on three cement horseshoe-shaped benches of varying height.

As enrolment rates grew over recent decades, the number of students per class increased to 40 to 50 in primary schools, 35 to 45 in junior secondary schools, and 30 to 35 in senior secondary schools. As with the national increases in enrolment rates, these changes increased the ability ranges within classes, leaving teachers frustrated and overwhelmed. Teachers have resorted to teacher-centered methods of teaching, and the quality of their work, usually measured by student pass rates on external examinations, has fallen. Under such circumstances, the public tends to blame teachers for their poor work, and the teachers, in turn, criticize teacher education institutions and their programs for not equipping them with the skills they need to manage mixed-ability and large classes. Teacher educators, for their part, blame the future teachers for allowing themselves to be resocialized into the school norms at the time they enter the profession. The debate has become a vicious cycle of reciprocal blame.

Germany

In contrast to the resource-scarce systems of many developing countries, Germany is an example of a fortunate country that has had two centuries to develop its education system. In terms of class size, working time, and salaries, there are, according to the national report, no particular problems in the working conditions for teachers in Germany even when these conditions are compared with those in other relatively affluent OECD countries.

For example, the OECD (2006) publication *Education at a Glance 2006* shows that the average class size in German schools is only very slightly above the OECD average. Primary school classes in Germany have, on average, 22.1 students, while the OECD average is 21.4. Lower-secondary school classes have, on average, 24.7 students in Germany, while the OECD average is 24.1. However, due to lower levels of funding, class size has been increasing recently in most federal states.

The OECD report also shows that primary, lower-secondary, and upper-secondary school teachers have to work 40 weeks per year, which includes 193 days of instruction

and a total statutory working time of 1,736 hours. These numbers are slightly above the OECD averages, which are reported as 37/38 working weeks, 186/187 days of instruction, and 1,691/1,698 hours of total statutory working time for primary and secondary education, respectively.

However, it should be noted that attaining and sustaining this relatively comfortable situation has required enormous investments over the last century as Germany worked to recover from war and depression and, most recently, to deal with German reunification and the integration of the less prosperous eastern states into the Federal Republic.

Spain

Spain is another country that has been able to regulate and standardize working conditions to a considerable and favorable extent. During academic year 2007/2008, the average Spanish primary class size was 21.5. The working time of civil-servant teachers is the same as that established for all civil servants, that is, 37.5 hours a week. However, teachers are obliged to stay at school for only 30 hours per week and can do the remaining hours elsewhere. Teaching time in preprimary and primary education is set at 25 hours per week; in secondary education, it amounts to 18 hours per week. The remaining time is spent on, among other tasks and responsibilities, class preparation and professional development, both of which may take place away from the school.

The official holiday periods for teachers in both the state sector and the private sector are also established by regulation: one month in summer, plus the same holidays as the students at Christmas (around 15 days) and Easter (approximately 8 days). Teachers in public schools are permitted to adapt their working time to the school calendar, which means that the majority of teachers do not have any teaching responsibilities from 1 July through to 1 September.

Switzerland

Within the TEDS-M group of countries, the Swiss education system is unique in two ways that affect the support it provides for teachers. First, it is the only TEDS-M country that has experienced neither war nor regime change since before World War 2. This situation has had positive consequences for the continuity of policy and the resources available to implement policy. In fact, at the time of a World Bank (2006) publication, Switzerland had the highest wealth per capita of any country in the world (compared to the United States at fourth place, Germany fifth, and Norway eighth). Second, Switzerland is uniquely decentralized with more or less independent education systems in each canton, even though cantons are small in comparison with most states and provinces in federal systems. Nineteen of the 26 cantons have populations of fewer than 40,000 people. Only Zurich has a population greater than 200,000. The parameters within which teachers' working conditions are organized and regulated are therefore very different from those in most other countries.

At primary level, a school year in Switzerland consists of between 35 and 40 weeks and at lower-secondary level between 36.5 and 40 weeks. Teachers at the primary and lower-secondary levels work approximately 1,860 hours a year. Working time cannot be equated to teaching time. Weekly teaching times vary from canton to canton. For a fulltime employee, cantonal teaching time varies between 27 and 33 lessons a week at primary school level and between 22 and 31 lessons at lower-secondary level. Teachers use approximately one half of their working hours for teaching, one quarter for daily preparation and follow-up, and the remaining quarter for long-term planning,

evaluation of teaching, administrative duties, professional development, meeting with parents, and other sorts of collaborative duties. Teachers' compulsory teaching duties can be reduced to allow teachers to carry out necessary school-management functions (e.g., school library, ICT support, and teachers' professional development).

Recently, however, according to the national report, teachers are increasingly leaving the profession. The authors of the report see this occurrence as a warning sign of problematical working conditions, declining prestige of the teaching profession, and absence of career development opportunities.

Chinese Taipei

Even though the teaching career is a very desirable and well-supported one in Chinese Taipei, teachers nonetheless see themselves facing difficult challenges. Under the influence of school-system planning in Chinese Taipei and regulation of teaching loads, teachers often have to cope with a variety of problems, including classes larger than desired, diverse abilities within schools, long school hours, and students with low learning motivation. Also, primary school teachers teach more subjects than secondary school teachers, making it difficult for them to master and have enthusiasm for the teaching of all subject-matters. Most primary and secondary school teachers are required to be on school grounds by 7:00 a. m. and not to leave school until after 5:00 p. m.

Middle school teachers also have to face the stiff pressures of the national entrance examination, which students are required to take to enter upper-secondary school. Taiwanese teachers take on much of the responsibility for how well their students do on examinations, making it necessary for them to put in extra time helping students prepare for these examinations.

An excess of teachers in a given school is now common due to the smaller age cohorts entering elementary schools. In such cases, the most recent teacher to enter the school may be forced to move from his or her present school to another one. As a result, the teacher can face unfamiliar circumstances or, in a worst case scenario, have to give up his or her home for another.

Finally, the traditional high status of teachers is being challenged as Taiwanese society becomes more open (as described in Chapter 3). According to the national report, beliefs such as "Teacher for a day, mentor for life" and "Heaven, Earth, King, Parents, Teachers (*tian, di, jun, qin, shi*)" that exemplify the traditional authority of teachers, are gradually losing credibility. Students are becoming ever more inclined to question and challenge, if only in small ways, the authority of parents and teachers.

Singapore

Singapore is an example of a country with well-resourced classrooms. However, as in other relatively wealthy Asian systems, class sizes are somewhat higher than would be considered ideal in most Western settings. Actual class sizes are about 30 for primary Grades 1 and 2, between 35 and 40 for other primary and secondary levels, and slightly below 25 for post-secondary junior college level.

Singapore schools are generally well equipped, and most classrooms have computer-based projection systems; teachers need bring only a laptop to class to deliver ICT-based lessons. The wide availability of ICT in schools is a direct consequence of Singapore's first billion-dollar ICT Masterplan for schools, which was in effect from 1997 to 2002. The next two ICT Masterplans (Mp2, 2003 to 2008 and Mp3, 2009 to 2014) have aimed at a still more thorough transformation of curriculum, pedagogy, and assessment.

A typical teacher has about 16 to 18 hours per week of classroom teaching, which take place during formal school hours (7:30 a.m. to 2 p.m. daily). Teacher responsibilities are diverse. As part of their normal workload, most teachers conduct remedial or enrichment classes and mark student work after formal school hours. They also supervise co-curricular activities, such as sports, clubs, and community-based projects. To support teachers effectively in these endeavors, the Ministry of Education has introduced various mechanisms: employment of teacher-aides for some administrative duties, hiring of managers for co-curricular activities, and implementation of the “white space” concept, first introduced in 2005. White space refers to extra time given teachers to plan more engaging lessons or to work with colleagues to plan interdisciplinary activities for their students. This extra time was made possible by reducing the content of many school subjects.

Chile

Chile is illustrative of middle-income countries where working conditions are neither as difficult as those of many lower-income countries nor as supportive as those of the higher-income countries tend to be. Fulltime, tenured teachers are usually employed for 30 or 44 hours per week. They may be employed for less time, depending on school needs. For teachers hired for 44 hours per week, this means, for example, 43 periods of 45 minutes each, plus 3 hours of recess and about 9 hours of other activities, such as meetings. The total hours of actual classroom teaching per year of 873 is at the highest end of countries included in OECD (2006) statistics.

In the poorer neighborhoods of Chile’s larger cities, such as Santiago, teachers work in classrooms with up to 45 students. Average class sizes are smaller than this, however, and vary according to region, urban versus rural location, and type of school. The national average class size is 31 for public basic schools (Grades 1 to 8) and 36 for public secondary schools (Grades 9 to 12). Because of long teaching hours and the number of students per class, teachers have little time for other professional activities. Over two-thirds of the 6,000 teachers in a national survey reported having had “little or no time” to prepare lessons, assist students with their difficulties, or work collegially with other teachers (Microdatos, University of Chile, 2006).

United States

The United States exemplifies the case of a country with such a high degree of inequality that generalization is difficult. Unlike wealthy countries where conditions are generally favorable and resource-scarce countries where conditions are generally unfavorable, the United States has both favorable and unfavorable conditions. While the country is endowed with many wealthy, well-equipped public and private schools, the working conditions in many high-poverty, low-resource schools are, if not as daunting as in the lowest-income countries, very difficult. These difficulties include large, hard-to-manage classes, lack of instructional materials, limited technology, long working hours, too little time not in front of classes, long commutes to school, and remote locations.

Research suggests that such working conditions contribute to high teacher turnover. For example, Loeb, Darling-Hammond, and Luczak (2005) found in California that high teacher turnover was strongly influenced by poor working conditions and low salaries, as well as by student characteristics. These poor working conditions included large class sizes, problems with school facilities, multiple academic tracks, and lack of textbooks. When these conditions were taken into account, the influence of student background characteristics on teacher turnover was substantially reduced.

Teachers' Salaries and Other Incentives⁴

TEDS-M countries range from those where teaching is very selective, highly regarded, and well remunerated to those with low salaries, lower status, and much less selectivity, leaving many countries in between. The following section focuses on salaries and incentives and especially whether these inducements compare favorably with other TEDS-M countries as well as with other occupations within the same country (insofar as such comparisons can be drawn from the country reports). The subsequent section deals with the consequences of this variation in favorability on the supply of and demand for teachers.

Favorable and Less Favorable Incentives in the TEDS-M Countries

In the sections below, we have ordered the countries very roughly from those that are able to offer teachers very favorable financial conditions to those where this has not been the case. However, as will become evident, countries may be favorable in providing certain inducements and incentives but less so in providing others. In addition, countries with salaries that compare well with those of other countries may not fare well when compared with salaries for other occupations within the same country.⁵

Chinese Taipei

In Chinese Taipei, the government has had a longstanding policy to provide and support favorable conditions for teachers. As in most other countries, teachers enjoy job security and dismissal is rare. However, the Chinese Taipei system has gone far beyond job security. In order to attract talented students into teaching and then retain them so as to avoid teacher shortages, the government after World War 2 incrementally put into place over the decades an exceptional package of incentives. By the time a new teacher education reform was adopted in 1994, these incentives had come to include the following:

- A tuition-free teacher preparation education, with an obligation to teach for at least five years (graduates wanting to switch into other professions had to reimburse the government in full for tuition, accommodation, and subsidies);
- Free accommodation during preservice preparation, with subsidies for books and clothing;
- Automatic certification as qualified for teaching upon graduation;
- A guaranteed teaching position upon graduation; and
- For those who stayed in teaching, generous remuneration and lifelong benefits that included salary, comprehensive health, disability, and life insurance, summer and winter vacations, and retirement pensions, all of which were intended to retain school teachers by taking good care of their needs throughout their lives.

4 This section is based primarily on national reports by K. G. Garegae, T. J. Mzwini, and T. M. Keitumetse (Botswana); B. Avalos Davidson (Chile); F.-J. Hsieh, P.-J. Lin, G. Chao, and T.-Y. Wang (Chinese Taipei); N. Mzhavanadze and T. Bokuchava (Georgia); J. König and S. Blömeke (Germany); R. Nagappan, N. Ratnavadivel, O. Lebar, I. Kailani, S. Malakolunthu, and M. Karim (Malaysia); T. Breiteig (Norway); E. B. Ogena, F. G. Brawner, and M. D. Ibe (Philippines); M. Sitek (Poland); K. Y. Wong, S. K. Lim-Teo, N. H. Lee, K. L. Boey, C. Koh, J. Dindyal, K. M. Teo, and L. P. Cheng (Singapore); E. Castro Martínez and P. Flores Martínez (Spain); S. Brandt, F. Oser, H. Biedermann, M. Kopp, S. Steinmann, S. Krattenmacher, and C. Brühwiler (Switzerland); P. Dechsri and S. Pativisan (Thailand); and P. Youngs and E. Grogan (United States).

5 The IEA report by Carnoy et al. (2009) focuses on comparing occupations within countries to assess comparability with other mathematics-intensive occupations. It does not systematically compare salaries across countries and, in fact, reports salaries in different ways that are not directly comparable from one country to another. We did not find, in any of the sources we consulted for all the TEDS-M countries, teacher salaries reported in directly comparable terms.

From the 1960s to the 1980s, Chinese Taipei's economy improved rapidly, along with its standard of living. As a result, teachers' salaries increased greatly while the retention policy for teachers remained unchanged. Teachers continued to enjoy very favorable benefits. For instance, although teachers have a two-month summer vacation and a 21-day winter vacation, they are not only paid a whole year's salary, they also receive an additional 1.5 months' pay as a New Year's bonus and a one-month "professional-performance merit" bonus every year. Teachers in primary and junior high schools are also exempted from income taxes as a reward for teaching at the compulsory education level. And there are still other benefits: teachers receive a marriage bonus (two months' salary), a birth allowance (two months' salary), a funeral allowance (three to five months' salary), a children's education allowance, health check-up grants, and parental leave. In short, as Carnoy et al. (2009) conclude, teacher compensation in the Chinese Taipei system is highly competitive with compensation in other occupations.

Teachers also enjoy an excellent pension upon retirement. Before 2007, the pension was almost always higher than the salary they would have received if still on the job. Although a 2007 reform limited the pension to no more than 95 percent of teachers' attained level of full pay, the pension is still very generous, ranging from 85 to 95 percent of the full pay associated with number of years of teaching experience.

Singapore

The remuneration of teachers in Singapore is comparable to what their peers with similar qualifications and years of working experience would earn in other occupations within either the private or the public sector. Carnoy et al. (2009) note that if teachers continue teaching into their forties, they are paid better than both accountants and engineers. Such advantages have enabled the Ministry of Education to be competitive in the labor market and thereby attract and retain good teachers. This remuneration package consists of monthly salaries, performance-based bonuses, and a long-term incentive plan that rewards teachers who stay in teaching. This package is reviewed regularly. Teachers are also eligible for such benefits as professional development leave and medical and dental care.

In 2006, the Ministry of Education introduced its GROW Package, designed to aid the professional and personal Growth of Education Officers, through better Recognition, Opportunities, and seeing to their Wellbeing. GROW 2.0 and the new Education Scheme package (April 2008) gave teachers an even more attractive remuneration package, more career opportunities, and greater flexibility to balance the demands of work and family. The main improvement was that of making teachers' pay more competitive and in line with market forces. The ministry has also increased performance-based pay differentials among teachers, in response to feedback from teachers calling for sharper differences in pay based on performance.

Spain

As mentioned earlier in this chapter, teachers holding continuing appointments in Spanish public schools are civil servants. Civil-service salary increases in Spain are based on length of service and professional development courses taken. Initial salaries are relatively high. In 2004, beginning teachers earned US\$31,381 compared to \$US 25,727 in OECD countries and \$US26,006 in the European Union (EU). Fifteen-year veteran teachers made \$US36,342 in Spain, while OECD and EU teachers earned \$US35,099 and \$US34,684, respectively. The top of the pay scale averaged \$US45,334 (Spain), \$US42,347 (OECD), and \$US41,945 (EU). Thus, average teacher salaries in

Spanish public schools in 2004 exceeded the average in both OECD countries and the EU at all levels. However, this difference diminished with years of experience. When compared with salaries in nearby continental countries, Spanish salaries were generally higher, except at the top of the pay scale, where teachers in Portugal and Germany were paid more.

There are also important differences in remuneration between primary teachers, secondary teachers, and university lecturers in Spain. During the 2002/2003 academic year, beginning primary teachers, secondary teachers, and university lecturers earned \$US22,786, \$US26,444, and \$US22,691, respectively. Thus, the salary of a recently appointed primary teacher was higher than that of a university lecturer and 14 percent less than that of a secondary teacher. However, after 30 years, the three salaries had reached very different levels, with the lowest percentage increase in primary education: \$US32,285 (a 42% increase). Increases in secondary education and university education, especially, were larger: \$US39,379 (49%) in secondary education and \$49,908 (120%) in university education.

Germany

Compared to teachers' salaries in most other OECD countries, teachers' salaries in Germany are relatively high when gross national product per capita is used as a basis of comparison. However, within Germany, teachers' salaries are not entirely competitive with other academic occupations requiring university qualifications and that are outside the public service. Although, in the public system, engineers, lawyers, and doctors are paid according to the same salary scale as teachers, in comparison to academic professions in the private sector, these salaries are relatively low.

Teacher salaries in Germany are based mainly on the type and level of teacher education the teachers have had as well as their age and family status (whether married and number of children). Relatively speaking, Germany offers few adjustments or added allowances to salaries, whereas in some other OECD countries, outstanding performance in teaching or additional training obtained during professional life is taken into account. Other adjustments to the base salary for teachers relate to working conditions and responsibilities. If a teacher teaches more classes or hours than required by a fulltime contract, the base salary is increased. As a result of such stipulations, the difference between teachers' starting salaries and salaries at the top of the scale is relatively small compared to the difference in other European countries.

Carnoy et al. (2009) also draw attention to the ways in which German teacher compensation has not lived up to the country's reputation for highly paid and respected teachers. They point out that

in the early 1990s, teachers appeared to do well, income-wise, relative to scientists, and this was particularly true for male teachers. However, in the second half of the 1990s, the opposite happened, especially for younger teachers. Their relative salaries showed a decline when compared to the salaries of workers in "competing" occupations. (p. 93)

In conclusion, Carnoy and colleagues admit that their data are not current enough to determine if German teacher salaries have remained highly competitive with salaries in mathematics-intensive occupations inside and outside the public sector. As mentioned above, the national report asserts that, in the case of the private sector, they have not.

Switzerland

The cantons set salaries in accordance with the duration of teacher education, the type of school, and years of service. The gross salaries for a fulltime position (including residential allowance, cost of living allowance, loyalty reward, other allowances, and a 13 months' salary) are approximately US\$55,000 to \$69,000 for beginning teachers in primary school, eventually reaching a maximum of \$US83,000 to \$108,000; and \$US61,466 to \$80,887 for beginning lower-secondary teachers, with a later maximum of \$US88,000 to \$123,000. According to Carnoy et al. (2009), the starting salaries of Swiss primary teachers and secondary school teachers in the early 2000s were the highest and second highest, respectively, when compared with the commensurate salaries in all OECD countries.

Efforts to save money in recent years have tended to reduce actual earnings. Also, in some cantons, other factors have been introduced to determine pay levels. School management boards, quality evaluation, and teacher assessments have been discussed as possibilities. The current overall trend has been an increase in the powers of the School Management Board (*Schulleitung*) and special instruments being introduced in order to assess teachers' performance.

Norway

In Norway, salaries are standardized in line with education level and seniority. The number of years spent in teacher education determines the salary scale. Each additional year (or two years) of experience increases the salary by one step, up to 16 years, when the top of the scale is reached. In addition, teachers with special responsibilities or tasks are paid extra. The system also provides some possibilities for local salary negotiation so that teaching as a profession remains competitive on the labor market and schools retain competent teachers. Salary negotiation also provides teachers with incentives to participate in professional development.

In recent years, important changes have been made to teachers' salaries. Twice in the last decade, the government has raised salaries considerably above the usual annual adjustments. In return, the Teachers' Union agreed on having teachers spend more time at school. As a result of the government's initiative, a teacher with five years of teacher education (*lektor*) at the top of the salary scale earns about \$US7,000 more annually than a university lecturer earns.

The IEA report by Carnoy et al. (2009) provides additional information on Norwegian teachers' salaries:

According to the OECD, teacher salaries in Norway are, on average, below teacher salaries in other OECD countries. In 2000, *starting* salaries in compulsory education were somewhat higher than the OECD average. However, the salary at the top of the scale, for teachers who had completed 15 years in the profession, was 10 percent to 25 percent lower than the OECD average The last three to four years have witnessed an increase in teacher salaries in Norway. (p. 129, emphasis original)

However, according to Carnoy and colleagues, the annual incomes of teachers in Norway do not compare favorably with those of other professionals with similar qualifications.

United States

In the United States, salary schedules (where used) are set by individual school districts and vary a great deal from school district to school district and from state to state. In districts with a schedule, the average yearly base salary for a beginning *public* school teacher with a Bachelor's degree in 2003/2004 was \$29,100, while the average salary at the highest step on the schedule was \$53,900. Beginning *private* school teachers with a Bachelor's degree made, on average, \$23,300, while teachers at the highest step earned, on average, \$39,300.

Almost 97 percent of public school districts at the time were offering teachers general medical insurance, and almost 91 percent were providing retirement plans. These figures contrast with the situation in private schools, where only 75 percent were offering medical insurance and 60 percent were offering retirement plans. Other incentives, such as compensation for obtaining advanced certification through the National Board for Professional Teaching Standards (NBPTS) or recruitment bonuses for teachers in hard-to-staff schools or subjects, were infrequent although more common in large, urban districts. A little more than 18 percent of public school districts were offering NBPTS compensation, approximately 5 percent were offering recruitment incentives to teach in less desirable locations, and about 12 percent were offering recruitment incentives in subjects for which teachers were in short supply.

By 2003, in a cohort of university graduates who had been in the workforce for 10 years, all occupational groups except administrative assistants and clerical workers were earning a salary higher than that of K to 12 teachers. Some groups, such as business workers/managers, engineers, computer scientists, medical professionals, and service workers, were earning \$15,000 to \$20,000 more than teachers. Individuals in other occupations, such as researchers/technology workers, human services professionals, legal professionals, and editors/writers, were earning between \$3,800 and \$14,000 more than teachers.

In summing up their analysis of American teachers being paid less than professionals in competing occupations, Carnoy et al. (2009, p. 176) concluded that "if the brighter college students who might consider teaching mathematics or science in middle and high school can also go into industry as a scientist or engineer, the income they have to forego to take up teaching is substantial."

Poland

Poland is a remarkable example of a country where incentives for teachers have substantially increased. Until recently, teachers in Poland were paid low salaries and had low professional status, although these disadvantages were partly offset by substantial privileges such as reduced teaching load, long vacations, and job security. According to the TEDS-M national report, this arrangement represented a "tacit contract" between strong unions representing teachers and the government, wherein little work was demanded, little pay was offered, and the wage distribution was relatively flat.

However, changes to the Teacher Charter between 2000 and 2002 linked teacher salaries to the new professional career levels discussed above. In addition, local governments were given power to increase salaries to levels above those set in the national budget. As a result, teacher salaries increased and became more differentiated. Since 2003, the average teacher salary has been slightly above the average in the national labor market. In addition, unemployment in Poland has been relatively high, making the teaching

profession even more attractive. Nevertheless, graduates in mathematics, unlike the future teachers in other fields, have relatively good job prospects outside teaching, such as information technology or financial services, making teaching somewhat less appealing to this group of particular interest.

Chile

Chile is another country where teachers' salaries have increased substantially since the beginning of the 1990s. At that time, the salaries of teachers in municipal and private subsidized schools were at their lowest point. According to the national report, teachers' salaries are now more than 150 percent higher than they were then. These increases are reported in more detail in Carnoy et al. (2009).

Teachers' salaries in Chile are also higher than in many other parts of Latin America, and also in comparison with certain professions in Chile requiring equivalent educations. As is the case in the United States, Chilean teachers become less competitive as they progress through their careers. Moreover, the OECD (2005) figures indicate that Chilean salaries were, at that time, lower than in most of the 30 countries compared. At an exchange rate of 465 Chilean pesos to one US dollar, Chilean primary or basic level municipal teachers with just over two years of service were earning a yearly basic salary of \$US5,916 on a 30-hour contract and \$US8,676 on a 44-hour contract. Secondary-level teachers were earning a slightly higher basic salary of \$US6,228 on a 30-hour contract and \$US9,132 on a 44-hour contract.

Teachers' salaries in municipal schools are set nationally, based on a legislated salary scale. Increases are funded through subsidies to the municipal authorities from the national government. General labor legislation governs the salaries of teachers working in private schools, but the salaries must comply with the minimum salary for teachers. In general, teachers' salaries in private nonsubsidized schools are higher than those in all other schools.

According to Carnoy et al. (2009), Chile has established a system of salary bonuses for teachers based on school performance on the Education Quality Measurement System (SIMCE) tests. This assessment system is open to both public and private schools. From 1996 to 2000, nearly half of all Chilean schools qualified for these bonuses.

Malaysia

Malaysia is notable for providing special incentives for certain teaching specialties and assignments. Critical subject-matter allowances are given to teachers teaching English, science, mathematics, and technical subjects. Teachers in remote areas receive a hardship allowance. Teachers' quarters being built on the periphery of remote areas provide accommodation and ensure that teachers working in challenging conditions are able to maintain a certain standard of living. Teacher Activity Centers and Resource Centers have also been built to support teachers in various districts. These centers reportedly are well equipped with books and equipment for teachers to use.

Thailand

In Thailand, according to Carnoy et al. (2009), teacher salaries fell between 1996 and 2005, following the Southeast Asian financial crisis of 1997. The authors suggested that "the oversupply of teachers had a severe dampening effect on teacher income in Thailand" (p. 162).

Later, by the time of the TEDS-M country report, a new teacher with a Bachelor's degree was entering the profession on a salary of \$US255 per month, while a teacher with a Master's degree was doing so with a salary of \$US285 per month. In contrast, graduates in such fields as management, engineering, and medical science were earning much more. The TEDS-M country report and the Carnoy report both conclude that this was one reason for the difficulty in attracting the better students to teaching. In addition, according to the national report, teaching is not considered an easy occupation in Thailand, and teachers have many responsibilities in school besides teaching. Nevertheless, teaching in the public sector is seen as offering the advantages of a highly secure profession with possibilities for advancement.

Botswana

Until recently, primary and lower-secondary teachers in Botswana were paid on two different salary scales, with primary school teachers receiving less than their secondary school counterparts. The argument for the differentiated remuneration package was that primary school teachers' training was not as rigorous and extensive as the training experienced by their secondary school counterparts. However, the difference due to duration and type of training has since been rectified; the rationale for scaling secondary school salaries differently from those for individuals holding diplomas in education and teaching in primary schools no longer applies. Teachers' salaries are equivalent to those of other civil servants with comparable qualifications. Carnoy et al. (2009) conclude that teachers in Botswana, and especially women teachers, are well paid relative to other occupations in the country.

For various reasons, the teaching profession in Botswana was once perceived more favorably than it is now, especially in terms of offering additional attractive incentives. According to the national report, there were four reasons for this appeal. First, teachers were respected in the community as the government's ambassadors and spokespersons. Second, the teaching profession was appealing because teachers had (and still have) holidays in the middle and at the end of the year, enabling them to carry out home duties such as plowing while still being employed by the government. Third, every teacher trainee found a job after completing teacher education requirements. In fact, in the past, some prospective teachers got jobs before writing their final examinations. Fourth, teachers' accommodation and amenities, such as water and electricity, were and still are subsidized. Finally, the teaching profession was perhaps deemed attractive in the past simply because it was one of the two careers best known at the time of independence. When Botswana gained its independence from Britain in 1966, only two occupations offered formal training—teaching and police work.

Currently, secondary school teachers in Botswana are still eligible for accommodations and other inducements to make their working conditions palatable. However, due to the huge increase in junior secondary schools and student enrolment, these advantages are not always available to teachers. Consequently, it is not uncommon to find teachers who have no state-provided accommodation or who have to share a house with teachers of opposite gender, an arrangement not acceptable to many Botswanans.

Philippines

The Philippines is another developing country experiencing difficulty recruiting enough competent teachers, because salaries, status, benefits, and working conditions have been generally unfavorable. In 2006, the National Economic Development Authority (NEDA) placed the poverty threshold at \$US156 a month for a family of six. At that time, the salary grade of entering teachers was equivalent to a monthly salary of \$US194, a sum placing them just a little above the poverty threshold.

In 2009, the government moved decisively to deal with low and lagging salaries in the public sector. Steps were taken to align the salaries of government personnel more with those of private sector workers. Among the different groups of government workers, teachers were treated particularly well, receiving the highest proportion of salary increases. Earlier, when Carnoy et al. (2009) compared teachers' salaries with two other occupations in 2001 and 2006, they found that teachers were paid better than a nonscientist occupation requiring university preparation, but less than the scientific occupation that the authors chose for comparison.

Georgia

According to the national report from Georgia, teaching is one of the least desirable professions in the country, with continued erosion of both salaries and the social status of teachers. While teaching was one of the most respected professions in Soviet times, teachers lost esteem when they appeared unable to adapt to the transition the country faced after the collapse of the Soviet Union. The only notable incentive left for teachers is government-provided health insurance.

Teacher Supply and Demand⁶

The balance or imbalance of teacher supply and demand, both in general and with respect to specialist teachers of mathematics, is the result of many factors, particularly those reviewed earlier in this chapter, namely, systems of teacher employment and the resulting opportunities for career advancement, teachers' working conditions, which can range from supportive to very difficult, and teachers' salaries and incentives.

In addition, the selectivity of teacher education (discussed in more depth in Part Two of this volume) is closely related to supply of beginning teachers. Thus, if there is a shortage of would-be teachers, national and institutional decisionmakers may loosen up the criteria governing admission to teacher education and also make it easier for poor or mediocre students to complete their teacher education. In contrast, an oversupply of applicants often leads to tighter admission screening as well as weeding out more students during teacher education.

⁶ This section is based primarily on national reports by K. G. Garegae, T. J. Mzwinila, and T. M. Keitumetse (Botswana); R. Crocker and H. Jodouin (Canada); B. Avalos Davidson (Chile); F.-J. Hsieh, P.-J. Lin, G. Chao, and T.-Y. Wang (Chinese Taipei); N. Mzhavanadze and T. Bokuchava (Georgia); J. König and S. Blömeke (Germany); R. Nagappan, N. Ratnavadivel, O. Lebar, I. Kailani, S. Malakolunthu, and M. Karim (Malaysia); T. Breiteig (Norway); M. Al-Ghafri, A. Al Abri, and M. Al Shidhani (Oman); E. B. Ogena, F. G. Brawner, and M. D. Ibe (Philippines); M. Sitek (Poland); K. Y. Wong, S. K. Lim-Teo, N. H. Lee, K. L. Boey, C. Koh, J. Dindyal, K. M. Teo, and L. P. Cheng (Singapore); E. Castro Martínez and P. Flores Martínez (Spain); S. Brandt, F. Oser, H. Biedermann, M. Kopp, S. Steinmann, S. Krattenmacher, and C. Brühwiler (Switzerland); P. Dechsri and S. Pativisan (Thailand); and P. Youngs and E. Grogan (United States).

Of the 16 TEDS-M countries, none reported severe overall shortages of generalist teachers, but most indicated that their teaching force is out of balance in certain limited respects that vary from country to country. Countries that tend toward balance of supply and demand include Singapore, Canada (but with uneven distribution), Germany (but with some current and additional predicted future shortages), Switzerland (but with scattered shortages), and Chile (but with some shortages). Other countries tend toward oversupply of applicants and graduates qualified to teach but without jobs and, in some cases, overstaffed schools. A few countries acknowledge admitting students to teacher education not to achieve quality teaching and balance in the labor market, but as a way to satisfy the strong social demand for higher education, whereby students can obtain degrees even if the prospects of finding a teaching job are small.

More typical are the countries that in various ways produce enough, or more than enough, generalist teachers for primary school, but are searching for ways to increase the number of well-qualified mathematics specialist teachers for lower-secondary and, in some cases, the upper-primary grades as well. These countries include Oman, Thailand, Malaysia, the Philippines, Norway, and Botswana. Spain reported a surplus of primary teachers but was not able to report on secondary school teachers. Georgia has both oversupply and shortages in certain specific areas. The four federalist countries, Germany, Switzerland, the United States, and Canada, all reported a good deal of variation among their constituent units in their needs for teachers.

The Extent of Balance in the Teacher Labor Market of the TEDS-M Countries

In this section, we start with the countries that tend toward a balance in their teacher labor markets and then continue with those countries whose reports identified situations in which supply and demand are out of balance.

Singapore (balanced)

Most of the new teachers in Singapore join the teaching service as fresh graduates from junior colleges, polytechnics, or universities. However, in recent years, there has been an increase in applications from people making midcareer changes from other professions. In 2007, midcareer teachers made up about 22 percent of the Education Service, compared to 15 percent five years previously. In addition to recruiting local applicants, the Ministry of Education also selectively recruits experienced and trained teachers from outside the country. Currently, the ministry employs about 400 foreign teachers. Initially, these teachers receive a contract of one to three years' duration. In general, taking all factors into account, there are a sufficient number of suitably trained mathematics teachers in Singapore at both primary and secondary levels.

In order to supply teachers of high promise, the ministry sets stringent requirements for entry to the profession. Singapore recruits teachers from the top third of each age cohort. At present, about 70 percent of the primary school teachers and 90 percent of the secondary school teachers recruited have university degrees. The remaining applicants have good diploma and A-level qualifications. As more of Singapore's diploma graduates obtain degrees, and with the university enrolment rate projected to increase to 40 percent by 2020, the ministry is moving toward an all-graduate teaching force.

To maintain this balance of supply and demand, the Ministry of Education determines the number of future teachers to send to the National Institute of Education for training

and the program-types in which they should be enrolled. This estimate is based on the projected number of teacher vacancies, computed on the basis of many factors, including future student enrolments in the schools (derived from demographic data), projected teacher resignations and retirements, projected additional teachers required to implement various new initiatives (such as reducing class size at the lower-primary levels, reducing administrative load for teachers, and covering for teachers who are on professional development or personal leave).

Germany (balanced, with limited exceptions)

Although the demand for teachers in the western states of Germany increased a good deal at the end of the 20th century, there was a sufficient number of qualified teachers in the job market to meet this demand because of the continued effect of a huge oversupply in the 1980s. Although there has been no shortage of teachers for years in Germany, a study of the future demand for teachers in the country predicted that, from the 10 years starting in 2007, the demand would increase considerably (Standing Conference of the Ministers of Education and Cultural Affairs, 2003). However, the increase was expected to be limited by pressures in the opposite direction—declining birthrates in the eastern states after reunification and reductions in the duration of schooling from 13 to 12 years in several states. Overall, though, according to the national TEDS-M report, it will not be possible to meet the demand, due to the large number of expected retirements at a time when not enough students are likely to choose a teaching career.

This development will not affect all types of teachers. There will probably be a sufficient number of primary teachers as well as teachers for most subjects at the lower- and upper-secondary levels of the gymnasia. However, a significant demand for teachers is expected for gymnasium teachers in specific subjects such as physics, mathematics, and Latin as well as in nongymnasium secondary teaching subjects more generally. In these areas, the study predicts that the demand for teaching staff will probably not exceed 60 percent of capacity.

Supply of mathematics teachers at the secondary level depends, to a large extent, on the labor market for mathematicians in general. When, in a booming economy, the demand for mathematics proficiency is strong, applications to teacher education go down. But in an economic downturn, more mathematically proficient students apply for teacher education. When faced with shortages, the regional states implement special recruitment measures that include the following:

- Putting in place advertising campaigns for entry to the second-phase institution and offering employment to those who complete this phase;
- Providing additional training possibilities for individuals who can teach the needed subject-matter;
- Making access to the second-phase institutions easier;
- Increasing the geographical mobility of teachers; and
- Recruiting higher education graduates who do not have formal teacher training.

Traditionally, entry to teacher education has been very open in Germany. Most German universities have never been able to select their own students and therefore have not had their own entry examinations. Every student who successfully passes the high-school exit examination (*Abitur*) has had the right to enroll at university, and courts have gone to great lengths to protect this right to a free choice of career. Only when the supply of applications significantly exceeds the number of places available several

years in succession—and this usually applies only to universities in big cities—have universities been allowed to reject applicants. However, under a new law, universities can decide to select up to 60 percent of their student body using additional criteria, not just a pass on the *Abitur*.

As students move through teacher education, a striking difference emerges with respect to the number of students entering the first phase of teacher education and the number who pass the first state examination. This dropout rate nearly always takes place during the first university phase of teacher education and is not the result of failure on the first state examination. The success rate of candidates taking the first state examination is almost 100 percent.

Switzerland (balanced, with limited exceptions)

Although teacher supply and demand in the majority of cantons was balanced during the 2005/2006 school year in Switzerland, there were substantial imbalances at certain school levels and in certain subjects. No shortages were reported at the primary level in any canton, with the exception of one canton, which reported shortages at kindergarten level. Insufficiencies were reported in schools/classes with special curricula. They were also reported at the lower-secondary level in school types with a basic curriculum, and somewhat less for school types with extended curricula. A few cantons had teacher surpluses at the remaining school levels. In general, all cantons reported shortages in lower-secondary mathematics and natural science and, to a lesser degree, in the language and music-handicrafts subjects. At the preschool and primary levels, there was neither a significant subject-related insufficiency nor a corresponding surplus.

The outlook for the future, however, is less sanguine. According to a 2004 study, the teaching profession lost much of its appeal over the preceding 10 years, even though schools and teachers were generally still held in high regard, at least in the German-speaking areas. The proportion of parents who said they would encourage their son or daughter to enter the teaching profession decreased by 23 percent for sons and 19 percent for daughters.

United States (balanced, with limited exceptions)

In the United States, shortages of primary school teachers have been rare, given that large numbers of elementary-teacher candidates graduate each year from university-based teacher preparation programs. To a large extent, it is the institutions and the programs themselves that decide how many students to admit, but if they are not proactive in this respect, admission is largely uncontrolled and available to all students with minimal qualifications who wish to obtain a teaching qualification.

Also, when a state or school districts within a state face teacher shortages in particular areas (e.g., secondary mathematics, secondary science, special education, bilingual education), state agencies or district personnel typically work with universities and other organizations to add new programs or program-types and/or to increase the supply of newly qualified teachers in other ways. States facing teacher shortages also tend to ease up on requirements for entry into the profession (e.g., setting passing scores lower on licensure tests).

Within universities, the total supply of places for teacher education students is based on a wide range of factors, depending on the institution. Many universities, especially less selective public and private institutions, have viewed teacher preparation as an important source of income and attempt to maximize the number of places available for teacher candidates, increasing supply without regard for demand. In contrast, many selective universities and liberal arts colleges either do not offer teacher preparation at all or

provide only a limited number of places. Other limiting factors that affect both selective and less selective institutions include availability of enough qualified instructors to offer required courses, availability of enough field experience placements, and interest in or demand for teacher education on the part of students and their parents.

In the large number of alternative routes that exist outside universities and colleges in the United States, the availability of places for teaching candidates usually depends on a similar set of factors—degree of interest on the part of candidates, availability of qualified instructors, and availability of student teaching or fulltime teaching placements.

The hiring of new teachers in the United States is big business. In 2003/2004, approximately 19 percent of United States public school teachers were newly hired. Again, as is the case in other countries, shortages of secondary mathematics teachers (as well as secondary science teachers, special education teachers, and bilingual education teachers) are common in many school districts. Before 2005/2006, many lower-secondary mathematics teachers in the United States were not even certified to teach mathematics. Ingersoll (1999) reported that approximately one third of all secondary school teachers who were teaching mathematics did not have a major or minor in mathematics, mathematics education, or experience/qualifications in related disciplines. Possible explanations for the high percentage of teachers teaching “out of field” included shortcomings in teacher preparation and the influence of teacher unions in negotiating labor contracts, as well as teacher shortages. Ingersoll (2008) concluded that principals’ decisions regarding teaching assignments also contributed to this situation.

One reason for shortages in teaching fields requiring exceptional skills and knowledge has to do with the attitudes of teachers, young people, and the public in general toward teaching. These attitudes have not been stable over the past two decades. For example, in a 1994 survey conducted by Anderson and Carroll, of all “career-oriented” graduates, K to 12 teachers were the least likely to agree that their current job had career potential (56% of teachers compared to 61% of all career-oriented majors). However, by 2003, teachers were the most likely career-oriented graduates to consider their current work a career.

Yet, despite this changing degree of commitment to their career, teachers in 2003 expressed less satisfaction than average (across all career groups) when it came to pay, benefits, and opportunities for promotion. While mean satisfaction with pay across occupations was 66 percent, only 55 percent of teachers were satisfied in this respect. Mean satisfaction with benefits in all groups was 75 percent, compared to 63 percent for teachers. However, teachers were more satisfied with their job security than were individuals in other occupations: 86 percent were satisfied, compared with the mean of 81 percent.

Canada (balanced, but with uneven distribution)

Most Canadian jurisdictions are experiencing declining school enrolments, but the teaching force has remained relatively stable over the past decade. Recently, however, the situation began to change with the many teachers reaching retirement age. Given that education is under provincial jurisdiction, the labor market for teachers has generally not been a matter for national study. Even the broad picture—declining school enrolments but increased supply of teachers—varies significantly across Canadian jurisdictions. The impression from provincial studies is that there is neither a general shortage nor a surplus of teachers, but instead an uneven distribution, especially of teachers specialized in mathematics and science or of those willing to teach in rural or remote regions of the country where staffing remains a challenge.

More precise information on teacher supply and demand can be obtained from a look at the situation of each of the four Canadian provinces that participated in TEDS-M.

- *Nova Scotia*: Nova Scotia is one Canadian jurisdiction in which high-profile government-commissioned external reviews have had an impact on teacher education. The most recent review, completed in 2008, addressed both the structure of program-types and labor market issues. The major labor market concern was the continued oversupply of teachers, despite policies adopted after the previous review. The oversupply was attributed to continuing substantial demand for places. Many students have had to move to other jurisdictions to complete their teacher education, encouraged by arrangements negotiated between Nova Scotia universities and institutions outside the province. These students then return to Nova Scotia seeking certification. As a consequence, a recent Nova Scotia study of teacher supply and demand predicted that supply will exceed demand by a ratio of close to 3:1 until 2014, with approximately 1,000 teachers entering the system per year and only about 360 leaving (Nova Scotia Department of Education, 2007).
- *Québec*: According to a report published by Québec's Ministry of Education, Leisure, and Sport (2004), a short-term deficit was reported for mathematics and science teachers in the French-language schools. The report predicted that declining enrolments would lead to a major surplus of teachers in all disciplines by 2013.
- *Ontario*: The most recent work on teacher supply and demand for Ontario came out of a consultation held by the Ontario College of Teachers in 2001. The college reported that teacher shortages would likely continue in specific geographic regions, areas of specialization, and leadership positions (Ontario College of Teachers, 2001).
- *Newfoundland and Labrador*: The most recent study in Newfoundland and Labrador was completed by Dibbon and Sheppard (2001). At that time, the number of teacher education graduates exceeded the number of positions for new teachers by more than three to one. At the same time, the supply of teachers in the specialized areas of mathematics and science was low, and remote communities were having difficulty recruiting teachers.

Chile (balanced, with limited exceptions)

In Chile, according to a study on supply and demand for teachers (Montoya, 2005), basic school teachers were slightly insufficient in number to cover the needs as assessed in 2004, but this shortfall was expected to gradually diminish due to lower birth rates in the country. Most of the teacher shortages were in rural areas and certain other regions of the country. Secondary education had more teachers than needed, but not in all specialties. The sciences had major shortages.

However, in recent years, the supply of teachers has been increasing for almost every school level, especially for secondary education, where the authors of the country report expected considerable oversupply by 2010. But they also anticipated that this oversupply would diminish if other scenarios were adopted, one being a reduction in class size.

One problem that could affect teacher supply and demand, if addressed, is the current use of generalists throughout the entire eight-year span of the basic school. This situation especially affects teachers' knowledge of subjects such as mathematics and science. The 2003 IEA Trends in International Mathematics and Science Study (TIMSS) teacher questionnaire noted that only half of Chilean Grade 8 teachers were confident

about teaching topics in algebra and measurement, and only a third felt confident about teaching geometry and statistics. Teachers who do feel confident are generally those who have a mathematics specialization and are qualified to teach in secondary schools. However, many of these teachers opt to teach Grades 7 and 8 in private schools. A change to more mathematics specialization in government schools would change the prospects for balancing supply and demand.

Chinese Taipei (oversupply)

In recent years, Chinese Taipei's economy has been in recession and the decreasing number of births has resulted in fewer school-age students and a lower demand for teachers. To prevent an imbalance between supply and demand, the Ministry of Education decided to decrease the number of admissions to the normal universities or universities of education each year, starting from 2004. This intervention forced the institutions to develop more selective policies and procedures. Thus, there is now more competition among applicants, not only because of reduced demand for new teachers but also because of the benefits and advantages of becoming a teacher.

The majority of students planning to teach secondary mathematics are from mathematics majors or science fields. In 2008, of the Taiwanese graduating class preparing to teach secondary school mathematics, 87 percent were mathematics majors and 4 percent were science majors. In contrast, at the primary level, future teachers are trained to teach a variety of subjects. These students come from a variety of majors and so are more variable in terms of their ability to do let alone teach mathematics.

The increased selectivity in admission to teacher education was necessary because, compared to other jobs, teaching is still a very attractive career in Chinese Taipei in terms of income, working hours, career development opportunities, and the like. Therefore, according to the national report, many undergraduates and graduates still dream of becoming a teacher. But even after completing teacher education, these individuals can find securing a teaching position very difficult. With an oversupply of teachers, they face much competition, especially since they must go through a screening and selection process that is held not only for preservice teachers but also for all the practicing teachers who want to change schools.

During the whole process of screening and selection for 2007, for example, the success rate of the elementary teachers was estimated to be only 3.9 percent of all applicants, and that of junior high mathematics teachers 15 percent. Although available data make it difficult to calculate the proportion of newly qualified teachers who get jobs, the TEDS-M national center has provided what it termed rough estimates. In 2007, about 18 percent of those preservice teachers who were credentialed obtained an official teaching job, and another 18 percent of them became substitute teachers, while others became reserve or what the public calls "wandering" teachers.

Poland (some oversupply)

Demographic trends in Poland have put strong pressure on the demand for and supply of educational services. Until recently, Poland had one of the highest birth rates in Europe. However, over the last decade, this rate has steadily declined. The effect has already been felt in the decreasing school-age population. For example, in the 7 to 12 age range (the typical age range for primary school students), the total number of students declined from 3.8 million in 1995 to only 2.4 million in 2007.

Due to these demographic trends and plentiful teacher education, there is generally no shortage of teachers in Poland. In integrated early education (Grades 1 to 3), there is actually a surplus: although 109,500 teachers were teaching at that level in September 2007, 42,000 more were qualified to teach these grades. For higher grade levels in mathematics, there was just a slight surplus of 5,000 qualified teachers without jobs.

Spain (oversupply at the primary level)

Spain has many schools of primary teacher education, as well as faculties of education that also prepare primary teachers. Every year, the number of students who graduate from these institutions is higher than the number of teachers required by the private and public sectors. This situation means there is an oversupply of candidates relative to the number of teaching positions in primary schools. A position in a state primary educational institution is attractive in regions where there are few professional-level jobs, but less attractive in industrial areas.

To enroll in primary teacher education in a system where the number of applicants is greater than university places available, applicants must have a baccalaureate degree representing successful completion of upper-secondary school. They must also take a university entrance examination. The grade obtained by the students who pass this test, set at between 5 and 10, is used to decide the order in which applicants are admitted to the different programs offered by Spanish universities. Each student chooses several programs in which he or she wishes to enroll and lists them in order of preference. The university publishes the lists of students admitted to each degree course, arranging them according to the grades obtained in the university entrance examination.

Oman (oversupply of generalists, but lack of qualified mathematics specialists)

Higher education institutions working with the Ministry of Education and other parties (private schools, Ministry of Defense) are responsible for admitting students to teacher education in Oman. Together, these agencies determine their needs for teachers with different specialties. They also take account of available facilities and the intake capacity of the colleges. The Ministry of Education also develops five-year plans of the nation's need for teachers.

Oman is an example of an education system that has developed very rapidly in recent decades and where, therefore, in earlier years, there was a huge demand for teachers that had to be filled. But more recently, the system reached a saturation point with respect to the number of primary school teaching positions. There is thus a surplus of Omani Cycle 1 teachers (Grades 1 to 4). In response to this surplus, the government has stopped, for the time being, all preparation of primary school teachers.

Yet, in the lower- and upper-secondary schools, there is still a great need for mathematics teachers (Cycle 2 schools, Grades 5 to 10 and post-basic education schools, Grades 11 to 12). Although this need initially led to recruitment of teachers of mathematics from other Arab countries, the Ministry of Education has more recently begun to accelerate "Omanization" of the teaching force. On the supply side, there was also a need to increase employment opportunities for holders of a Bachelor of Science degree in mathematics from the College of Science, due to the fact that the existing openings in teaching had already been filled by the first batches of B.Sc. graduates, resulting in decreased employment chances for these graduates over time.

Another factor mentioned in the national report as a reason for offering the Professional Educational Diploma at the university is the great interest that women have shown in

teaching, given the advantages and privileges that teaching provides, such as working in schools for girls where co-education does not exist.

In response to these labor market conditions, Oman reconsidered the roles of the university colleges. In 2004/2005, the country stopped admitting students to study teacher education in five of these colleges. Only one college of education is therefore producing teachers today.

Thailand (oversupply of generalists, but lack of qualified mathematics specialists)

According to Thailand's TEDS-M national report, Thailand has many primary school teachers, but not enough specialist mathematics teachers in secondary schools. This situation is due, in part, to Thailand's success over several decades in lowering its birth rate through family planning practices. As a result, fewer children are starting school. Teacher production, however, has remained the same, leading to an oversupply of teachers.

The oversupply of elementary school teachers in Thailand has also been the result of too many public and private teacher training institutions, especially the Rajabhat group of universities. This problem was exacerbated by the universities' lack of coherent policies and collaborative planning, making it difficult to assess both the expected number and the quality of graduates. The situation began to be remedied 15 years ago when most teacher colleges were transformed into the Rajabhat group of universities or institutes offering much more than just teacher education. Today, universities in the Rajabhat group offer a variety of both Bachelor's and Master's degrees.

The shortage of lower-secondary school mathematics teachers is the result of a number of other factors. First, students who perform well in school mathematics are reluctant to teach school. They normally prefer more elite professions such as medicine, engineering, mass media, and architecture. In contrast, students who are less successful in secondary school typically turn to teachers' colleges when they are unable to enter their preferred programs. Teachers' colleges cater to these second-choice students by setting their application deadlines much later than those of the more selective universities.

Malaysia (no shortage of generalists, but lack of qualified mathematics specialists)

With improvement in the status and working conditions of Malaysian teachers, the teaching profession has been in great demand among school graduates who would like to make teaching their lifetime career. Teaching has thus been attracting students with high academic qualifications. The number of open teaching positions, as determined by the Ministry of Education, has been increasing each year as student enrolments continue to grow at each level of education—preschool, primary, and secondary.

However, although many school graduates want to enter teacher education, finding teachers who can provide effective teaching and learning of mathematics in secondary schools is a perennial problem. The preference is for mathematics teachers to have a university degree with relevant specialization, either a Bachelor of Education (Mathematics) or a degree in mathematics with a certificate or diploma in education.

In principle, all teachers are required to have a professional qualification. However, if trained teachers are not available, schools employ temporary teachers. To teach in a lower-secondary school, these temporary teachers must have a degree in mathematics or at least have gained an A-level pass in mathematics at the end of secondary school. Normally, these teachers are guided and supervised by the head of department or a senior mathematics teacher. Cross-appointment in primary and secondary schools is

not practiced, and temporary teachers are ordinarily not engaged to teach examination classes, such as Form 3 (Grade 9) or Form 5 (Grade 11).

Philippines (no shortage of generalists, but lack of qualified mathematics specialists)

A college or university education is highly valued by Filipino families. Education has been one way to meet this expectation because nearly every college and university offers teacher preparation. Moreover, many of these nearly 600 institutions are located relatively close to families living in the provinces.

Teacher education is also widely accessible because academic standards of entrance to teacher education are low compared to those in engineering, business, dentistry, and medical technology. Teacher education generally attracts students of less ability. Mathematically inclined high school graduates typically decide to study toward a Bachelor of Science program in mathematics, statistics, or engineering.

The accessibility of teacher education institutions and low tuition costs have made it convenient to enter the field, especially for individuals who do not possess the financial resources to otherwise complete university. Teacher education students generally come from economically disadvantaged families. Data on entering students for school year 2007/2008 at a premier teacher training institution showed that 65 percent of students were from Metro Manila and came from families with an average monthly income of \$US222. Central Philippines institutions reported an average family monthly income of about \$US116, and southern institutions an average family income of roughly \$US133 (Center for Research and Development in Education, Philippine Normal University, 2008).

One special factor affecting supply and demand for teachers in the Philippines, and more so than in most countries, is emigration. The demand for teachers in Western countries, especially the United States, has diminished the stock of leaders in mathematics and science education in the Philippines. Over the last 10 years, financial incentives have seen faculty members in teacher education institutions with specialization in mathematics and science taking up positions in other countries. And those who go abroad for employment as teachers are mostly those with Master's and doctoral degrees. Thus, the teachers lost to the Philippines are drawn from faculty members in the teacher education institutions or from among the most reputable practicing teachers in the public and private schools.

Norway (supply weak in mathematics)

Until 2013, qualified graduate teachers in Norway were authorized to teach mathematics from Grades 1 to 10, even if they took little mathematics during teacher preparation. Many of these generalists have indeed had much experience in teaching mathematics, but 40 percent either had no mathematics study during their teacher education or just a short course of about 25 to 30 hours of coursework on teaching methods in mathematics. Of the teachers of mathematics in the primary school grades, only 14 percent had taken 60 credits of mathematics or more—the lowest percentage for any school subject. A white paper in 2009, however, signaled the need for an increased emphasis on teachers' subject-matter knowledge. Henceforth, in order to be employed as a mathematics teacher at the lower-secondary level, teachers will need at least 60 credits in mathematics. A primary teacher will need at least 30 credits.

In 2007 and 2008, the number of primary applicants to general teacher education was slightly over 3,000 each year or 1.3 for each available place. In 2009, this number

increased, possibly because of the international financial crisis. In any case, these are averages that cover up differences from institution to institution. Small and/or rural institutions have experienced much less competition for admission than have the bigger and/or urban institutions. Sometimes they have experienced no competition at all. As a consequence, weak students do enroll, and that subsequently increases the number of dropouts.

Although the number of openings for students in teacher education was, until recently, decided by the ministry, the institutions are now more autonomous. Today, each institution decides on the number of students to admit. Institutions are being paid for the number of students graduating within limits set by the ministry. Because of this system, no institution can afford to take the number of students for granted. In 2007 and 2008, teacher education switched to open admissions: all applicants meeting the requirements could enroll. To keep enrolments from falling and to increase the supply of teachers, many providers have created special external but locally-based education programs as well as distance ones.

Teacher education students may begin their education at a time when the market for teachers appears good and jobs plentiful, but by the time they finish, the situation may have changed. Some will look for other jobs or other ways to use their education. At such times, educated teachers often take up jobs in other areas of society. Also, teachers in upper-secondary schools in Norway are, on average, relatively old, and many Norwegian teachers retire before they are 67 (the conventional age of retirement), even though the current education authorities want to keep teachers longer in school. In short, the rate of retirement is expected to accelerate in the next 10 years, fueling a growing concern in Norway about whether it will be possible to replace this highly qualified workforce with new teachers of similar quality.

Botswana (supply weak in mathematics)

Botswana is another one of the TEDS-M countries concerned about the tendency of mathematics teacher education program-types to attract weaker students. According to the national report, those who do not qualify for the general Bachelor of Science program-type in mathematics often apply to the Bachelor of Education. And even after enrolling in the latter program-type, students who do well tend to transfer to other program-types with more lucrative future employment opportunities. Students who remain in the program-type tend to be weak and more often than not have to repeat courses many times. This all creates concern about the quality of future mathematics teaching in the country.

Georgia (lack of data)

In Georgia, there are no clear statistics on teacher supply for specific levels of general school. However, supply and demand are known to be out of balance in certain respects. In the post-Communist transition, the number of teachers remaining at a particular school has not changed, regardless of the demand for them. Recent statistics suggest that the average number of students per teacher can be exceptionally small, because although the number of students has gradually decreased, the number of teachers has stayed the same. Nevertheless, in some cases, and mostly in rural areas where there has been a lack of teachers in a certain subject area, teachers are forced to teach subjects that differ from those that they were trained to teach.

A worse problem of supply and demand is predicted for the future. Implementation of the Master's degree requirement for secondary teachers, according to the national report, will eventually result in a drastic shortage of teachers at the secondary level. The same report considered teaching salaries to be too low to be competitive in attracting individuals with this higher qualification. Because there is no state subsidy to help pay the cost of studying under Master's program-types, students have to cover their own tuition fees. The degrees cost at least \$US1,100 per term, an amount which students would be unable or unwilling to spend, given such low teacher salaries.

Conclusion

When a student chooses to prepare to teach, this choice is not just a function of abilities and interests developed in the student's earlier experience. It is also the choice of a future career, which in many respects the student can plausibly predict based on what teaching is like at the present time. This chapter has examined teaching in general and the teaching of mathematics in particular from this perspective in order to illustrate the importance that knowledge of teacher careers, positions, labor markets, and working conditions contribute to our understanding of teacher education.

This chapter has also raised and discussed several key questions:

1. What is the employment status of teachers and how are they hired?
2. What is the nature of the working conditions and the challenges new teachers will find on the job?
3. How good are the salary prospects and other incentives offered to teachers?
4. What sort of labor market awaits the future teacher at graduation?
5. How well is the supply and demand for teachers in general and mathematics teachers in particular met and in balance?

These factors and considerations will certainly change over time, but the choices of the TEDS-M target population (future teachers in the last year of their teacher education) are necessarily based in large part on what they can infer about the future from what they know of the present. Likewise, although policymakers and leaders of teacher education may commission studies of the future, their views on what is needed for teacher education are very much rooted in what they see happening in teacher education at the current time. Thus, an analysis of these factors, as evident at present, and despite all the uncertainties, is still the main source of knowledge about the choices and challenges that will face teacher education systems and students.

References

- Anderson, S., & Carroll, C. D. (2008). *Teacher career choices: Timing of teacher careers among 1992–1993 Bachelor's degree recipients*. Washington, DC: National Center for Education Statistics, United States Department of Education.
- Carnoy, M., Brodziak, I., Luschei, T., Beteille, T., & Loyalka, P. (2009). *Teacher Education and Development Study in Mathematics (TEDS-M): Do countries paying teachers higher relative salaries have higher student mathematics achievements?* Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement (IEA).
- Cortes, J. (1993). *Explorations in the theory and practices of Philippine education 1965–1993*. Quezon City, the Philippines: Claretian Communication, Inc.

- Dibbon, D., & Sheppard, B. (2001). *Teacher demand, supply and retention in Newfoundland and Labrador*. St. John's, NL: Memorial University of Newfoundland.
- Center for Research and Development in Education, Philippine Normal University. (2008). *Profile of PNU College freshmen, school year 2007–2008*. Manila, the Philippines: Author.
- Ingersoll, R. M. (1999). The problem of underqualified teachers in American secondary schools. *Educational Researcher*, 28(2), 26–37.
- Ingersoll, R. M. (2008). *Misdiagnosing the teacher quality problem*. Paper presented at the Center for Research in Education Opportunity Conference on Understanding Teacher Effects on Educational Outcomes. South Bend, IN: University of Notre Dame.
- Loeb, S., Darling-Hammond, L., & Luczak, J. (2005). How teaching conditions predict teacher turnover in California schools. *Peabody Journal of Education*, 80(3), 44–70.
- Microdatos, University of Chile. (2006). *Encuesta Longitudinal de Docentes. Primera versión: Informe final* [Longitudinal survey of teachers. First version: Final report]. Santiago, Chile: Author.
- Montoya, A. M. (2005). *Estudio de oferta y demanda de docentes en Chile: Proyección 2004–2015. Informe final* [Study of supply and demand for teachers in Chile: Projections 2004–2015. Final report]. Santiago, Chile: CPEIP.
- Nova Scotia Department of Education. (2007). *Nova Scotia public education teacher supply and demand: 2007 update report*. Halifax, NS: Author.
- Ogena, E., & Brawner, F. (Eds.). (1998). *Science education in the Philippines: Challenges for development*. Manila, the Philippines: U-P Center for Integrated Development Studies.
- Ontario College of Teachers. (2001). *Teacher supply and demand: Report on the consultation*. Toronto, ON: Author.
- Organisation for Economic Co-operation and Development (OECD). (2005). *Teachers matter: Attracting, developing and retaining effective teachers*. Paris, France: Author.
- Organisation for Economic Cooperation and Development (OECD). (2006). *Education at a glance*. Paris, France: Author.
- Province of Québec Ministry of Education, Leisure, and Sport. (2004). *Surplus ou pénurie de personnel enseignant qualifié au Québec : situation actuelle et perspectives à court et moyen terme pour le secteur francophone* [Surplus or shortage of qualified teachers in Québec: Current situation and prospects in the short- and medium-term for the French sector]. Québec City, QC: Author. Retrieved from http://www.mels.gouv.qc.ca/DFTPS/interieur/PDF/pers_emploi_previson_nov04.pdf
- Senate Committee on Education, Arts, and Culture. (2000). *A profile of the Filipino teacher: A project undertaken by the Senate Committee on Education, Arts, and Culture*. Manila, the Philippines: Author.
- Standing Conference of the Ministers of Education and Cultural Affairs of the Länder in the Federal Republic of Germany (KMK). (2003). *Lehrereinstellungsbedarf und -angebot in der Bundesrepublik Deutschland: Modellrechnung 2002–2015* [Teacher recruitment, demand, and supply in the Federal Republic of Germany: Model statements for 2002–2015] (Statistical Publications of the Standing Conference, Document No. 169). Retrieved from <http://www.kmk.org/statist/dok169.pdf>
- World Bank. (2006). *Where is the wealth of nations? Measuring capital for the 21st century*. Washington, DC: World Bank.

Part Two

Quality Assurance in Teacher Education: A Study of 17 Countries

Part Two of this volume focuses on policies related to assuring the quality of initial teacher education, with particular reference to the preparation of teachers of mathematics. It begins with a brief introduction to this part of the publication (Chapter 5) and a review of relevant recent research (Chapter 6). It then documents the quality-assurance arrangements operating in the 17 countries that participated in the IEA TEDS-M study. The particular arrangements considered concern:

- The recruitment and selection of students entering teacher education programs (Chapter 7);
- The assessment and accreditation of teacher education programs (Chapter 8); and
- The certification of graduates as ready to enter the teaching profession (Chapter 9).

Part Two concludes (Chapter 10) with a summary account of these arrangements and reports on a recent (preliminary) study exploring the relationship between quality-assurance arrangements and the quality of teacher education graduates.

CHAPTER 5:

THE RELEVANCE OF QUALITY ASSURANCE OF TEACHER EDUCATION WITHIN THE CONTEXT OF TEDS-M

Lawrence Ingvarson

International interest in policies that promote teacher quality has increased markedly in recent years (OECD, 2005). With mounting evidence that the most important in-school influence on student achievement is teachers' knowledge and skill (see, for example, Hanushek, 2004; Hattie, 2008) policymakers have been paying closer attention to strategies that will recruit, prepare, and retain the best possible teachers.

Part Two of this volume focuses on policies related to assuring the quality of initial teacher education, with special reference to the preparation of teachers of mathematics. It documents the quality-assurance arrangements operating in the 17 countries participating in the IEA TEDS-M study. The particular arrangements considered concern:

- The recruitment and selection of students entering teacher education programs;
- The assessment and accreditation of teacher education programs; and
- The certification of graduates as ready to enter the teaching profession.

TEDS-M grew in part out of an interest in exploring why student achievement in mathematics in international studies such as the IEA TIMSS studies varied from country to country. In TIMSS 2003, for example, the average scale scores for Grade 8 students in countries such as Singapore and Chinese Taipei was about one standard deviation above the international mean. Average scale scores for the Russian Federation and the United States were slightly above the international mean and more than one standard deviation below for Botswana, Chile, and the Philippines.

Each country mentioned in the previous paragraph participated in TEDS-M. This part of our report examines whether this variation in student achievement across countries is related to differences in their teacher education systems, particularly policies for assuring the quality of future teachers of mathematics and the teacher education programs that prepare them.

The key research question addressed in this part of the report concerns the relationship between the strength of quality-assurance arrangements and the quality of graduates from teacher education programs. More specifically, it investigates whether countries with stronger quality-assurance arrangements produce graduate teachers who do better on tests of mathematical knowledge and mathematical pedagogy knowledge. The findings reported here from TEDS-M indicate that they do.

The primary sources of data for Part Two were the country reports prepared by each participating country, following guideline questions provided by the TEDS-M research team. (For a list of country reports and their authors, see pages 19–20 of this volume.) These reports described the national policies, institutions, and practices for assuring the quality of teachers and teacher education.¹

¹ Condensed copies of these reports will be found in the forthcoming TEDS-M encyclopedia. Writers of these reports followed guidelines provided by the TEDS-M research team. These procedures are described in detail in the TEDS-M technical report (also forthcoming).

Key Terms Used in Part Two

Many countries now have a government agency responsible for auditing the academic quality of their higher education institutions. The National Center of Public Accreditation in the Russian Federation (NCPA), the Swiss Center of Accreditation and Quality Assurance in Higher Education, and the Office for National Education Standards and Quality Assessment in Thailand are examples. The NCPA in Russia, for example, was

established to be the national quality assurance agency in higher education, with responsibility for public accreditation at the program and institutional levels, assisting in quality enhancement, advising on quality assurance, and serving as the liaison with quality agencies worldwide, for the benefit of Russian higher education. (NCPA, 2012)

Several transnational agencies have also been established in recent years. The Asia-Pacific Quality Network and the European Association for Quality Assurance in Higher Education (ENQA) are examples. ENQA's role is

to contribute significantly to the maintenance and enhancement of the quality of European higher education at a high level, and to act as a major driving force for the development of quality assurance across all the Bologna signatory countries. (ENQA, n. d.)

These agencies typically focus on quality-assurance systems at the institutional level. In addition, some countries also have agencies with more specific responsibilities for regulating the quality of professional preparation programs and the competence of their graduates. These agencies are well established in professional fields such as medicine and engineering. They are also of special interest in this report. National or state governments may establish these agencies as statutory authorities or they may, in some countries, be set up by professional bodies. In some countries, these agencies are known as "accreditation" agencies. Their function is to assess whether a professional preparation course, program, or institution meets specified standards and to approve those that do.

Accreditation is an endorsement by an external quality-assurance agency that a *program* is producing graduates who are competent to begin practice and who meet standards for initial or provisional license. Accreditation agencies may be set up by governments (e.g., the General Teaching Council in Scotland), or by the professional bodies themselves, or by not-for-profit private bodies (e.g., the National Council for Accreditation of Teacher Education in the United States). They may operate at the national level or at the state/province level. They are usually responsible also for providing a license to beginning teachers who graduate from accredited professional programs.

Certification is an endorsement that a *person* has attained the standards necessary to gain full entry to a profession. *Licensing* and *registration* are other commonly used terms. This endorsement may be given by a government agency (e.g., a statutory authority) or a professional body, often the same agency that is responsible for accreditation of teacher education programs. To avoid confusion, we use the term certification throughout this report. However, TEDS-M encouraged each country to use the term that described a teacher who had attained a level of knowledge and professional performance necessary to gain full entry to the teaching profession in that country.

The guidelines for authors of the country reports made a distinction between standards for gaining a teacher education *qualification* and standards for gaining a *certification* to teach. Whereas a teacher education provider, such as a university, usually determines whether an individual has met its academic qualification standards and graduated, another agency, such as a government employing authority or a professional standards body, may determine whether to grant a license to teach.

In some countries, gaining a university qualification leads automatically to gaining a license from a professional standards agency and eligibility to be employed as a teacher in schools. In others, national or state authorities may require graduates of teacher education programs to meet additional criteria, such as tests of subject-matter knowledge, thesis completion, or successful completion of a period of induction or probationary teaching in schools.

Structure of Part Two

The next chapter in Part Two, Chapter 6, provides a review of related research on quality assurance in teacher education and its relation to teacher quality. The following three chapters provide information about quality-assurance policies and practices in TEDS-M countries.

More particularly, Chapter 7 focuses on *recruitment* and *selection* and considers these questions:

- Who decides, and how, which students gain entry to teacher education programs?
- What policies and agencies are in place to monitor and assure the quality of entrants to teacher education?
- What are the standards or requirements to be eligible to enter programs for preparing teachers of mathematics?
- How do the academic standards of entrants to teacher education compare with standards for entry to most other university or professional preparation programs?

The focus of Chapter 8 is on *accreditation of teacher education institutions*. The questions considered here are:

- Who decides, and how, which institutions are allowed to train teachers?
- What policies and agencies are in place to monitor and assure the quality of teacher education institutions and programs?
- What procedures are used in assessing and accrediting the quality of teacher education institutions or programs?
- What requirements are laid down for the curriculum, school experience, and staffing in teacher education institutions and programs?

Chapter 9, *entry to the teaching profession*, poses and considers these questions:

- Who decides, and how, which students have met the requirements for full entry to the profession?
- What policies and agencies are in place to monitor and assure that graduates are competent and qualified to gain certification and full entry to the profession?

Each country deals with the implications of these questions in its own way. Some countries have specific policies to ensure that teaching presents an attractive career option in comparison with other professions. Some have national agencies with responsibility for selecting entrants to teacher education programs. Others leave the selection to individual universities and other teacher education providers.

Chapter 10 brings these findings together and summarizes arrangements for assuring the quality of teacher education programs in the countries participating in TEDS-M. It reports on a preliminary investigation into relationships between quality-assurance arrangements and the quality of graduates from teacher education programs showing a strong positive correlation between these two factors.

References

European Association for Quality Assurance in Higher Education (ENQA). (n. d.). *ENQA in a nutshell*. Brussels, Belgium: Author. Retrieved from www.enqa.eu/profile.lasso

Hanushek, E. A. (2004). *Some simple analytics of school quality* (Working Paper No 10229). Cambridge, MA: National Bureau of Economic Research.

Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. London, UK: Routledge.

National Center of Public Accreditation (NCPA). (2012). *Official website of the NCPA*. Retrieved from <http://www.nica.ru>

Organisation for Economic Co-operation and Development (OECD). (2005). *Teachers matter: Attracting, developing and retaining effective teachers*. Paris, France: Author.

CHAPTER 6:

RECENT RESEARCH ON QUALITY ASSURANCE IN TEACHER EDUCATION

Lawrence Ingvarson

This chapter provides brief summaries of research studies and reviews that have focused on teacher quality and quality assurance in teacher education. These studies generally aim to provide guidance to policymakers about the most effective approaches to ensuring a high-quality teaching workforce. Although most of the studies focus on teacher education, in general, their findings also apply to the preparation of teachers who will teach mathematics in primary and secondary schools.

Review of Research on Quality Assurance in Teacher Education

Teachers Matter: Attracting, Developing, and Retaining Effective Teachers

Teachers Matter (OECD, 2005) is one of the most thorough examinations of policies related to teacher quality in recent years, particularly policies related to quality assurance. The report is based on detailed country background reports, visits to some countries by external review teams, data collections, commissioned research, and workshops. Twenty-five countries participated. The study reflects growing acceptance of the evidence that student learning in schools depends more than anything else on what the students' teachers know and can do. At the same time, it reflects increasing concern about teacher quality and the capacity of the profession to maintain and improve its status and quality.

The report draws attention to broad concerns about the supply of talented teachers in many countries, particularly in mathematics and science. It also draws attention to the concern in many countries that arrangements for assessing and accrediting teacher education institutions and programs are weak and have little impact on the quality of teacher education. The authors argue that accreditation criteria should focus more on the outcomes of teacher education programs (which is an area where TEDS-M has the potential to make a contribution) and standards that describe what beginning teachers should know and be able to do as a result of their training. In related vein, the report documents the growing trend for countries to introduce policies requiring the certification of new teachers, in addition to them completing their teacher education programs, before they can gain full entry to the profession. Governments are increasingly using teacher certification based on professional standards as a policy lever to influence teacher education programs and align them more closely with the needs of schools.

The conceptual framework for the OECD study matches closely the main sections in this second part of this volume. It identifies policy initiatives to promote teacher quality in the following areas: attracting, recruiting, and selecting suitable teachers; developing and accrediting effective teacher-preparation programs; and providing effective induction programs and ensuring graduate teachers have attained standards of competency before they gain full entry to the profession. The OECD report will be drawn on in more detail in each of the following chapters.

Quality Assurance in Teacher Education in Europe

In 2004, the European Commission asked the research organization Eurydice to carry out a study on regulations for evaluating teacher education in European countries. Quality control in education was becoming an important issue at that time on the political agenda of the European Commission in light of the Lisbon and Bologna processes. The report of that study, *Quality Assurance in Teacher Education in Europe* (Eurydice, 2006), provides a comprehensive summary of procedures for evaluating and accrediting initial and inservice teacher education in the mid-2000s. The European Commission was interested in developing suitable indicators for measuring improvement in the education of teachers as part of a more general objective of enhancing the quality and effectiveness of education and training systems in Europe by 2010.

The purpose of the Eurydice survey was descriptive: it mapped the processes for evaluating and accrediting institutions and programs for initial and inservice teacher education in each country (p. 7). It showed the main characteristic structures of quality-assurance systems in place without embarking upon a detailed analysis of particular aspects of such systems. No attempt was made to examine relationships between quality-assurance processes and the quality of teacher education, or the outcomes of teacher education programs.

Of the 30 countries considered in the Eurydice report, most (24) had only general regulations for evaluating all higher education institutions in 2004. Most did not have specific evaluation systems geared to teacher education institutions or programs. In six countries, evaluation of teacher education was governed by both general and specific regulations. The specific regulations usually applied to a particular stage of initial teacher education, such as the final phase of professional training, or a particular part of it in the consecutive model, or the induction phase. In regard to Germany, for example, the report noted that specific regulations applied solely to the evaluation of the second, “on-the-job” qualifying (induction) phase of teacher education, which, unlike the first phase, is organized by the teacher training institutes (*Studienseminare*). The situation is similar in France where, besides general regulations, specific regulations apply to the evaluation of training provided by the university institutes for teacher education (*Institut universitaire de formation des maîtres* or IUFMs).

The Eurydice report revealed a complex and diverse picture of the different external quality-assurance systems. It identified the different types of people who may act as external evaluators of initial primary or general teacher education, such as peers, experts in evaluation, inspectors with a teaching background, inspectors with an administrative background, and student and foreign experts.

The report also identified the variety of official documents that may be recommended or required as the basis for external evaluation criteria, such as general legislation on higher education, regulations or guidelines on initial teacher education, qualification standards for future teachers, and a list of evaluation criteria or specific national indicators, such as educator/student ratios and student performance.

The Eurydice study found that the scope of external evaluations encompass a wide variety of features, including the results of internal evaluations, the content of the curriculum for teacher education, teaching methods (i.e., how the content of that curriculum is taught), and assessment practices. They may also consider the balance between professional training and general education, the management of school placements for teaching practice, potential partnerships with schools, and the general human resources

management of institutions (e.g., the qualifications required by teacher educators or the nature and content of their continuing professional development). Other features evaluated in some countries include the teacher educator–student ratio, student performance, the attitudes and motivation of students, their opinions on the education they receive, and the general infrastructure of institutions (including libraries, ICT facilities and laboratories, and the like).

The Eurydice study also mapped the procedures used in external evaluations. It stated that these are normally based on a site visit and on an internal evaluation report. Site visits might include interviews or surveys with management and academic and administrative staff as well as with students. Observations directly linked to student teachers being taught might also be included.

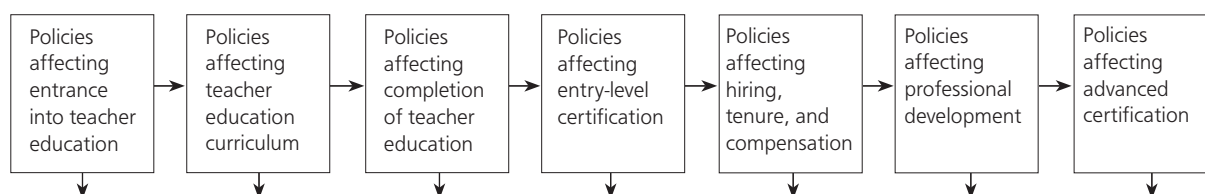
The Eurydice study was useful to TEDS-M in terms of setting out the main characteristics and features of quality-assurance systems. Since 2006, when the study was conducted, events in higher education in Europe have moved rapidly. A more recent Eurydice report, *Higher Education in Europe 2009: Developments in the Bologna Process* (Eurydice, 2009), documents these developments. It focuses on topics related to the emerging European Higher Education Area (EHEA), in particular the new Bachelor’s–Master’s degree structure.

Preparing Teachers Around the World

This study of teacher education was conducted by a team of researchers from the Educational Testing Service (ETS) in the United States (Wang, Coleman, Coley, & Phelps, 2003). It arose from concerns about the performance of the United States relative to other countries on international studies of student achievement, such as IEA’s Trends in Mathematics and Science Study (TIMSS) of 1999. ETS’s report, *Preparing Teachers Around the World*, explored whether there might be a relationship between the policies countries were using to shape the quality of the teaching force and student performance on TIMSS 1999. The ETS researchers gathered data from seven countries (Australia, England, Hong Kong SAR, Japan, Korea, the Netherlands, and Singapore) that had performed relatively well in the TIMSS study when compared with the United States.

In examining the quality-assurance arrangements, the ETS researchers used the idea of “filters” that control quality along a teacher “pipeline,” as illustrated in Exhibit 6.1 taken from that study. The researchers found substantial differences across countries, particularly in relation to where in the pipeline they placed special emphasis on quality control and filtered out unsuitable applicants or teachers. Exhibit 6.2 shows eight pressure points or filters along the pipeline. A “high-stakes” filter requires a candidate to satisfy a certain criterion or be prevented from continuing. An example of a high-stakes filter would be the requirement that a candidate attain a high score in a subject-matter test for entry to a teacher education program.

Exhibit 6.1: Policy model of the teacher-supply pipeline



Source: Reproduced from Wang et al. (2003, p. 14)

The main finding was that high-performing countries were more likely than the United States to “front load” their quality-assurance requirements, that is, place emphasis on selection into teacher education. They also used more filters, and more high-stakes filters, as shown in Exhibit 6.2. Some, such as Japan, also “back-load” their quality-assurance requirements, which means that new teachers have to successfully complete rigorous induction programs before their teaching position becomes a permanent one. Most countries have centralized regulatory systems that can “standardize” teacher education; the United States and Australia were the only countries in this study that had decentralized systems. Only England and the United States require a licensure examination in addition to the examinations given by the teacher education institution.

Exhibit 6.2, taken from the ETS report, shows that Korea and Japan, for example, have a large number (four) of high-stakes filters along the selection, teacher education, and development pipeline. The United States and Australia have only one each (the asterisks indicate that practices may vary across states in these countries). Teachers in Korea can attain salaries that are more than 2.5 times the starting salary, but only after meeting stringent hiring criteria and providing evidence of professional development. The filters contribute to outcomes such as the fact that over 90 percent of Grade 8 students in countries such as Korea and Japan have teachers who majored in mathematics in their university studies, compared with 61 percent in the United States.

Exhibit 6.2: Filters used along the teacher education and development pipeline

	Entry to teacher education program	Evaluation of practical experience requirement	Exit from teacher education program	Certification	Hiring	Evaluation of induction period	Evaluation of professional development	Evaluation of probation period (for tenure)
Australia*	○	○	●	○	○	○	○	○
England	○	●	○	●	○	○	○	○
Hong Kong SAR	○	○	○	○	○	○	○	○
Japan	●	●	○	○	○	○	○	○
Korea	●	○	●	○	●	○	○	○
Netherlands	●	●	○	○	○	○	○	○
Singapore	●	○	●	○	○	○	○	○
United States*	○	○	○	●	○	○	○	○

● High-stakes ○ Medium-stakes ○ Low- or no-stakes

Source: Reproduced with minor modifications from Wang et al. (2003, p. 7).

A valuable feature of the ETS study is its ability to draw attention to quality assurance arrangements in teacher education and certification as a set of interrelated practices and policies. It does not treat them in isolation, but covers the total sequence from recruitment and selection to ongoing professional development. This approach can be helpful, therefore, in making more reliable generalizations about the extent to which a country’s policies focus on teacher quality and the rigor of quality-assurance arrangements within a country.

As the authors of the report point out, the findings of this study should be treated with caution, especially as links between TIMSS data about student achievement and the various filters are attenuated. The number of countries is also small and selective, while the process of gathering data by means of surveys completed by one or two key informants in each country raises questions about the study's reliability. Studies such as one by Wilson and Youngs (2005) indicate that standards and arrangements in the United States for certification and entry to teaching vary significantly across the 50 states.

There is also room for alternative explanations about the ETS findings. Teaching is a very attractive career choice for abler secondary school and university graduates in countries such as Singapore and Korea, not only in terms of salary but also in terms of working conditions. It is possible, therefore, that the presence of strong filters in countries such as Singapore is the result of the fact that teaching is a high-status profession in that country rather than a cause of high-quality entrants to the profession.

What is missing from the ETS study, in its focus on filters, is an estimate of the extent to which a country has policies to ensure the status and the attractiveness of teaching as a career. Filters, in themselves, will have little effect on quality if governments have not created a strong demand for individuals to join the profession in the first place. Singapore and Korea are good examples of countries that have invested heavily in education since World War Two, particularly in terms of offering attractive salaries and working conditions for teachers. Teacher salaries in Korea and Singapore are among the highest in the world.¹ The evidence indicates that these policies have created a strong incentive among abler graduates in those countries to join the teaching profession.

The ETS study is useful in providing an example of how to conceptualize the main components of a policy system for assuring the quality of the teaching workforce. The authors describe their study as an “exploratory analysis or development of indicators about the teacher education and certification policies in a selected group of countries. It is not an evaluation of these policies, or an analysis that attempts to relate the policies to other aspects of the education system, such as student achievement” (p. 14).

The study is also useful in providing an example of a rubric for classifying the various filters as high (dense), medium, or low (porous) stakes and measuring the relative strength of quality-assurance systems. The ETS rubric was adapted and used in TEDS-M. This was an important first step in developing reliable indicators that might later be useful in testing hypotheses about relationships between, for example, teacher education policies at the national level and characteristics of teacher education graduates, which is one of the aspirations of TEDS-M.

The ETS study relied on data from TIMSS 1999 in order to explore relationships between the quality-assurance arrangements and outcomes. As mentioned, the relationship is rather tenuous. For example, the students tested may have had teachers who were trained before these arrangements were in place. In contrast, TEDS-M offered the possibility of examining the relationship between quality-assurance mechanisms, such as selection, accreditation, and licensing, and more direct measures of outcomes of teacher education programs, such as mathematics content knowledge and teacher preparedness—and with a much larger group of countries.

1 The 2004 OECD report, *Education at a Glance*, showed that salaries for primary and secondary teachers in Korea rise to 2.77 times the starting salary (\$US75,000). The corresponding figures for the United States at that time were 1.77 and \$52,000.

How the World's Best-Performing School Systems Come Out on Top

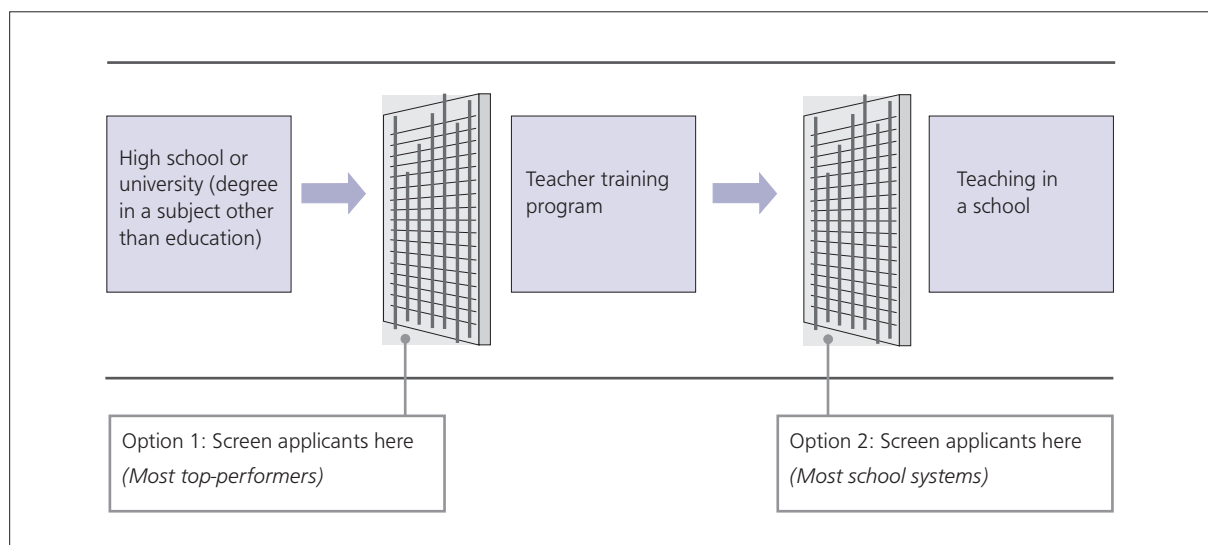
This study from McKinsey & Company (Barber & Mourshed, 2007) is similar in several ways to the ETS study, although the authors were not as reluctant as the authors of the ETS study to make causal claims about the characteristics of high-performing school systems. Their report, *How the World's Best Performing School Systems Come Out on Top*, also explored relationships between teacher-quality policies and student outcomes, this time relying on PISA (Programme for International Student Achievement) measures of student achievement. The authors drew on data from a small number of the best-performing countries and the most rapidly improving countries on PISA, so their findings should be treated cautiously. As with the ETS study, the McKinsey study is correlational and open to alternative, or deeper, analyses of the underlying reasons for the relative success of some countries in international testing programs. Also, the authors provided fewer details about how they collected and analyzed their data.

The central argument of the McKinsey report is that the main driver behind the variation in student learning at school is the quality of the teacher. But what are the main determinants of teacher quality? Barber and Mourshed pay particular attention to two teacher quality-assurance measures—recruitment and selection, and the attractiveness of teaching as measured by starting salaries for teachers as a percentage of gross domestic product (GDP) per capita. They do not examine the nature of teacher education programs, nor procedures for their assessment. They point out that “The top-performing school systems we studied recruit their teachers from the top third of each cohort that graduate from their school systems; the top 5 percent in Korea, the top 10 percent in Finland, the top 30 percent in Singapore” (p. 16).

All countries would, of course, like to be in this position. However, countries such as these are not necessarily among the top countries in terms of educational expenditure per student. Funding priorities, such as average class size, vary significantly across countries. The McKinsey report identifies two options for selecting teachers, as shown in Exhibit 6.3, which taken from that report. The first is evident in countries such as Singapore that focus on high entry standards and limiting training to those who are selected. The second is evident in countries, such as the United States, which have more open entry policies and which delay assessment until teachers have graduated from training programs. These options differ significantly in terms of recruitment and funding implications.

Top-performing countries in PISA tend to use the first option. Countries such as Germany, the United States, and Australia traditionally prefer the second option and more open entry policies. In Germany, a 1973 Supreme Court decision protects the right of every individual to enter training for whatever profession he or she chooses. This policy can, however, lead to significantly higher teacher education costs. A study conducted in Australia, for example, showed that less than 50 percent of teacher education students gained employment as teachers (Committee for the Review of Teaching and Teacher Education, 2003). In contrast, Exhibit 6.4, taken from the McKinsey report, shows that almost all students in Singapore who gain training places become teachers. (The Singapore TEDS-M national research coordinator pointed out that this situation is based on an historically strong link between the Ministry of Education as the employer and the sole teacher education institute as the training agency.)

Exhibit 6.3: Options for selecting (screening) applicants to teacher education programs



Source: Reproduced from Barber and Mourshed (2007, p. 18).

Barber and Mourshed (2007) claim that strict entry standards do more than just cut down on costs:

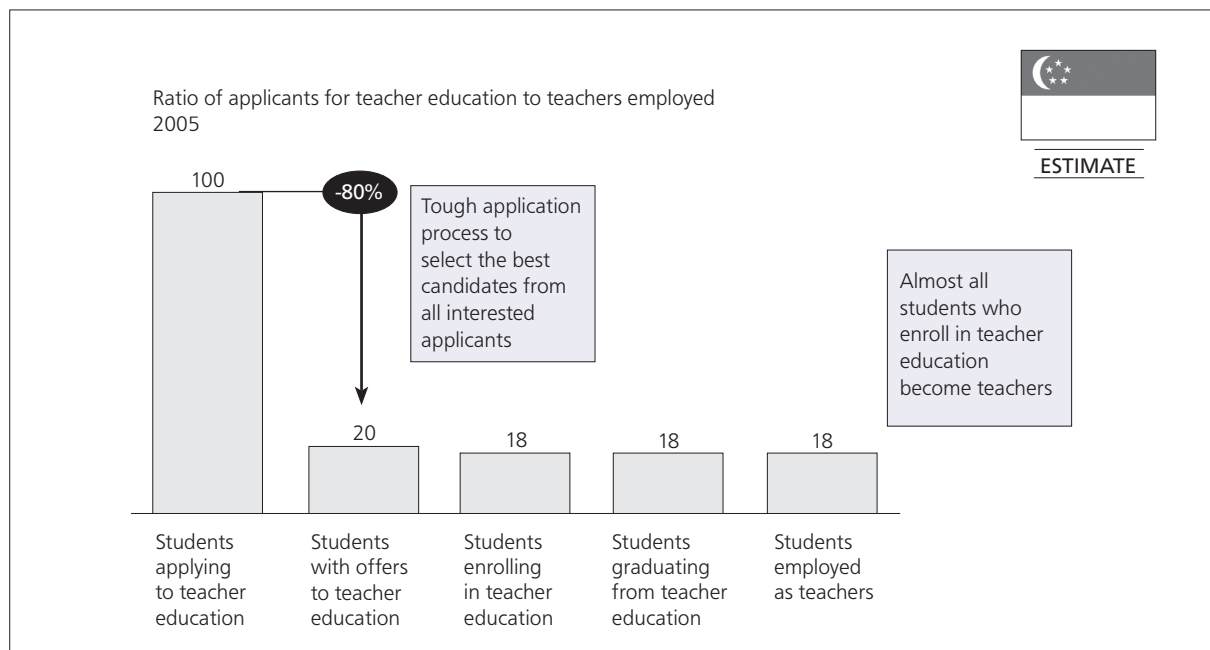
Failing to control entry into teacher training almost invariably leads to an oversupply of candidates which, in turn, has a significant negative effect on teacher quality. ... In such conditions, teacher training becomes an option for students who have few other options available to them. ... As the quality of the people on the courses begins to drop, so does the quality of the courses themselves ... (p. 18)

While this claim is plausible, the McKinsey report does not appear to be sufficiently based on systematic data collection and analysis procedures to provide back-up for such claims. The first part of the claim does not seem to apply to countries such as Germany, which is facing a severe shortage of teachers in several fields, notably as science and mathematics, despite unrestricted access to teacher education.² As the authors admit, their report is based on “qualitative insights” into what high-performing school systems have in common. They give little attention to the nature and quality of teacher training across countries or the impact, relative to the impact of selection processes, that it might have on the quality of teachers who ultimately enter the teaching profession. No data are collected that would shed light on the variation between countries in how they prepare their teachers. How, for example, are Japanese teachers prepared to work in a system that values collaborative lesson study by groups of teachers, a system widely respected for its influence on professional learning?

While it is a credible hypothesis that the academic quality of people selected into teacher education has an important influence on their effectiveness as teachers, as measured, for example, in PISA, the McKinsey study, like the ETS study, does not enable other explanations to be compared or ruled out. In addition, as an outcome measure, PISA scores are only distantly related to selection procedures at the point of entry into teacher education. The same applies to TIMSS.

² However, it should be kept in mind that the German *Abitur* examination sets a relatively high hurdle. Students who pass the *Abitur* are in the top 30 percent of students in their age cohort.

Exhibit 6.4: Recruitment into teaching in Singapore



Source: Reproduced from Barber and Mourshed. (2007, p. 18).

A Comparative Study of Teacher Preparation and Qualifications in Six Nations

This study by Ingersoll et al. (2007) examined the preparation and qualifications of primary and secondary teachers in China, Hong Kong SAR, Japan, Korea, Singapore, Thailand, and the United States. Its purposes were similar to the ETS study in that its intention was to inform policy debate within the United States about how to improve teacher quality. At the time of the study, some US commentators were arguing that entry and training requirements for teacher education needed to be more rigorous. Others were arguing the opposite—that entry and training requirements were already too restrictive and tended to discourage many academically able applicants and “career changers” from choosing teaching as a career. Not only were they ineffective, these critics argued, there was little evidence that training and licensing requirements added value to teacher quality (Finn, Kanstoroom, & Petrilli, 1999; Hanushek & Rivkin, 2004).

Meanwhile, several studies had shown that teacher education in mathematics (as measured by a university major in mathematics or in mathematics education) consistently related (the relationship was statistically significant and positive) to students’ mathematics proficiency (Greenberg, Rhodes, Ye, & Stancavage, 2004; Raudenbush, Fotiu, & Cheong, 1999). Others were showing links between training in mathematics-specific pedagogy (“mathematical knowledge for teaching”) and student learning (Hill, Rowan, & Ball, 2005; Ma, 1999). Still others found that training made a difference to teacher beliefs about mathematics and their ability to encourage deeper mathematical reasoning in students (Bishop, Clements, Keitel, Kilpatrick, & Leung, 2003; Stacey, 2008).

When addressing these issues, Ingersoll asked these questions:

- How well are other education systems succeeding in ensuring all students are taught by qualified teachers?
- How could this study help us understand where problems may lie during effort to meet these needs?

Unlike the researchers responsible for the ETS and McKinsey studies, Ingersoll and colleagues did not aim to explore links between teacher qualifications, teacher quality, and student achievement. Rather, they wanted “to compare how each system itself defines teacher qualifications and standards and then to address the question: how well are the different educational systems succeeding in ensuring all students are taught by qualified teachers?” (Ingersoll, 2007, p. 4).

More specifically, Ingersoll and colleagues in the six countries and one autonomous region gathered data pertaining to three sets of specific questions:

1. What are the preparation requirements and standards to become a teacher?
2. What are the levels of qualifications of the current teaching force?
3. What proportions of teachers are not qualified in the subjects they teach?

The researchers distinguished between prior educational requirements and professional training requirements for entry into teacher education. They found little variation in the educational qualifications or professional qualifications required across the seven countries. They also found just slight variation in length of training, with China, Hong Kong SAR, and Singapore (diploma students only) requiring no more than four years of training for future primary teachers.

However, in line with the findings of the ETS and McKinsey studies, Ingersoll and colleagues found considerable variation in the strength of demand for teacher education places and in the attractiveness of careers in teaching, and hence the relative quality of applicants. While almost all countries required teachers, at the time of the study, to hold regular teaching certificates or licenses, Ingersoll’s study does not tell us how rigorous the requirements were to obtain a license in each one; whether, for example, some kind of performance assessment or test was required.

An interesting point about the United States data was the relatively high proportion of teachers holding Master’s degrees or higher. Most contracts in the United States include extra pay for higher education credits, providing incentives for further study. However, research indicates that this practice does not appear to be having an impact on student achievement or, thereby, its standing on international tests of student achievement (Prince, Koppich, Azar, Bhatt, & Witham, n. d.).

One area where Ingersoll and his colleagues did suggest the possibility of dramatic differences across countries was in the extent to which teachers were teaching outside their field (or fields) of teaching, that is, the field in which they were educated and trained. Ingersoll reported this problem as severe in the United States. Therefore, an alternative possible explanation for the variation in the United States’ relative standing on international tests is not that teachers are unqualified as teachers; it may be related more to the fact that the subjects tested, such as mathematics, are being taught by teachers who qualified in subject areas other than those being tested.

Like the Ingersoll study, TEDS-M gathered data about quality-assurance arrangements related to selection, training, and certification, but it did not gather data beyond this point, such as that relating to ongoing professional learning requirements or out-of-field teaching. It is important to keep this in mind when engaging in discussions about the outcomes of TEDS-M and international tests of student achievement. The Ingersoll study also brings home the important point that there is no point lifting entry requirements for teacher education places without lifting teachers’ salaries and working conditions to levels commensurate to those of professions competing for similar graduates.

International Comparative Study in Mathematics Teacher Training

This study was conducted by the Centre for Innovation in Mathematics Teaching (CIMT), based at the University of Plymouth in England, by David Burghes (2008; see also Burghes & Geach, 2009). Amongst other work, the centre conducts long-term studies on the factors that influence good practice in mathematics teaching and learning in secondary schools. Burghes and his team examined the training of teachers of mathematics in primary and secondary schools in countries with a good track record in international studies.

The first stage of the study reviewed the structure of teacher education in 10 countries, two of which, Singapore and the Russian Federation, also participated in TEDS-M. Burghes's first report provided useful summaries of the structure and characteristics of teacher education in each country.

There are many similarities between TEDS-M and the CIMT study, given that Burghes and his team went on to track about 200 trainee primary and secondary teachers in their last year of training, assessing their mathematics knowledge and gathering data by means of diary entries, questionnaires, and video evidence of teaching practices.³ Unlike TEDS-M, however, the researchers did not gather representative national data about the mathematics knowledge, or pedagogical mathematics knowledge of graduates from teacher education programs.

No Common Denominator: The Preparation of Elementary Teachers in Mathematics by America's Teacher Education Schools

Unlike most of the studies reported so far, this study was confined to teacher education programs in just one country—the United States. It was conducted by the National Council on Teacher Quality (Greenberg & Walsh, 2008). The study directors developed a set of standards for what they considered to be high-quality teacher education programs and applied these to programs in a sample of 77 education schools (tertiary institutions) located in most states. Schools were selected for the study; they did not volunteer. No information was provided about the representativeness of the sample, however. The study focused on the content of courses that future primary teachers are required to study. The researchers looked at 257 courses syllabuses and required textbooks. Despite the study's limitations, it is useful in terms of documenting the wide variation in teacher education practices in the United States, particularly the proportion of courses within programs that focus on teaching primary teachers the mathematics they will be expected to teach, and how to teach it.

Other Studies on Quality Assurance

This section concludes with a brief mention of some other international studies that have examined the relationship between quality-assurance arrangements and student achievement. Akiba, LeTendre, and Scribner (2007) used Grade 8 mathematics-assessment data from TIMSS 2003 to explore the relationship between teacher quality and the "achievement gap" in 46 countries. Teacher quality was measured by a composite index that included the percentage of students taught by teachers with full certification in mathematics and mathematics education. The achievement gap was the difference in the mean mathematics score between students from high-socioeconomic backgrounds and students from low-socioeconomic backgrounds.

³ Burghes and Geach (2009) subsequently provided recommendations for initial teacher education.

The study found that the higher-achieving countries had a higher percentage of students taught by teachers who had met their country's criteria for full certification as mathematics teachers. Like the Ingersoll study mentioned above, this study is a useful reminder that variation in student achievement in international studies (within and between countries) may have more to do with the percentage of teachers teaching out of their certification field than with the nature and quality of the teacher education system.

Kang and Hong (2008) picked up on a point made by Akiba et al. (2007) that it would be interesting to study countries such as South Korea which have a high percentage of students taught by qualified teachers as well as students who have equality of access to qualified teachers no matter whether they (the students) are from high-socioeconomic or low-socioeconomic backgrounds. Kang and Hong claimed that South Korea's success in studies such as TIMSS 2003, in comparison to the situation in countries such as the United States, is a product of the respect accorded to the teaching profession in Korea, the working conditions in that country (nearly half the number of face-to-face teaching hours per year), and the relatively high salaries for teachers.

Mention should also be made here of major reviews of research in teacher education, particularly those that have examined research on the relationship between quality-assurance arrangements, such as accreditation, and the quality of graduates from teacher education programs. In 2001, Wilson, Floden, and Ferrini-Mundy produced a report reviewing United States' research on teacher education, which included an examination of research on the effects of accreditation. Stephens (2003) reviewed regulations concerning the entry of mathematics teachers into the profession across countries.

Several handbooks of research on teacher education have been recently published in the United States, each containing chapters reviewing research on recruitment, selection, accreditation, and certification. The latest, the *Handbook of Research on Teacher Education: Enduring Questions in Changing Contexts*, is the third edition (2008), and was edited by Marilyn Cochran-Smith, Sharon Feiman-Nemser, and D. John McIntyre.

In 2005, the American Educational Research Association Panel on Research and Teacher Education published a report titled *Studying Teacher Education*. Edited by Marilyn Cochran-Smith and Ken Zeichner, the volume contains several chapters relevant to TEDS-M, even though both are restricted to research conducted in the United States. Two chapters by Karen Zumwalt provide extensive reviews of the demographic profile of students going into teaching and their academic characteristics. A chapter by Suzanne Wilson and Peter Youngs focuses on research related to accountability processes in teacher education, such as certification and accreditation. Because there is considerable variation from state to state in how consistently these processes are applied, Wilson and Youngs found it difficult to reach definitive conclusions on the effects of certification and accreditation. However, they did find that most studies focused on mathematics showed a positive correlation between certification as a mathematics teacher and student achievement.

Wilson and Youngs furthermore found little empirical research on the impact of accreditation. Despite there being few reliable measures of impact, the authors noted a trend toward developing standards-based measures of beginning teacher knowledge and performance. The authors gave, as an example, the Performance Assessment for

California Teachers (PACT) being developed at that time for a new licensing scheme in that state. The authors hoped that such measures would provide more reliable benchmarks against which to judge the quality of teacher education programs in the future. In this regard, the measures of pedagogical content knowledge for teaching mathematics developed for TEDS-M are potentially useful for outcomes-based accreditation schemes.

Conclusion

TEDS-M grew out of an interest in exploring how variation in student achievement in mathematics in international studies such as the IEA TIMSS surveys might be explained. Although not tested directly in TEDS-M, an obvious hypothesis is that variation in student achievement is due, in part, to the different ways in which teachers of mathematics are selected, trained, and inducted into the teaching profession; certainly, this was one of the main focuses of TEDS-M.

However, the ways in which teachers are selected and trained is, in turn, shaped by traditions and policies at the state and/or national levels. The next three chapters in this volume describe the nature of these shaping forces in each of the 17 countries that participated in TEDS-M, in a way that recognizes their uniqueness, but also provides a basis for making some general comparisons across countries about quality-assurance arrangements.

To accomplish this aim, it is necessary to find appropriate and economical ways to summarize and classify quality-assurance systems. The review of related research in this present chapter was conducted in part to determine how other researchers have tackled the task of conceptualizing or classifying systems for assuring quality. One of the most helpful approaches to doing this was provided by the ETS study (Wang et al., 2004), with its concept of the teacher education and development “pipeline.” As explained above, the pipeline has different filters or pressure points along its length, the aim of which is to assure the quality of new teachers and promote their professional development. Wang and colleagues were able to use this approach to develop a reasonably robust profile against which they could compare the relative strength of quality-assurance arrangements in each country that featured in their study.

References

- Akiba, M., LeTendre, G., & Scribner, J. (2007). Teacher quality, opportunity gap and national achievement in 46 countries. *Educational Researcher*, 36(7), 369–387.
- Barber, M., & Mourshed, M. (2007). *How the best performing school systems come out on top*. New York, NY: McKinsey & Company.
- Bishop, A. J., Clements, M. A., Keitel, C., Kilpatrick, J., & Leung, F. K. S. (Eds.). (2003). *Second international handbook of mathematics education*. Dordrecht, the Netherlands: Kluwer Academic Publishers.
- Burghes, D. (2008). *International comparative study in mathematics teacher training*. Reading, UK: CfBT Education Trust, University of Plymouth, UK.
- Burghes, D., & Geach, R. (2009). *International comparative study in mathematics teacher training: Recommendations for initial teacher training*. Reading, UK: CfBT Education Trust, University of Plymouth, UK.
- Cochran-Smith, M., Feiman-Nemser, S., & McIntyre, D. J. (Eds.). (2008). *Handbook of research on teacher education: Enduring questions in changing contexts* (3rd ed.). New York, NY: Routledge.

- Cochran-Smith, M., & Zeichner, K. (Eds.). (2005). *Studying teacher education: The report of the AERA Panel on Research and Teacher Education*. Washington, DC: American Educational Research Association.
- Committee for the Review of Teaching and Teacher Education. (2003). *Australia's teachers: Australia's future*. Canberra, ACT: Commonwealth of Australia.
- Eurydice. (2006). *Quality assurance in teacher education in Europe*. Brussels, Belgium: European Commission.
- Eurydice. (2009). *Higher education in Europe: Developments in the Bologna process*. Brussels, Belgium: European Commission.
- Finn, C., Kanstoroom, M., & Petrilli, M. (1999). *The quest for better teachers: Grading the states*. Washington, DC: Thomas B. Fordham Foundation.
- Greenberg, E., Rhodes, D., Ye, X., & Stancavage, F. (2004). *Prepared to teach: Teacher preparation and student achievement in eighth-grade mathematics*. Paper presented at the annual meeting of the American Educational Research Association, San Diego, California, April 12–16, 2004.
- Greenberg, J., & Walsh, K. (2008). *No common denominator: The preparation of elementary teachers in mathematics by America's education schools*. Washington, DC: National Council on Teacher Quality.
- Hanushek, E., & Rivkin, S. (2004). How to improve the supply of high quality teachers. In D. Ravitch (Ed.), *Brookings papers on education policy* (pp. 7–44). Washington, DC: Brookings Institution.
- Hill, H. C., Rowan, B., & Ball, D. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal*, 42(2), 371–406.
- Ingersoll, R. (2007). *A comparative study of teacher preparation and qualifications in six nations*. (CPRE Policy Brief RB 47). Philadelphia, PA: University of Pennsylvania, Consortium for Policy Research in Education.
- Ingersoll, R., Boonyananta, S., Fujita, H., Gang, D., Kim, E. G., Lai, K. C., ... Wong, A. F. L. (2007). *A comparative study of teacher preparation and qualifications in six nations*. Philadelphia, PA: Consortium for Policy Research in Education.
- Kang, N. H., & Hong, M. (2008). Achieving excellence in teacher workforce and equity in learning opportunities in South Korea. *Educational Researcher*, 37(4), 200–207.
- Ma, L. (1999). *Knowing and teaching elementary mathematics: Teachers' understanding of fundamental mathematics in China and the United States of America*. Hillsdale, NJ: Erlbaum.
- Organisation for Economic Co-operation and Development (OECD). (2004). *Education at a glance*. Paris, France: Author.
- Organisation for Economic Co-operation and Development (OECD). (2005). *Teachers matter: Attracting, developing and retaining effective teachers*. Paris, France: Author.
- Prince, C. D., Koppich, J., Azar, T. M., Bhatt, M., & Witham, P. J. (n. d.). *What do we know about the relationship between student achievement and teachers' educational attainment and experience, which is the traditional way that teacher salaries are determined?* Center for Educator Compensation Reform Research Synthesis. Retrieved from http://cecr.ed.gov/guides/researchSyntheses/Research%20Synthesis_Q%20A2.pdf
- Raudenbush, S., Fotiu, R., & Cheong, Y. (1999). Synthesizing results from the trial state assessment. *Journal of Educational and Behavioral Statistics*, 24(4), 413–438.
- Stacey, K. (2008). Mathematics for secondary teaching: Four components of discipline knowledge for a changing teacher workforce. In P. Sullivan & T. Wood (Eds.), *Knowledge and beliefs in mathematics teaching and teaching development* (pp. 87–113). Rotterdam, the Netherlands: Sense Publishers.

- Stephens, M. (2003). Regulating the entry of teachers of mathematics into the profession: Challenges, new models and glimpses into the future. In A. Bishop, M. Clements, C. Keitel, & F.-K. Leung (Eds.), *Second international handbook of mathematics education* (pp. 767–793). Dordrecht, the Netherlands: Kluwer Academic Publishers.
- Wang, A., Coleman, A. B., Coley, R. J., & Phelps, R. P. (2003). *Preparing teachers around the world*. Princeton, NJ: Educational Testing Service.
- Wilson, S., Floden, R., & Ferrini-Mundy, J. (2001). *Teacher preparation research: Current knowledge gaps and recommendations*. Seattle, WA: Center for the Study of Teaching and Policy.
- Wilson S., & Youngs, P. (2005). Research on accountability processes in teacher education. In M. Cochran-Smith & K. Zeichner (Eds.). (2005). *Studying teacher education: The Report of the AERA Panel on Research and Teacher Education* (pp. 591–644). Washington, DC: American Educational Research Association.
- Zumwalt, K., & Craig, E. (2005). Teachers' characteristics: Research on the indicators of quality. In M. Cochran-Smith & K. Zeichner (Eds.), *Studying teacher education: The Report of the AERA Panel on Research and Teacher Education* (pp. 157–260). Washington, DC: American Educational Research Association.

CHAPTER 7:

RECRUITMENT AND SELECTION IN TEACHER EDUCATION

Lawrence Ingvarson

This is the first of three chapters reviewing policies and practices for assuring the quality of entrants to teacher education programs across the 17 countries that participated in the IEA TEDS-M survey. The policies and practices reviewed in this chapter fall into two main groups—recruitment and selection. Given the central importance of teacher quality to student learning, many governments are seeking strategies that will ensure teaching is an attractive career option for abler graduates.

Method of Data Collection

This chapter is based on information provided by the national research coordinators (NRCs) from each country participating in TEDS-M. They provided this information in two forms: country reports and responses to a questionnaire about the organization of teacher education in their respective countries.¹ The guidelines for the country reports asked the NRCs to address the following questions about recruitment and selection practices in teacher education:

1. Who determines the total number of university places available for teacher education students?
2. How, or on what basis, is the total number of places available for teacher education students determined?
3. Who determines the requirements or standards for students to gain entry to professional preparation programs for teachers?
4. What are the standards or requirements to be eligible to enter programs for preparing teachers of mathematics at the lower-secondary level? For example:
 - What level of secondary school and/or university mathematics courses is required?
 - Are there any areas of content or subject-matter in previous secondary school/university mathematics courses that are prescribed or required?
 - Are there any tests of prerequisite subject matter knowledge that must be taken or passed?
5. What are the standards or requirements to be eligible to enter programs for preparing teachers who will teach mathematics at the primary/elementary level? For example:
 - What level of secondary school/university mathematics courses is required?
 - Are there prerequisite subjects that must have been taken?
6. How does the responsible agency ensure that its selection standards are complied with?
7. How do the academic standards of entrants to teacher education programs for teachers of mathematics at the lower-secondary level compare with standards for entry to most other mathematics-related professional preparation programs?" (NRCs were

¹ A full list of the country reports and their authors appears on pages 19–20 of this volume.

asked to refer to the quality indicators used in their country, for example, SAT scores in the United States; A-levels in England.)

8. How do the academic standards of entrants to teacher education programs for teachers of mathematics at the primary/elementary and secondary levels compare with standards for entry to most other university or professional preparation programs?
9. If any other external examinations are required at some point during these routes, what are the purpose, nature, content, and use of these examinations?

NRCs were also asked to provide information in the TEDS-M route questionnaire about the minimum credential or qualification required to enter each teacher education route, the level of prior academic achievement typical of teacher education students relative to their age group, and whether their country was experiencing a shortage of teachers.

NRCs provided extensive responses to these questions. It was necessary to find a way to summarize this information so that readers could readily compare and contrast quality-assurance arrangements. The ETS study discussed in Chapter 6 (Wang, Coleman, Coley, & Phelps, 2003) provided one example of how to conceptualize the main components of a policy system for assuring the quality of the teaching workforce. It was also useful in providing approaches to classifying quality-assurance systems and measuring their relative strength.

Profiling Recruitment and Selection Policies

The TEDS-M team decided to adapt the ETS approach. Profiles of quality-assurance arrangements were developed for each country along a sequence of mechanisms that ran from recruitment and selection, through accreditation, and on to certification and entry to the profession. These profiles aimed to provide a snapshot of the nature of the quality-assurance arrangements for each country and the components that the report authors emphasized. The profiles of policies presented in this chapter cover:

1. Governance of recruitment (supply and demand);
2. Attractiveness of teaching as a profession and as a career;
3. Selection standards and methods.

Each is discussed in turn below.

Recruitment

The status of teaching varies markedly across the countries participating in TEDS-M, as does the prior academic achievement level of students entering teacher education programs relative to that of their age group overall. Increasingly, countries are looking to broaden the sources of teacher supply through policies that encourage suitably qualified people from other careers to apply. A few countries also have policies that provide alternative pathways into teaching from traditional teacher preparation programs. Although most of the TEDS-M countries did not have a problem with the supply of applicants to primary teacher education programs, many said they had a problem with the quality of the supply, especially in relation to mathematics background and achievement.

Recruitment of suitable applicants calls for concerted policies that improve the status and attractiveness of teaching as a profession and its relative position in the job market. Recruitment and selection policies clearly need to go hand in hand, but this is not always the case in practice. Governments need to ensure that the teaching profession can attract an appropriate share of high-quality graduates from which to select suitable applicants. However, when the teaching profession has difficulty attracting sufficient applicants of high academic quality, selection policies and practices, in themselves, will achieve little in terms of assuring teacher quality.

Countries vary in the extent to which they control and manage the supply of teachers in order to meet demand. Some countries determine at national (central) level the number of prospective teachers who can enter teacher education programs. They also vary in terms of whether they exercise “high-stakes” selection at the point of entry to training, or at some later point after graduation from training, such as certification before full entry to the profession.

The McKinsey report (Barber & Mourshed, 2007) pointed out that high-performing countries on PISA (Programme for International Student Assessment) tests, such as Finland and Singapore, tend to place special emphasis on controlling entry to teacher education programs, and limit the number of places to those who are selected. These also tend to be countries where the status of teaching is high and careers in teaching are deemed attractive. Consequently, there are many more applicants to teacher education programs than there are places available in them.

For historical or other reasons, countries such as Chile have relatively fewer legislative mechanisms for controlling the number of students who can enroll in university teacher education programs. For political reasons, there may also be few controls on the number of providers in the teacher education marketplace, as in the Philippines. The tradition of university autonomy may also be strong in these countries, even for professional preparation programs.

For other countries, often federations such as Germany and the United States, open-entry policy may be based on strong community values, such as the belief that every student who has successfully passed the high-school exit examination should have a legal right to enroll at university and to make career decisions later. These countries tend to delay the selection or filtering process until prospective teachers have completed their first university degree. Such policies can mean that universities enroll many more students in teacher education courses than the country needs.

In Georgia, until recently, each teacher education institution independently determined the number of places it would make available to students. These institutions now receive upper limits from the Ministry of Education and Science on the number of teacher education students they can accept. However, they are still free to accept fewer teacher education students than this defined upper limit. The upper limit on the number of teacher education students for each institution is determined by state commissions and based on parameters such as total area of lecture rooms, number of lecturers, and so on.

TEDS-M provided an opportunity to examine some current claims about effective policies for promoting teacher quality. The widely quoted McKinsey report, for example, made this claim:

The top performing school systems consistently attract more able people in the teaching profession, leading to better student outcomes. They do this by making entry to teacher

training highly selective, developing effective processes for selecting the right applicants to become teachers, and paying good (but not great) starting salaries. Getting these essentials right drives up the status of the profession, enabling it to attract even better candidates. (Barber & Mourshed, 2007, p. 16)

The authors of the McKinsey report also claimed that failing to control entry into teacher education “almost invariably leads to an oversupply of candidates, and that, in turn, has a significant negative effect on teacher quality” (p. 18). While TEDS-M cannot test these claims, it does provide an opportunity to examine the relationship between recruitment policies and certain characteristics of future teachers, such as their knowledge of the mathematics they will be expected to teach.

Recruitment policies in TEDS-M countries

Countries participating in TEDS-M can be classified according to the strength and locus of control over policies concerning teacher recruitment, supply, and the number of available teacher education places for teacher education students. The spectrum runs from countries with strong central control by national or state government agencies to countries with devolved or local control at the institutional level.

In countries with strong controls, national or state governments lay down requirements or standards for students to gain entry to professional preparation programs. They control the total number of places available for teacher education. They may do this by limiting funding to a specified number of places in each teacher education institution, or by setting quotas for each university, as in Chinese Taipei. Some countries, such as Singapore, attempt to closely match the number of places to the number of teachers the school system needs. Countries where control is more localized are more likely to allow institutions to determine the number of students who enroll in their teacher education programs and/or to have a policy of encouraging alternative providers of teacher education to traditional providers such as universities.

Exhibit 7.1 provides a summary of the information that the NRCs provided in their country reports about policies and practices related to recruitment and its governance. Botswana, Chinese Taipei, Malaysia, Oman, the Russian Federation, and Singapore have stronger controls than the other TEDS-M countries. In Singapore, the Ministry of Education determines how many future teachers are needed and the types of programs in which these students should enroll. This number is based on the projected number of teaching positions that will need to be filled. In Malaysia, the Ministry of Education determines the number of teaching posts based on an assessment of the number of teachers needed to cover each subject area in schools nationwide. Although the Chinese Taipei Ministry of Education sets quotas, the total is more than the number currently needed on the teaching market.

Exhibit 7.1: Strength of control over total number of university places available for teacher education students

Level of Control	TEDS-M Countries
Strong Controls	Botswana, Chinese Taipei, Malaysia, Oman, Singapore
Mixed Controls	Canada,* Germany, Poland, Russian Federation, Thailand
Weak Controls	Chile, Georgia, Norway, Philippines, Spain, Switzerland, United States

Note: *Although Canada did not meet the sampling requirements for future teachers in TEDS-M, it did provide a country report and so is included in this section of the report.

Quotas exist in some Canadian jurisdictions, but universities are not bound to comply with them. Universities can thus determine the number of places for teacher education students. There is a major oversupply of teachers in several provinces and a wide range of academic achievement among applicants for teacher education places in different universities. The situation in Germany, Poland, and Thailand is also mixed. Although Germany has an open entry policy (every student who has successfully passed the *Abitur*, the high-school exit examination, has a legal right to enroll at university), the academic requirements for graduation from secondary school are relatively high: students who pass the *Abitur* are in the top 30 percent of students in their age cohort.

In countries with weak controls, universities have no limits or quotas on the number they can enroll. In the United States, individual teacher preparation institutions play the primary role in determining the total number of university places available for teacher education students. In Norway, until recently, the overall enrolment of teacher education students was determined by the ministry. However, teacher education providers are now autonomous, which means that each institution decides on the number of students it will accept. Spain reports a large oversupply of graduates from its schools of primary teacher education as well as from its faculties of education, which are relatively autonomous.

Chile has relatively weak controls over the number of students who can enroll in teacher education programs. More than half of the 700 teaching-related major programs in that country were created during the last 10 years, and enrolment in teaching programs has tripled. Until recently, half of the enrolment in primary education teaching programs was in nonregular programs based on distance learning and lasting fewer than four or five years, whereas regular programs take at least four years. The government has since, however, ordered these nonregular or distance programs to close, and they are gradually disappearing.

The Attractiveness of Teaching as a Profession and as a Career

Perhaps the most effective way in which countries assure teacher quality is by ensuring that teaching offers a rewarding career to people with the capacity to become effective teachers. Some countries make special efforts to guarantee teaching as an attractive option for talented graduates from secondary schools and universities. These countries have rigorous policies in place that govern, for example, job security, pensions, and other benefits. Demand for places from abler graduates in these countries is high.

Countries participating in TEDS-M were classified according to the policies they have in place to maintain and promote the attractiveness and status of teaching relative to other career choices.² Exhibit 7.2 summarizes the findings for each country. Salaries for teachers, compared to salaries for people in other professions, and teachers' working conditions vary markedly across the countries participating in TEDS-M. The authors of the country reports indicated that the prior academic achievement level of students entering teacher education programs, relative to their age group, tends to vary accordingly.

There is a strong demand for teacher education places in Canada, Chinese Taipei, and Singapore from abler high school and university graduates. These countries are characterized by deliberate strategies to maintain or improve teacher quality. In Singapore, for example, future teachers are paid a stipend in addition to receiving

² Details of these procedures are provided in the TEDS-M international report (Tatto et al., 2012).

Exhibit 7.2: Attractiveness and status of primary and secondary teaching as a profession and as a career

Status	TEDS-M Countries
High	Canada, Chinese Taipei, Singapore
Mixed	Botswana, Germany, Malaysia, Oman, Poland, Russian Federation, Spain, Switzerland, United States (secondary only)
Low	Chile, Georgia, Norway, Philippines, Thailand, United States (primary only)

free teacher education. Salaries for beginning teachers, compared to other graduate salaries, are high. Working conditions in schools (e.g., hours of face-to-face teaching) are supportive of competent teaching. Career prospects as a teacher are good, with the ratio of final salaries to starting salaries comparatively high. Entrants to teacher education programs in these countries are above-average to high achievers in secondary schools, relative to their age cohort.

In Canada, salaries are relatively high, and competition to gain admission to education faculties is also reported to be strong. In Chinese Taipei, a beginning teacher's salary is much higher on average than that which most fulltime employees in other industries receive. Salaries rise steadily to about double the starting salary, and more if the teacher has or gains a Master's degree or a doctorate. Teachers receive a marriage bonus (two months' salary), a birth allowance (two months' salary), a funeral subsidy (salary of three to five months), education subsidies for their children, health check-up grants, parental leave, and a pension that is nearly the same amount of the final salary received when still teaching.

The social status of teachers in Chinese Taipei is very high. Teachers have job security and are rarely dismissed from a job. The work satisfaction of secondary and elementary school teachers in Chinese Taipei is one of the highest across all careers. In the mid-2000s, the appeal of teaching in Chinese Taipei resulted in a surplus of teachers. In response, the Ministry of Education decreased (by 50% in the three years from 2004) the number of admissions to programs that prepare future teachers. It is possible that this policy has increased the attractiveness of teaching in that country even more.

Salaries for Swiss teachers are among the highest in the OECD countries. Students entering primary teacher education programs are described as high achievers (i.e., the top 20% of their age group). However, the Swiss country report cited research showing a marked loss of attractiveness of the teaching profession in recent years. Fewer parents said they would advise their children to enter the profession. State efforts to make savings during these years led to reductions in actual earnings for teachers.

Although starting salaries are attractive in Switzerland, they reach a plateau at a comparatively early point in the career. Opportunities for promotion as a teacher are few unless teachers apply for a limited number of management positions and move out of teaching. The rate at which teachers are leaving their profession has increased. The authors of the Swiss report stated that these factors (working conditions, prestige, absence of career development opportunities in the profession) can be seen as warning signs that the status of individual schools, school boards, and/or the school system as a whole is declining.

At one time, teaching was a lucrative career in Botswana. However, working conditions have deteriorated in recent years, with a rapid increase in student numbers per class. In Germany, the increasing shortage of future teachers means that almost everyone who

wants to enter the profession will get a job. In the United States, teaching candidates who pursue elementary education with licensure in mathematics tend to have lower Scholastic Aptitude Test (SAT) scores than the average college graduate (Zumwalt & Craig, 2005).

Until recently, and at the time of TEDS-M, teachers' salaries in Norway, relative to GDP per capita, were low in comparison with teachers' salaries in other countries (OECD, 2004; see, in particular, Table D3.1, p. 390). Teachers' salaries after 15 years of teaching were only 1.2 times the salary for beginning teachers (Carnoy, Beteille, Brodziak, Loyalka, & Luschei, 2009). Applications for teacher education programs had been decreasing (up to 2009), and the number of dropouts had risen substantially. As competition for study places diminished, programs enrolled some weak or poorly motivated students, which in turn affected the number of dropouts. This situation seems to confirm claims made in the McKinsey report (Barber & Mourshed, 2007) that the quality of courses drops as the caliber of students on those courses drops "because the quality of any classroom experience is highly dependent on the quality of people in the classroom" (p. 18).

Malaysia reported a strengthening demand for teaching from students with higher academic qualifications in recent years because of improved conditions for teachers and a slowdown in the private economic sector. The Russian Federation, however, reported that the status, salary, and morale of the teaching profession had lowered and attrition rates had risen.

Until recently, teachers in Poland were paid low salaries and had low professional status. However, this state of affairs was partly offset by substantial privileges, such as reduced teaching load, long vacations, and job security. Changes to the Teacher Charter implemented between 2000 and 2002 related teachers' salaries more closely to professional career levels. Local governments now have the power to set remuneration levels higher than those set in the state budget. As a result, teacher salaries have become more differentiated, and average salaries for teachers are now slightly above the average in the national economy. Unemployment in Poland has been relatively high, which has also made the teaching profession more attractive. Consequently, Poland currently has a surplus of teachers.

The report from Georgia³ points out that entrants to teacher education are rated as low achievers when considered against other students in their age cohort.

Sadly, teaching is one of the least desired professions in Georgia. The still ongoing depreciation of the profession includes decreased salaries as well as decreased social status of teaching. While teaching was one of the most respected professions in the Soviet times, it became less appreciated when teachers appeared to be unprepared for the transition period faced by the country.

Despite several attempts to improve teachers' salaries, they remain at a level which, according to the country report from Georgia, is more than three times lower than the desired minimal amount, in the opinion of an average teacher. Because of teaching's low social and cultural status in Georgia, students entering teacher education programs are typically drawn from average and below-average achievers (for their age group). The main criterion used for selection into this route is a candidate's performance in an examination set by each training institution, not the level of his or her attainment at the end of secondary schooling or on a national tertiary education entrance examination.

³ Written by N. Mzhavanadze and T. Bokuchava.

The Philippines country report⁴ pointed out that “Academic standards of entrance to teacher education are low compared with those for degree programs such as engineering, business, dentistry, medical technology. One reason for this is that teacher education programs attract mainly students with low-to-average intellectual ability.” In Chile, scores on the *Prueba de Selección Universitaria* (PSU), the university entrance examination for new entrants to basic teacher education programs, are significantly lower in private than in public universities. PSU scores for future teachers are generally lower than those required for professions such as engineering, computing, mathematics, accountancy, and economics.

Ratings by teacher education institutions of prior academic achievement of entrants to their programs

TEDS-M also gathered information about the academic achievement of entrants to teacher education. Each teacher education institution was asked to provide an estimate of the prior academic achievement of students entering their programs relative to the achievement of other students in their age group. Exhibits 7.3 and 7.4 summarize the findings. Comparison with Exhibit 7.2 shows a clear relationship between the relative attractiveness of teaching as a career and the prior academic achievement typical of entrants to teacher education programs.

Exhibit 7.3: Ratings by teacher education institutions of prior academic achievement of entrants to their programs (primary)

Rating	TEDS-M Countries
Top 20% of Age Group	Singapore
Above-Average Achievers for Age Group	Botswana, Chinese Taipei, Malaysia, Philippines, Russian Federation, Switzerland, United States
Average Achievers for Age Group	Chile, Georgia, Norway, Poland, Spain

Exhibit 7.4: Ratings by teacher education institutions of prior academic achievement of entrants to their programs (secondary)

Rating	TEDS-M Countries
Top 20% of Age Group	Oman, Singapore
Above-Average Achievers for Age Group	Botswana, Chinese Taipei, Georgia, Malaysia, Norway (up to Year 12), Philippines, Poland (up to Year 12), Russian Federation, Switzerland, United States
Average Achievers for Age Group	Chile (up to Year 10), Norway (up to Year 10), Poland (up to Year 10)

TEDS-M focused on the preparation of teachers intending to teach mathematics in primary and lower-secondary schools, and the knowledge they had of mathematics and mathematics pedagogy at the end of their training courses. While the variation in this knowledge across participating countries, and across programs within countries, may be the result of differences in teacher education programs (e.g., the extent to which programs require students to complete courses in mathematics), it is clear from Exhibits 7.3 and 7.4 that this variation might, to some extent, also be due to differences in the prior academic ability and mathematics achievement of the students who enter these programs. TEDS-M therefore provided an opportunity to explore the influence of recruitment policies on the quality of entrants to the teaching profession and to compare this influence against other influences, such as the characteristics of teacher education programs. This matter is addressed in other TEDS-M reports.

4 Written by E. B. Ogena, F. G. Brawner, and M. D. Ibe.

Selection Standards and Methods

Entry to primary teacher education programs

The TEDS-M NRCs were asked to describe the level of mathematics (and any other prerequisite subjects) that individuals are required to have in order to enter teacher education programs for primary teaching in their country. The NRCs were also asked whether there was an agency that ensured compliance with these standards.

With a few exceptions, such as in Germany, primary teacher education programs in TEDS-M countries are concurrent. (Students entering consecutive programs must, by definition, have already completed a university degree.) NRCs indicated that the most common basis for selecting students into concurrent teacher education programs is an applicant's general academic achievement (not just mathematics achievement) in his or her final year of secondary schooling. Other than Canada and the United States, countries were using no other criteria.

In Canada, many institutions have admission requirements that extend beyond academic standards, such as work experience, essays or profile statements, references, and interviews. While all participating countries require entrants to teacher education programs to have successfully completed secondary education, several have specific requirements about the year level to which entrants should have studied mathematics. Canada, Chile, Georgia, Malaysia, Philippines, Spain, Switzerland, Thailand, and the United States reported no specific mathematics requirement for future primary teachers. Graduation from secondary school with some mathematics requirement is mandated in Botswana, Poland, Norway, Singapore, and Germany. In Singapore, the requirement varies with the type of teacher education program applicants hope to enter (e.g., diploma, degree, or postgraduate diploma).

Except for a few federal states, Germany requires entrants to the second cycle of professional preparation to have successfully completed mathematics courses during the first cycle of tertiary education. Chinese Taipei is a special case in that students must be enrolled in their second year of university or higher, or enrolled as Master's students or doctoral students, before they can be admitted to a teacher education program. Although there is no specific secondary school mathematics requirement, students must pass the national university entrance examination, which has mathematics as a required test subject.

Exhibit 7.5 summarizes information about requirements for admission to primary teacher education for future generalist teachers. This information should be interpreted cautiously, however. Graduation from secondary education alone is a crude measure of academic standards. As a filter, completion of secondary education can be very selective or hardly selective at all. Graduation in some countries is based on external national examinations, such as the *Matura* in Poland and Switzerland, or rigorous subject-based examinations conducted at the school level, such as for the *Abitur* in Germany at the time the TEDS-M cohort was in school.⁵ These examinations form the sole or main basis for gaining entry to university.

⁵ These examinations have since been centralized in all federal states.

*Exhibit 7.5: Selection requirements and methods (primary generalist)**

Requirement	TEDS-M Countries
Graduation from Secondary School—No Specific Mathematics Requirement	Canada, Chile, Georgia, Germany, Malaysia, Philippines, Spain, Switzerland, Thailand, United States
Graduation from Secondary School with Specific Mathematics Requirement	Botswana, Norway, Poland,+ Russian Federation, Singapore
Graduation from Secondary School and Requirement for Tertiary-Level Studies	Chinese Taipei, Germany

Notes:

* Oman did not participate in the primary part of TEDS-M.

+ Only for teachers who will teach Grades 4 and above, not teachers who will teach Grades 1 to 3.

In other countries, such as the United States, requirements for graduation from high school vary greatly and may depend more on course completion than on attaining a particular academic standard. When selecting students, universities in the United States typically use information from college entrance tests (e.g., the Scholastic Aptitude Test or SAT) in addition to high school grade point averages. There is wide variation across universities in the SAT scores of entrants to teacher education programs (Zumwalt & Craig, 2005).

Although Botswana, Norway, Poland, the Russian Federation, and Singapore are grouped together in Exhibit 7.5, we need to keep in mind that generalist primary teachers (teachers who are expected to teach most subjects in the curriculum) are required to teach up to Grade 3 only in Poland and up to Grade 4 only in Russia. Generalist primary teachers are expected to teach up to Grade 6 in Singapore, Grade 8 in Chile, and Grade 10 in Norway. While we might assume that the required level of mathematics studied in secondary school would vary accordingly, this does not necessarily appear to be the case. For example, there is no specific mathematics requirement for future teachers in Chile even though they may be eligible to teach up to Grade 8. Future teachers in Chinese Taipei are expected to successfully complete tertiary-level studies before being eligible to enter teacher education programs, even though they will be eligible to teach up to Grade 6 only.

In addition, in some countries, such as Poland, students in Grades 4 and beyond are taught mathematics by specialist mathematics teachers who are therefore expected to know mathematics to an advanced level. In Germany, this expectation applies to teachers of mathematics for Grades 5 and beyond in most federal states. In Norway,⁶ while study of mathematics is not a specific requirement for entry to teacher education, all secondary school students have to study mathematics in Grade 11.

Another point that needs to be noted about Exhibit 7.5 is that it does not provide information about the extent to which future primary teachers must study mathematics during their teacher education program.

⁶ The Norway NRC noted that the requirement in Norway is very low, in that future teachers must have completed general mathematics with an average performance in Grade 11, which is the same requirement for all nonvocational students in upper-secondary schools.

Minimum levels of mathematics achievement required to enter primary teacher training

Information about the level of mathematics required to enter primary teacher training was also gathered from teacher education institutions in each country. Exhibit 7.6 summarizes the findings and provides further information to add to and cross-check with that contained in Table 7.5.⁷ It is noteworthy, for example, that data provided by NRCs about national policy did not always correspond with data provided by representatives of teacher education institutions. The Swiss NRC, for example, reported that Sweden did not have a policy setting a minimum level of mathematics for entry to teacher education programs. However, at the institutional level, entrants must have studied mathematics to Year 12.

Exhibit 7.6: Minimum levels of mathematics required to enter teacher education (primary)

Year	TEDS-M Countries
Year 12	Botswana, Switzerland, United States
Year 11	Georgia, Malaysia (special), Norway, Russian Federation
Year 10	Philippines, Singapore, Spain

Summaries of selection requirements and methods for primary teachers in TEDS-M countries

- *Botswana:* Prospective primary teachers must have, as a minimum qualification, the Botswana General Certificate of Secondary Education (BGCSE) with a credit in mathematics in order to enroll in a teacher education program. Admission is competitive. Future teachers need to have obtained at least three credits in the BGCSE in order to gain entry to colleges of education. Applicants were described by the Botswana NRC as “above average achievers for their age group.”
- *Canada:* Admission requirements are determined by individual universities, but for all of them, the core requirement is the applicant’s academic record, expressed in terms of grade point average or percentage grades achieved in prerequisite programs.
- *Chile:* There are no specified entry standards for teacher education, other than those in force generally for entry into university or nonuniversity higher education. In practice, this means that students are selected into universities in accordance with their secondary school grade average and their university entrance examination (PSU) scores.
- *Chinese Taipei:* The Teacher Education Act stipulates that students must be enrolled in their second or higher year of university, or enrolled Master’s students or doctoral students before they can be admitted to a teacher education program. Although they also have to pass various selection processes specific to the programs in their own teacher education institutes, there are no specific mathematics requirements. However, all applicants will have had to pass the national university entrance examination, which has mathematics as a required test subject.
- *Georgia:* The minimal qualification normally required for entry is completion of upper-secondary school. The main criterion used for selection into this route is a candidate’s performance in an examination set by each training institution, not his or her level of attainment at the end of secondary school or on a national tertiary education entrance examination. In terms of prior academic achievement, students entering the first phase of this route are typically drawn from average and below-average achievers (for their age group).

⁷ Note that some countries did not complete the institutional questionnaire.

- *Germany*: As mentioned above, all university students are graduates of the selective *gymnasium* system and its rigorous academic curriculum. This means that future primary teachers would have had at least 12 years of school mathematics. Every future teacher must pass two “state examinations,” one after completion of university training, as the first phase of teacher education, and the second one after completion of the practical training—the second phase of teacher education. These two stages represent major quality-assurance hurdles for future primary teachers, because they describe minimum requirements of training beyond those relating to mathematics pedagogy. In addition to studying German pedagogy and general pedagogy, future primary teachers must study the pedagogy of a third subject. Some federal states require university-level mathematics. The number of places available for students to enter the second phase varies considerably across federal states. If selection is necessary, it is based mainly on the applicant’s grade point average for the first state examination.⁸
- *Malaysia*: An important aspect of the Malaysian context is the decision made in 2003 to have mathematics taught in English, rather than in Malay, for students in Years 1 to 13. This has meant, of course, that preservice teachers must be able to teach mathematics in English. Future primary teachers are also expected to have at least a credit-level pass in mathematics. The number of students that can be admitted to teacher education institutions is determined by the resources of the institution and the number of qualified applicants. Also, each institution has to review the size and nature of the student intake in consultation with relevant stakeholders (e.g., Ministry of Human Resources) to ensure gender and ethnic balance and opportunities for disadvantaged students.
- *Norway*: For many years, there has been no difference in preparation of teachers for the lower grades as compared to the upper grades of the basic school (Grades 1 to 10). Applicants for general teacher education for all these grade levels must have completed three years of upper-secondary education or the equivalent. However, they need only have taken mathematics for the first year of their upper-secondary schooling (Year 11). Since 2005, applicants must score at least three marks (on a scale from 1 to 6) in mathematics during this first year. The Norway NRC described entrants to concurrent programs as average to above-average academic achievers for their age group.
- *Oman*: See the information for Oman under the “Entry to lower-secondary” section below.
- *Philippines*: According to the country report from the Philippines, entrance standards for teacher education in that country are lower than those for other degree programs. Previously, the traditional National College Entrance Examination (NCEE) was administered to all who were aiming to proceed to university. The level for admission required by most teacher education institutions in 1983 was at the 60th percentile. In the 1970s, the NCEE was seen as elitist and undemocratic. As a result, some tertiary-level schools admitted students who attained very low scores on the NCEE, but eventually the NCEE was abolished in the late 1980s. As a matter of

⁸ This description applies to the TEDS-M sample, which would have graduated from the first phase about three to four years earlier. Since 2004, universities have been permitted to apply additional criteria such as grades in the subject to be taught, entry tests, interviews, essays, or whatever they want to put in place in order to increase quality at the point of entry to tertiary education, and thus achieve a better match between students and the respective university’s profile.

policy, the country's top-level universities administer their own entrance tests and other measures for admission to their degree programs so as to maintain their own standards. Standards for entry to teacher education institutions vary.

- *Poland:* Entry to university at the Bachelor's level is based solely on results obtained on the external assessment at the end of upper-secondary education (the *Matura* examination), which is conducted independently from schools by the Central and Regional Examination Office. Each institution defines which results and what level performance are satisfactory. For mathematics programs for future teachers of Grades 4 and higher, the nonobligatory mathematics part of the *Matura* is the main point of reference. This means that higher education institutions themselves define how selective their recruitment policy will be. Higher education institutions are free to define the requirements to enter first degree studies and postgraduate studies that give a qualification to teach. The performance in previous academic studies is usually used to evaluate candidates. Some institutions also use written examinations (especially in mathematics programs) or interviews in the selection process.
- *The Russian Federation:* The normal minimum requirements are passes in the Total State Examination (TSE), with passes in two relevant subjects (Russian and mathematics) and certification in secondary education or secondary vocational training. The most academically able students have to compete for entry to vocational study after the Bachelor of Education degree, because the number of places is determined by quota.
- *Singapore:* All applicants for teacher training, whether primary or secondary, are shortlisted by the Human Resources Department in the Ministry of Education, based on their academic qualifications and relevant experience in competition with the rest of the teaching applicants. Shortlisted applicants are interviewed by a panel made up of serving or retired principals, Ministry of Education officials, and representatives from the National Institute of Education (NIE). The interview panel assesses applicants' academic achievements, their interest in teaching, and those of their personal and leadership qualities that will enable them to be good teachers.

The unique feature of the Singapore situation is that successful applicants are accepted *into the profession as untrained teachers*, after which they are sent to NIE for training. If they pass their training, they become trained teachers who are posted to the schools without further license or evaluation, as in other systems, given that they have already been accepted into the profession via the first "filter."

The main academic criteria for entry to primary training are results in the Singapore-Cambridge General Certificate of Education (GCE) O (ordinary)-level or A (advanced)-level examinations, or in diplomas from the various Singapore polytechnics. All programs require an O-level pass, or equivalent, in mathematics and English language. In recent years, the overall percentages of students who pass these two crucial subjects have been around the 85 percent mark. This pass rate underscores the importance that mathematics holds in the training of Singapore teachers. All applicants must also pass the relevant Entrance Proficiency Test (EPT) unless they meet its exemption criteria. Applicants for the consecutive Post-Graduate Diploma in Education programs must hold a relevant and recognized degree from a local or an overseas university.

- *Spain:* Any applicant can enroll at the primary level, as long as he or she has passed the Baccalaureate degree. However, there are no special requirements with regard to mathematics knowledge, nor is it necessary to take a specific test in order to enroll

in the course of studies leading to the teaching qualification. As a consequence, the mathematics abilities of future primary teachers vary widely when they enter university. The Spanish NRC described the students entering the primary route as average and below-average achievers for their age group.

- *Switzerland*: Since the reform of teacher training in the 1990s, students holding the general qualification for university entrance, the *Matura*, can gain direct admission to a teacher-training institute. However, most teacher institutions also use their own selection or proficiency tests, usually in relation to the first phase of teacher training, which may include tests of mathematics knowledge. According to the Swiss NRC, students entering teacher education programs are typically high achievers (i.e., the top 20% of their age group).
- *United States*: Requirements for entry into elementary preparation programs vary across states based on whether states mandate that candidates attain a minimum grade point average, attain minimum scores on the Scholastic Aptitude Test or American College Testing, and attain minimum scores on tests of basic literacy and numeracy skills. Areas of mathematics content addressed during elementary preparation are determined by (a) national accreditation organizations, (b) state licensure requirements regarding coursework, and (c) the discretion of individual programs or pathways. However, there are a few areas of content that some states require applicants to complete (prior to program entry), such as some mathematics coursework at the postsecondary level. As noted, some states or individual programs require elementary candidates to pass state basic skills tests prior to program entry, but few states or programs require candidates to pass state tests of content knowledge or teaching skills prior to entry.

In summary, and as mentioned in the introduction to this chapter, graduation from secondary education, as a measure of academic standards, varies from country to country. In some cases, such as the *Matura* in Poland, graduation is based on external national subject-based examinations. In others, it is based on moderated subject-based examinations conducted at the school level, such as the *Abitur* in Germany.⁹ In the United States, high school graduation requirements vary from state to state. But no matter how the examination is conducted or graduation is decided, we need to keep in mind that graduation from secondary school is, according to the TEDS-M NRCs, the most common criterion for selecting prospective primary teachers into teacher education institutions.

Entry to lower-secondary teacher education programs

Standards for entry to programs that prepare teachers who will teach mathematics at the lower-secondary level are more difficult to estimate. It might be expected that the level to which entrants will have studied mathematics previously will be greater for consecutive than for concurrent programs. By definition, entry to consecutive training programs is open only to students who have completed mathematics courses successfully at university. Countries with such programs include Canada, Georgia, Malaysia, Norway, Oman, Singapore, Thailand, and the United States.

⁹ As it applies to the TEDS-M sample, which graduated from school about 8 to 10 years earlier. As noted earlier in this chapter, end-of-school examinations have since been put under centralized jurisdiction in all federal states.

However, to confuse the picture somewhat, most of these countries also have concurrent programs for preparing secondary mathematics teachers, which include mathematics course requirements to varying levels. Also, as explained earlier, the two-phase programs in Germany cannot be classified simply as either concurrent or consecutive, although the fact that students must pass the first state examinations before proceeding to the second implies that these programs have more in common with consecutive than with concurrent programs.

Once again, even though graduation from secondary education is usually a crude measure of academic standards, it is the most common selection criterion reported by TEDS-M countries. Exhibit 7.7 summarizes information about the level to which entrants to lower-secondary teacher education programs should have studied mathematics at school. Future lower-secondary teachers in Chile, Malaysia, Philippines, and Thailand are trained mainly in concurrent programs that have no specific requirements about the level to which entrants should have studied mathematics while in secondary school. Most future lower-secondary mathematics teachers in Botswana, Chinese Taipei, Georgia, Norway, Oman, the Russian Federation, and the United States are also trained in concurrent programs, but a specified level of achievement in mathematics at the secondary level is required. However, both groups of countries usually require future mathematics teachers to undertake some mathematics courses as part of their university program.

Exhibit 7.7: Selection standards and methods (lower secondary)

Requirement	TEDS-M Countries
Graduation from Secondary School—No Specific Mathematics Requirement	Chile (up to Year 10), Philippines, Thailand, Switzerland
Graduation from Secondary School with Specific Mathematics Requirement	Botswana, Georgia, Malaysia, Norway, Oman, Poland,* Russian Federation, United States
Graduation from University with a First Degree in Mathematics or Successful Completion of Designated Courses at University Level	Canada, Chinese Taipei, Germany, Singapore, Spain

Note: * The standard for Poland applies only to programs included in the TEDS-M sampling frame. Successful completion of mathematics courses is a requirement for “second degree studies” in mathematics for secondary school teaching.

A third set of countries has stronger requirements. Teachers at the lower-secondary level are expected to be teachers with specialist training in teaching mathematics (e.g., teaching no more than two or three subjects at that level). In these countries, entrants to programs usually have to complete a university degree in mathematics or successfully complete designated mathematics courses at university level before they can enter the teacher-training phase. They are Canada, Chinese Taipei, Poland, Spain,¹⁰ and Singapore. Once again, even though graduation from secondary education is usually a crude measure of academic standards, it is the most common selection criterion reported in TEDS-M countries.

For the purposes of TEDS-M, the difference of interest across the participating countries is whether students at the lower-secondary level (e.g., Year 8) are taught mathematics by teachers trained as generalists or by teachers with specific training in teaching mathematics. As might be expected, the answer to this question depends mainly on the level that students continue on to during the first phase of schooling beyond Grade 6

¹⁰ Note, however, that future lower-secondary teachers from Spain did not participate in TEDS-M.

(e.g., Grade 8 in Botswana, Grade 9 in Chile, and Grade 10 in Norway). Future teachers in these countries are mainly trained in generalist programs. However, even here the difference may be blurred. For example, Germany, Thailand, and the United States have programs that train specialist mathematics teachers who are eligible to teach across the later primary and early secondary levels.

As indicated, expectations about the level of mathematics future lower-secondary teachers require varies with the structure of the school system. If students at the lower-secondary level are part of schools of basic education linked to primary levels (such as in Chile and Norway), their mathematics teachers are more likely to be generalist teachers who teach a range of subjects other than mathematics. Teachers who will teach no higher than the lower-secondary level are less likely to be expected to have specific training in how to teach mathematics as specialists and more likely to teach other subjects as well as mathematics. In Switzerland, lower-secondary schools normally teach up to Grade 9, and students are usually taught by generalist teachers who teach about four different subjects. If they are part of secondary schools that teach up to Grades 12 or 13 (such as in Canada, Chinese Taipei, Germany [*gymnasia* only], Poland, the Russian Federation, Singapore, and the United States), they are more likely to be taught mathematics by teachers trained as mathematics specialists.

In summary, this area is a complex one to clarify. What can be said with some confidence is that students are more likely to be taught mathematics by teachers with specialist training in the teaching of mathematics in Canada, Chinese Taipei, Germany, Malaysia, Oman, Poland, the Russian Federation and Singapore than they are in the other TEDS-M countries.

Summaries of selection requirements and methods for lower-secondary teachers

- *Botswana:* All candidates for teacher education programs must have, as a minimum qualification, the Botswana General Certificate of Secondary Education (BGCSE) or a comparable qualification. Prospective Diploma in Secondary Education students must have an “A” grade in mathematics. A minimum of a first degree (with a lower second-class pass) is required for admission into the Post-Graduate Diploma in Education program at the University of Botswana. Admission is competitive. Colleges of education select future teachers based on them having obtained at least three credits in their BGCSE results. In addition, a candidate must meet the subject requirements of the major and minor in which they intend to enroll. In addition to an assessment of academic competence, admission procedures at colleges of education include a half-day interview that assesses future teachers’ interpersonal and oral communication skills. At the end of the interviews, future teachers are selected based on best performance in mathematics and the BGCSE overall.
- *Canada:* The entry requirements for prospective secondary school mathematics teachers are the same as those for all other disciplines. For consecutive programs, applicants must have a major in mathematics in their first degree. The minimum grade required for entry varies substantially across institutions and provinces. It is typical for these students to specialize in their major area and perhaps one other related subject area within their teacher education program, with the expectation that they will become specialists in these areas as teachers. For concurrent programs, it is expected that the candidates will take both academic and professional courses in that subject in preparation for subject specialization as teachers.

- *Chile:* Entry requirements are the same as for primary education (see above). These requirements are therefore limited to the achievement of a minimal score in the university selection examination (*Prueba de Selección Universitaria* or PSU). Only traditional universities require completion of the PSU examination and attainment of the minimum score set by the association of these universities. Private universities are not required to use this examination when selecting students, although the most prestigious ones do so.
- *Chinese Taipei:* Requirements are the same as for primary teaching above. The Teacher Education Act regulates that students must be enrolled in their second or higher year of university, or enrolled Master's or doctoral students before they can be admitted to a teacher education program. Secondary-level teacher education students are prepared to teach specific subjects when they take up teaching positions. Some of the teacher education universities take students' first-year grades into account when screening and selecting applicants to teacher education programs, as well as the grades of the first academic year (including some of the grades from the mathematics courses they studied during that year). As a consequence, students who pass the teacher education selection process usually have higher capacities in mathematics than do other students in the same university.
- *Georgia:* Standards and requirements for preparing teachers of mathematics at the lower-secondary level include, as a rule, knowledge of the secondary school mathematics courses mandated by the national curriculum. Teacher education applicants do not have to take or pass tests of prerequisite subject-matter knowledge. However, to ensure that selection standards comply with what the selected students know and can do in reality, each institution requires students to sit examinations each semester. Academic standards of entrants to teacher education programs for teachers of mathematics at the lower-secondary level are similar to standards for entry to most other mathematics-related professional preparation programs up to the level of Bachelor programs. In particular, future teachers of mathematics have to take the same entry examinations as those who enter other mathematics-related programs.
- *Germany:* The comments above for primary teachers also apply here because the admission processes are essentially the same. As is the case for future primary teachers, the two main stages in teacher preparation in Germany represent major quality-assurance hurdles for future secondary teachers because their minimum training requirements encompass more than just proficiency in university-level mathematics. Future secondary teachers must also be proficient in mathematics pedagogy, a second subject, and general pedagogy.

Several federal states have now changed their entry regulations for students, giving universities in those states the possibility of selecting 60 percent of their student body according to criteria additional to passing the high-school exit examination (such as grades in the subject to be taught, entry tests, interviews, and essays). However, it is unlikely that German universities will make stronger efforts to select candidates for mathematics teacher education in the near future, because the increasing shortage of teachers will make it necessary to give entry to almost everyone who wants to enter the profession.

- *Malaysia:* The information on Malaysia for primary teachers (see above) also applies here. Although the Ministry of Education prefers mathematics teachers to have a Bachelor of Education (Mathematics), or a degree in mathematics and a postgraduate certificate in education, this preference has not been fully realized. When trained teachers are not available, Malaysian schools employ temporary teachers. These teachers must have a degree in mathematics or an A-level pass in mathematics from their secondary school.
- *Norway:* What is said above about standards and requirements for primary teachers in Norway also applies to generalist teachers (ALU) in lower-secondary schools. This level, however, also has specialist teachers in the consecutive and concurrent programs in teacher education institutions (PPU and Master's).
- *Oman:* In 2006, the Ministry of Higher Education established the Higher Education Admission Center to facilitate admission of students to all higher education institutions. It is responsible for setting admission requirements for all colleges of education under the Ministry of Higher Education. It also coordinates with Sultan Qaboos University and other higher education institutions in order to know the admission requirements of each institution. The required numbers of students are admitted to the teacher education program according to their results obtained in the General Secondary School Certificate examinations in general and their marks in mathematics in particular.
- *Philippines:* Traditionally, all students aiming to proceed to university had to sit and pass the National College Entrance Examination (NCEE). The admission criterion required by most teacher education institutions in 1983 was achievement at the 60th percentile rank. However, NCEE was seen as elitist and undemocratic and was eventually abolished. As a result, some tertiary-level schools admitted students who scored very low (e.g., 20%) on the NCEE. Some of the stricter schools administered their own entrance tests and other measures for admission to their degree programs. Without the NCEE, institutions used a prospective student's score on the National Secondary Achievement Test (NSAT), or they used the student's average grade during his or her last two years or final year of secondary school as an entry requirement. Applicant standards varied; they still do. Some colleges, including those preparing teachers of mathematics, do not have standards for entry to teacher education.
- *Poland:* In Grade 4 of the primary school as well as in lower-secondary and upper-secondary schools and postsecondary education institutions (ISCED 4), teachers qualified to teach mathematics teach this subject. These individuals are usually mathematics graduates (see also the description for the primary level, as the information there has relevance for lower-secondary education).
- *Russian Federation:* The normal minimum requirements are passes in the Total State Examination (TSE). Passes must include two relevant subjects (Russian and mathematics). Certification in secondary education or secondary vocational training is also necessary. Because the number of students admitted to secondary-level teacher education is determined by quota, the most academically able students compete for entry to it. However, according to Burghes (2008), the status, salary, and morale of the teaching profession are low, with many teachers leaving it after only one or two years.

- *Singapore*: Applicants for the Post-Graduate Diploma in Education (Secondary) program who are interested in teaching mathematics as a major (designated CS1) may teach mathematics up to Grade 12 but must first pass tertiary mathematics up to Year 3 in their degree. Those who choose mathematics as a minor (CS2) are qualified to teach mathematics up to Grade 10, as long as they have a grade of at least C in at least two tertiary mathematics courses, as well as a grade of at least B in A-level mathematics. Those in the mathematics (lower-secondary program) are eligible to teach mathematics in Grades 7 and 8 only. They are not required to have studied tertiary mathematics, but they must have good grades in their O-level or A-level mathematics.
- *Spain*: The entry requirements for prospective secondary school mathematics teachers are the same as those for all other disciplines. Applicants must have passed the Baccalaureate degree in any of its specializations, but those who have passed the science and technology or the natural and health specializations are given priority. Applicants must then pass a university entrance examination with a result high enough to warrant acceptance into mathematics or other science faculties. Once they have obtained their university degree, they need to follow a short pedagogy course. As the authors of the Spanish country report explained, the Bologna process recently modified this pathway into a two-cycle program—a degree in mathematics or science and a Master’s in secondary education pedagogy.
- *Switzerland*: Preparation of future secondary mathematics teachers takes place in faculties of mathematics, which offer specially tailored courses. Entrants must have passed the *Matura*, the general qualification for university entrance, and have had a strong mathematics component within it. Students entering teacher education programs for upper-secondary schools are typically described as high achievers, which means they are in the top 20 percent achievement bracket for their age group.
- *Thailand*: The first requirement for entry to a mathematics teaching program at both the elementary and secondary school levels is a high school diploma. Having passed this first requirement, applicants are then selected through an entrance admission system for public universities. However, some Rajabhat universities determine their own entry standards for prospective students and operate their own selection processes.
- *United States*: The requirements for entry into lower-secondary mathematics preparation programs vary across states based on whether states mandate that candidates attain a minimum grade point average, attain minimum scores on the Scholastic Aptitude Test or American College Testing, attain minimum scores on basic skills tests, and/or attain minimum scores on state tests of mathematics content knowledge. As an exit requirement, due to the HQT provision of the No Child Left Behind Act, states must require all lower-secondary mathematics teaching candidates to demonstrate subject-matter knowledge in mathematics in order to earn a secondary mathematics teaching license. However, candidates across states are able to demonstrate such knowledge in a variety of ways, for example, by majoring in mathematics, passing a state test of mathematics content knowledge, or earning National Board for Professional Teaching Standards certification in secondary mathematics.

There are a few areas of content that applicants to lower-secondary mathematics programs must complete prior to program entry. As noted, some states or individual programs require lower-secondary mathematics candidates to pass state-based basic skills tests before program entry. However, only a few states or programs require candidates to pass state tests of mathematics content knowledge prior to entry.

Conclusion

This chapter reviewed policies for recruiting and selecting students for teacher education programs in participating countries. Countries varied significantly in terms of the extent to which national or state government agencies exercised control over the supply of teachers. Countries such as Singapore carefully match the number of places available for teacher education to the demand. In countries with weak controls, such as Chile and the United States, there are few limits on the number of students universities can enroll.

Countries also varied significantly with regard to which policies were in place to maintain and promote the attractiveness and status of teaching relative to other career choices. In Chinese Taipei, for example, a beginning teacher's salary is much higher on average than that which most fulltime employees in other industries receive. In Chinese Taipei, salaries rise steadily to about double the starting salary and more if the teacher gains a Master's degree or a doctorate. The social status of teachers in Chinese Taipei is very high, and the work satisfaction of secondary and elementary school teachers in Chinese Taipei is amongst the highest of all careers.

There is strong demand from abler high school and university graduates for teacher education places in Canada, Chinese Taipei, and Singapore. Analysis of country reports indicated a strong relationship between the relative attractiveness of teaching as a career and the prior academic achievement typical of entrants to teacher education programs.

The most common criterion across the TEDS-M countries for selecting prospective primary teachers into teacher education institutions is graduation from secondary school, without any special mathematics requirements. However, expectations about the level of mathematics teachers required of future lower-secondary teachers vary with the structure of the school system. If lower-secondary school students are part of schools of basic education linked to primary levels (such as in Chile and Norway), their mathematics teachers are more likely to be generalist teachers who teach a range of subjects other than mathematics. Teachers who will teach no higher than the lower-secondary level are less likely to be expected to have specific training in how to teach mathematics as specialists and more likely to teach both mathematics and other subjects. Lower-secondary students in Canada, Chinese Taipei, Germany, Malaysia, Oman, Poland, the Russian Federation, and Singapore are more likely to be taught mathematics by teachers with specialist training in the teaching of mathematics than are these students in the other TEDS-M countries.

References

- Barber, M., & Mourshed, M. (2007). *How the best performing school systems come out on top*. New York, NY: McKinsey & Co.
- Burghes, D. (2008). *International Comparative Study in Mathematics Teacher Training*. Reading, UK: CfBT Education Trust, University of Plymouth, UK.
- Carnoy, M., Beteille, T., Brodziak, I., Loyalka, P., & Luschei, T. (2009). *Do countries paying teachers higher relative salaries have higher student mathematics achievement?* Amsterdam, the Netherlands: International Association for the Evaluation of Student Achievement (IEA).
- Organisation for Economic Co-operation and Development (OECD). (2004). *Education at a glance: OECD indicators*. Paris, France: Author.
- Tatto, M. T., Schwille, J., Senk, S. L., Ingvarson, L., Rowley, G., Peck, R., Bankov, K., Rodriguez, M., & Reckase, M. (2012). *Policy, practice, and readiness to teach primary and secondary mathematics in 17 countries: Findings from the IEA Teacher Education and Development Study in Mathematics (TEDS-M)*. Amsterdam, the Netherlands: International Association for the Evaluation of Educational Achievement.
- Wang, A., Coleman, A. B., Coley, R. J., & Phelps, R. P. (2003). *Preparing teachers around the world*. Princeton, NJ: Educational Testing Service.
- Zumwalt, K., & Craig, E. (2005). Teachers' characteristics: Research on the indicators of quality. In M. Cochran-Smith & K. Zeichner (Eds.), *Studying teacher education: The report of the AERA Panel on Research and Teacher Education* (pp. 157–260). Washington, DC: American Educational Research Association.

CHAPTER 8:

REGULATION AND ACCREDITATION OF TEACHER EDUCATION INSTITUTIONS AND PROGRAMS

Lawrence Ingvarson

This chapter focuses on policies for the regulation and accreditation of teacher education programs in each of the 17 countries participating in IEA's TEDS-M survey.

Most of the countries have a government agency with a general responsibility for auditing the academic quality of their higher education institutions. National or state governments usually establish these agencies. The European Universities Association and the Asia-Pacific Quality Network are examples of international associations made up of such agencies. Some countries only require evidence that institutions are regularly conducting internal reviews of their performance. Others also require an independent external quality-assurance agency to conduct periodic reviews of universities.

Some countries also have agencies with more specific responsibilities for assuring the quality of programs, especially programs that prepare students for the professions. These agencies focus on assuring that programs produce graduates who are competent to practice in the relevant profession. In some countries, these agencies are known as "accreditation" agencies. Their function is to assess whether a professional preparation course, or program, or institution meets specified standards and to approve those that do. Some countries, such as Canada and the United States, also have agencies for accrediting accreditation agencies. Examples are the Association of Accrediting Agencies of Canada and the Association of Specialized and Professional Accreditation in the United States.

Accreditation Agencies

The term *accreditation* in this report refers to an endorsement by an external agency that a teacher education program is able to produce graduates who are competent to enter the profession and to begin practice. The country report from the United States¹ quotes a similar definition of accreditation:

Accreditation has been defined as "A quality assurance process based on program review ... a means to verify the quality of academic programs and of institutions to external stakeholders. The accreditation process most often involves a formal review, with self-study of a specific academic program, evaluations by peers and external constituents and a report to the agency, association or organization that will certify program quality." (Lubinescu, Ratcliff, & Gaffney, 2001, p. 8)

Accreditation agencies vary. They might be part of a national ministry of education (as with the National Agency for Quality Assurance and Accreditation in Spain). They might be set up by governments as independent statutory authorities (as with the Ontario College of Teachers), or they may be established by professional bodies themselves or by not-for-profit private bodies (e.g., the National Council for Accreditation of Teacher Education in the United States). They may operate at the national level or the state/provincial level. Many have a certification or licensing function for beginning teachers as well as an accreditation function.

¹ Written by P. Youngs and E. Grogan.

The General Teaching Council for Scotland (GTCS) is an example of a statutory, independent professional agency with responsibility for both accreditation of programs and certification (registration) of graduates. The council has been accrediting teacher education programs for over 40 years. Only graduates from universities accredited by the GTCS are eligible for registration (certification) to teach in Scotland. Conversely, a few countries, such as the United States and, to some extent, Canada, have a tradition whereby independent agencies can set themselves up as providers of a voluntary accreditation service for professional preparation programs in universities. The National Council for Accreditation of Teacher Education (NCATE) in the United States, established over 50 years ago, is a well-known example of an independent accreditation agency.

There are few examples of independent, professional accreditation agencies, such as NCATE, among the countries that participated in TEDS-M. For most of these countries, the national or state government establishes agencies to assure the quality of teacher education providers and programs. In the Philippines, the accrediting organizations are recognized by the Commission on Higher Education (CHED), which is responsible to the Minister for Education. Sometimes they are statutory authorities, such as the Norwegian Agency for Quality Assurance in Education (NOKUT), the Ontario College of Teachers, and the Office for National Education Standards and Quality Assessment (ONESQA) in Thailand. There is a decided move within the European community to establish or strengthen accreditation agencies, as part of the Bologna process and to facilitate mutual recognition of tertiary qualifications.

Accreditation in Other Professions

It is relevant to note here that there is a strong trend in other professions, such as engineering and accountancy, to develop not only national but also international systems of accreditation (Ingvarson, Elliott, Kleinhenz, & McKenzie, 2006). In some cases, such as engineering, national accreditation agencies develop agreements for the mutual recognition of one another's accreditation systems. In others, such as accountancy, international agencies set themselves up as providers of a voluntary accreditation service.

Arrangements for mutual recognition of accreditation systems between countries are also evolving in teaching. An informal international organization of teacher registration agencies from British Commonwealth countries has been working on mutual recognition for several years. European countries are also working toward a common approach to the accreditation of higher education institutions and professional preparation programs. Interestingly, the Oman country report² mentioned that it has been seeking accreditation from foreign organizations, such as the NCATE in the United States, with the accreditation process similar to that obtained by Oman's College of Engineering from the international Accreditation Board for Engineering and Technology (ABET). Another form of mutual "recognition" is through the formation of consortia of universities, such as the International Alliance of Leading Education Institutes (IALEI) from Australia, Brazil, Canada, China, Denmark, South Korea, Singapore, the United Kingdom, and the United States (<http://www.intlalliance.org>).³

² Written by M. Al Ghafri, A. Al Abri, and M. Al Shidhani.

³ In 2008, the alliance produced a report, *Transforming 21st Century Teacher Education* (IALEI, 2008), which contained case studies of innovations in teacher education.

Studies on the Accreditation of Teacher Education

As indicated in Chapter 5 of this volume, many countries are paying increasing attention to developing effective procedures for promoting quality teacher education and monitoring the effectiveness of teacher education programs. There is increasing pressure for accountability in teacher education. However, as Wilson and Youngs (2005) found in their extensive review of practices in the United States, there is little empirical research on the impact of accreditation.

Traditional modes of accreditation usually focused on gathering information about inputs to teacher education programs, such as the content of the curriculum, the nature and use of resources, and the staffing profile. More recently, there has been increasing international interest in modes of accreditation based on the outcomes of teacher education programs. This has led to greater research interest in more valid methods for assessing the performance of graduate teachers against professional standards (see, for example, Gitomer, 2009; Kennedy, 2010).

In addition, as Wilson and Youngs (2005) point out, questions are being asked about the relationship between internal and external purposes for accreditation. Ideally, external modes of accountability should encourage institutions to engage in internal review practices that enable them to understand and address their own weaknesses. However, while not wishing to devalue the importance of self-evaluation, the focus in this current report is mainly on the external purposes of accreditation.

The Eurydice study of accreditation practices in Europe was also mentioned in Chapter 5 of this report (Eurydice, 2006). The purpose of this survey was descriptive: the report of the study maps the processes for evaluating and accrediting institutions and programs for initial and inservice teacher education in each country (p. 7). It shows the main characteristic structures of quality-assurance systems in place without embarking upon a detailed analysis of particular aspects of such systems. No attempt was made to examine relationships between quality-assurance processes and the quality of teacher education, or the outcomes of teacher education programs. The Eurydice report defined accreditation as a

process by which an institution or a programme is judged by the relevant legislative and professional authorities as having met predetermined standards in order to provide (teacher) education or training and to award the corresponding qualifications (where they exist). The accreditation procedure presupposes that the programmes or institutions to be accredited are evaluated. (p. 7)

In reviewing official regulations for the evaluation of initial teacher education, the report distinguished *general regulations* on the evaluation of higher education that include the evaluation of teacher education programs from *specific regulations* that apply only to a particular stage of initial teacher education.

Of the 30 countries in the Eurydice study, most (24) had only general regulations for the evaluation of higher education institutions in 2004. Most did not have specific evaluation systems geared to teacher education institutions or programs. In six countries, both general and specific regulations governed evaluation of teacher education. The specific regulations usually applied to a particular stage of initial teacher education, such as the final phase of professional training, or to a particular part of it in the consecutive model, or the induction phase.

In Germany, for example, the report found that specific regulations applied solely to the evaluation of the second, “on-the-job” qualifying (induction) phase, organized by the teacher training institutes (*Studienseminare*) in each *länder*. The situation is similar in France where, besides general regulations, specific regulations apply to the evaluation of training that the university institutes for teacher education provide for teacher education (*Institut universitaire de formation des maîtres*). The TEDS-M country report from Poland, however, pointed out that “teacher education provided by universities is evaluated in accordance with general regulations for quality control in higher education, whereas specific regulations apply in the case of teacher training colleges.”

As discussed in Chapter 5 of this volume, the Eurydice report made clear the complexity and diversity of external quality-assurance systems throughout the world. It also identified the different types of people who become external evaluators of initial primary or general teacher education, and the variety of official documents informing external evaluation criteria. As stated in Chapter 5, the report furthermore made clear that external evaluations encompass many and diverse features, and it described the (also diverse) procedures used in these evaluations.

Accreditation of Teacher Education Within the Context of TEDS-M

In line with the approach with the 2006 Eurydice study, the findings reported in this chapter are descriptive. They describe accreditation practices in different countries, as well as central requirements for the content, the practicum, and the staffing of teacher education programs. However, the intention is to present this information in a way that will facilitate later exploration of relationships between these practices and data gathered in other parts of TEDS-M.

Unlike the Eurydice study, TEDS-M drew together a considerable range of data about teacher education and its outcomes in each of the participating countries. This includes information from teacher educators about their institutions and programs. It also includes information from future teachers about their experiences with these programs and the outcomes of them, such as future teachers’ mathematics knowledge and their beliefs about their preparedness for teaching.

A question of general interest to policymakers is “Does accreditation make a difference?” A more useful question to ask, perhaps, is “Under what conditions do accreditation systems make a difference?” For example, accreditation systems are increasingly based on detailed standards about what beginning teachers should know about the subjects they are expected to teach and how to teach those subjects. TEDS-M was not, however, designed in a way that has enabled definitive answers to these questions. Nonetheless, the information presented in this chapter can be useful, for example, in exploring relationships between national policies concerning accreditation and the nature and quality of teacher education programs, as reported by future teachers. This information is used later in this report to investigate whether there is an association between different types of accreditation systems and TEDS-M outcomes, such as the mathematics knowledge of future teachers.

Method of Data Collection

As with the previous chapter, this chapter is based on information that the TEDS-M national research coordinators (NRCs) provided in 2008 in two forms—the country reports and NRC responses to a questionnaire about teacher education called the route questionnaire. It is important to note that this section describes the situation as it was in 2008.

The guidelines for the country reports asked NRCs to address questions about policies and practices for the regulation or accreditation of teacher education programs in their country. These included questions about the names and types of agencies involved, whether accreditation was compulsory, how frequently assessments were conducted, the procedures used and how, and whether any institutions had been denied accreditation over the past 10 years.

When preparing their country reports, the NRCs were asked to address the following questions, with special reference to the preparation of mathematics teachers:

- Who decides which institutions are allowed to train teachers?
- How do they make that decision?
- What policies and agencies are in place to monitor and assure the quality of teacher education institutions and programs?
- What procedures, if any, are used by external agencies for assessing and accrediting the quality of teacher education institutions or programs?
- Finally, what requirements are laid down for the curriculum, the practicum and school experience, and staffing in teacher education institutions and programs?

The authors of and titles for each country report appear on pages 19–20 of this volume.

Classifying Systems for Regulating and Accrediting Teacher Education

The country reports prepared by the TEDS-M NRCs provide a rich body of information about current accreditation arrangements in the participating countries. Summaries of these responses from each country are provided below. This information shows that countries varied markedly in terms of the locus of authority for regulating and accrediting teacher education programs and institutions. They also differed in terms of the nature and strength of central regulation and its capacity to shape and assure the quality of teacher education.

For the purposes of this report, it was important to find an economical way to represent this diversity. We looked to related studies to find ideas for profiling or classifying arrangements for regulating teacher education programs. The 2006 Eurydice study explored in Chapter 5 provides one example. This study distinguished general systems for assuring the quality of higher education from systems specifically geared to assuring the quality of professional preparation programs, such as teacher education. The Eurydice study was, essentially, an attempt to classify countries according to the rigor of their systems for monitoring and assuring the quality of teacher education providers and programs. The key question, however, relates to how to ensure these systems operate in a way that makes a difference to how well new teachers are prepared.

In England, for example, which was one of the countries that participated in the Eurydice study, there is a clear distinction between the agency responsible generally for the review of all higher education institutions, the Quality Assurance Agency (QAA), and agencies specifically responsible for evaluating and accrediting professional preparation programs within these institutions. The latter include the General Medical Council in the case of medicine and the Training and Development Agency (TDA) in the case of teacher education.⁴

The TDA provides an example of a strong central system for assuring the quality of teacher education providers. A statutory body responsible for developing standards for evaluating teacher education programs, as well as standards for “newly qualified teachers,” the TDA treats teacher education institutions as service providers to government. Relative to agencies in other countries in the study, the TDA enables a tight coupling between national policies for quality assurance and arrangements for evaluating teacher education institutions and programs.

Another agency in England, the Office for Standards for Education (Ofsted), carries out “inspections” of teacher education providers for the TDA, using standards developed by the TDA. Inspections include site visits to observe not only teacher educators but also student teachers in schools. Teacher education providers are judged “outstanding,” “satisfactory,” or “inadequate.” Providers found inadequate may have the number of students for whom they receive funding reduced. Alternatively, the TDA may cease to require their services. Since the mid-1990s, the TDA has actively encouraged providers other than universities to offer teacher education. Whether the TDA has improved the quality of teacher education in England remains an open question. However, the TDA does provide evidence which suggests that, over the years, graduate teachers have become increasingly satisfied with their training.

Only a few countries in TEDS-M have quality-assurance arrangements for teacher education programs as highly regulated as those in England. Until recently, several had neither general nor program-specific external quality-assurance systems. The ongoing considerable variation across participating countries led to one of the main research questions addressed by TEDS-M, namely, the extent to which there is an association between external accreditation arrangements and TEDS-M outcomes. As mentioned above, addressing this question requires a defensible way of profiling or classifying the nature of quality-assurance arrangements for teacher education programs in each country.

When endeavoring to classify the variety of regulatory systems operating in the countries participating in TEDS-M, we decided to use the following typology, which is adapted from the one used in the 2006 Eurydice study.

1. Countries without compulsory systems for evaluating and accrediting all higher education institutions in general or teacher education programs in particular.
2. Countries with agencies responsible for accrediting higher education institutions, but with limited requirements for evaluating specific teacher education programs.
3. Countries with agencies responsible for accrediting teacher education institutions, but with accreditation decisions based mainly on internal evaluations conducted by institutions. Agencies in these countries have no power to conduct independent, external evaluations, or to disaccredit programs.

⁴ The TDA has been discontinued and its functions absorbed into the Department for Education and Science.

4. Countries that require teacher education institutions or programs to be evaluated by an independent, external accreditation authority or agency, and that have the power to disaccredit institutions or programs.

Accreditation of Teacher Education in Each TEDS-M Country

Exhibit 8.1 shows the countries participating in TEDS-M study classified according to the above typology in 2008, the time when the data for TEDS-M were collected. It is important to again note that, since that time, several countries have moved to new accreditation arrangements. These countries include the European Union member countries that are moving through the Bologna process. Although Exhibit 8.1 focuses mainly on arrangements for programs training primary teachers, there is considerable overlap in the quality-assurance arrangements for primary and secondary teacher education.

Caution is needed when interpreting this exhibit, although the NRCs from each country carefully checked it for accuracy. As a generalization, the strength of the regulatory system increases from Group 1 to Group 4. However, the mere presence of an accreditation agency is not necessarily a clear indication that it exerts a major influence on the quality of teacher education or that teacher education standards are high, or the reverse.

Some countries have national teacher education accreditation bodies, but these bodies lack the authority to evaluate programs rigorously, or to disaccredit poorly performing programs. For example, although Botswana, Chinese Taipei, the Russian Federation, Thailand, and the United States are alike in having agencies for accrediting teacher education, it is clear from the country reports that these agencies differ in their power to gather direct evidence about the quality of teacher education programs and their graduates.

Group 1: Countries with weak regulations or voluntary systems only for the evaluation and accreditation of teacher education programs

The countries in this group are the TEDS-M countries least regulated in terms of evaluating and accrediting their teacher education programs.

- *Chile:* Chile is among the countries that are in the process of rapidly reforming their teacher education systems in line with reforms to their school systems. However, at the time of the TEDS-M data collection, Chile had no direct regulatory powers over teacher education carried out by the Ministry of Education or any other public body. Past governments had adopted a market approach to the development of higher education. As a result, a large number of unaccredited private universities and professional institutes were established in the 1980s and 1990s. In 2008, these organizations trained just over 70 percent of teachers intending to teach in the country's "basic schools" (Years 1 to 8). Chile does have, however, active networks that operate across the university sector and are designed to promote quality. The deans of faculties of education in traditional universities, for example, have a longstanding organization that meets two or three times a year.

Exhibit 8.1: Accreditation systems for teacher education in the TEDS-M countries

Regulation of Teacher Education	Country	Special Features
Group 1: Unregulated teacher education systems or voluntary accreditation only	Chile	No direct regulatory powers over teacher education in the hands of the Ministry of Education or any other public body at the time of TEDS-M. Sharp increase in unregulated private providers in recent years. A National Accrediting Commission has been established, but as yet has no power to close a program that does not meet its standards.
	Georgia	Accreditation system exists, but application for accreditation of university programs is voluntary. The Commission on Higher Education recognizes existing accreditation bodies. The Philippines also has a relatively large number of unaccredited teacher education programs in private universities.
	Oman	Two types of accreditation—institutional and program. Only the former is operational.
	Philippines	No accreditation system. However, external international program reviewers can be used.
	Germany	At the time of TEDS-M, Germany did not have an accreditation system for the first phase of teacher education. Universities had only to show they were following very general state requirements for each course. However, Germany does have specific arrangements for teacher education in the second phase, with responsibility for these exercised by the Ministry of Education in each federal state; external evaluation is deemed not compulsory.
Group 2: Countries with agencies responsible for the accreditation of higher education institutions, but with limited requirements for evaluating specific teacher education programs	Spain	Created in 2001, Spain's National Agency for Quality Assessment and Accreditation was recently restructured as the Spanish agency responsible for quality evaluation, accreditation, and certification of higher education. It verifies and accredits all curricula leading to an official university degree. The agency carries out inspections of higher institutions every six years, and assesses and accredits the merits of teaching staff. However, at the time of TEDS-M, no teacher education programs had been the subject of such a procedure.
	Switzerland	The Swiss Conference of Cantonal Ministers of Education has the main coordinating responsibility for teacher education. However, teacher training institutes have merged with more autonomous universities in recent years. Switzerland has no formal procedures for external evaluation of individual programs.
	Malaysia	Programs offered by universities have to be accredited by the Malaysian Qualification Agency. The Ministry of Education is responsible for programs offered by the teacher education institutes.
Group 3: Countries with agencies responsible for the accreditation of teacher education institutions, but based mainly on internal evaluations conducted by institutions—no independent, external evaluation	Norway	The Norwegian Agency for Quality Assurance in Education, established in 2002, conducts audits of internal quality assurance systems, but at the time of TEDS-M, no teacher education programs had been the subject of such a procedure.
	Poland	The State Accreditation Committee conducts mandatory evaluations of institutions and programs. Teacher education provided by universities is evaluated in accordance with general regulations for quality control, whereas specific regulations apply to teacher training colleges.

Exhibit 8.1: Accreditation systems for teacher education in the TEDS-M countries (contd.)

Regulation of Teacher Education	Country	Special Features
Group 3: External evaluation and accreditation of teacher education providers by a government, statutory, or professional agency, and with power to disaccredit programs.	Botswana	Has two quality-assurance agencies—the self-accrediting University of Botswana and the Tertiary Education Council (TEC). The University of Botswana in collaboration with the TEC acts as the accrediting body for the university colleges.
	Canada	Varies with province. Ontario and Québec have independent, statutory accreditation authorities with power to disaccredit.
	Chinese Taipei	One national agency with clear legislated responsibility for program development and evaluation.
		Use of professional experts. First-hand evidence about programs gathered from a variety of sources. Agency acts on its evaluations and recommends termination of, or decrease of admission to, weak programs.
	Russian Federation	The Federal Education and Science Supervision Agency carries out licensing, certification, and state accreditation of educational institutions.
	Thailand	Universities are required to conduct internal evaluations. The Office for National Education Standards and Quality Assessment carries out external quality-assurance procedures every five years.
	United States	Most states have compulsory course approval requirements. Independent national agencies also provide a voluntary accreditation service. However, significant numbers enter teaching via “alternative routes,” some of which are unaccredited.
Special case	Singapore	Only one teacher education provider. Close links with Ministry of Education. Strong feedback systems on program quality. External evaluation by international expert peers in relevant specialist fields, such as mathematics education. Singapore moved toward a culture of self-improvement with the establishment of the Office of Academic Quality Management in 2009.

- *Oman:* The Oman Accreditation Council, established in the Sultanate of Oman by royal decree in 2001, is charged with assisting in the development of the Omani higher education sector. This work is conducted through institutional quality audits and institutional and program accreditation processes. The council, in collaboration with the Ministry of Higher Education, is also responsible for establishing academic standards and providing training and networking opportunities. By 2007, the council had developed a quality audit plan for all higher education institutions. It also had in place a timetable for carrying out this task, which covered all private and public institutions. So far, no accreditation processes have taken place in the colleges of education. An interesting feature of the Oman system is its use of international reviewers to evaluate its teacher education programs, a feature it has in common with Singapore.
- *Philippines:* Responsibility for developing or revising teacher education programs in the Philippines rests with the Commission on Higher Education. However, application for accreditation of teacher education programs is voluntary. The Philippines recognizes two systems of accreditation—one for private colleges and universities, the other for government (i.e., state and local colleges and universities). The Philippines also has a large number of unregulated private, as well as public, providers of teacher education.
- *Georgia:* The Law on Higher Education of Georgia regulates the process of accreditation. In accordance with the law, the accreditation process started in 2004. It consisted of two main aspects—institutional and program (content) accreditation. The law's legal framework defines accreditation as the procedure for confirming the status of a higher education institution or an educational program by the state (more exactly, confirming permission for higher education to issue relevant documents such as a diploma, a certificate, etc.). Consequently, there are two types of accreditation procedure. The first is institutional (concerning the entire institution), and the second is program (relevant to each academic program offered at a higher education institution). Currently, only institutional accreditation is under implementation. There are no specific guidelines for accrediting teacher education programs. If institutional accreditation is required, the state automatically considers the institution's academic programs to be accredited as well.

Group 2: Countries with agencies responsible for accrediting higher education institutions, but with limited requirements for evaluating specific teacher education programs

At the time of TEDS-M, countries in Group 2 did not have specific arrangements for external evaluation and accreditation of teacher education programs. Although Germany, Spain, and Switzerland had general regulations that applied to universities and their courses, they did not have external agencies with specific responsibilities for evaluating the quality of teacher education providers and programs. (Accreditation systems have since been introduced in Germany and Spain that apply to all programs.) This state of affairs should not be taken as a comment on the quality of entrants to teacher education or teacher education in itself, but simply as a statement of a feature that these countries share.

In other respects, the German system differs from the systems in the other countries in that it is the only country where the major providers of teacher education (in Phase 2) are the federal states, which are also the major employers of teachers. Specific regulations

apply solely to the evaluation of this second, “on-the-job” qualifying (induction) phase, which is organized by the teacher training institutes (*Studienseminare*) in each *länder*. External evaluations, however, are not compulsory. The managers of universities or teacher training colleges—or the minister of education in the case of the *Studienseminare*—are entitled to request an external evaluation if they consider this to be necessary in the light of internal evaluation results.

- *Spain*: Like Chile, Spain is in a period of rapid change with respect to the regulation of teacher education institutions. Universities have traditionally enjoyed a high degree of autonomy. More recently, however, the central government (generally, the Ministry of Education) laid down common curriculum guidelines for teacher education programs. These include the number of common core subjects that are compulsory for all universities; the number of obligatory subjects each university offers and that all students at that university must therefore take; the number of optional subjects that each university offers, with these generally corresponding to each branch of study; and the free choice subjects (i.e., students can choose which ones to take) that the university offers. This last group of subjects provides greater flexibility in the curriculum.

The 2006 Organic Law on Education states that the content of initial teacher education must ensure that future teachers acquire the teaching skills necessary to cope with the challenges facing the education system. Under the law, initial teacher education had to adapt by 2010 to the graduate and postgraduate system of the European Space for Higher Education. Curricula now have to be validated by the new National Agency for Quality Assurance and Accreditation (ANECA), or similar agencies in the different autonomous communities, and published in the *Official State Gazette* before they can come into effect.

At the time of TEDS-M, ANECA had yet to accredit qualifications based on the new curricula that universities were trying to introduce in Spain. The authors of the Spanish country report expected that, by 2010, ANECA and other agencies would have verified and accredited all new primary education degrees as well as all the Master’s degrees (needed by secondary education teachers) of all the Spanish universities that intended offering them.

- *Switzerland*: The Swiss country report described a complex set of influences on teacher education programs at the national, cantonal, and institutional levels. However, the report’s authors rated the strength of external quality-assurance or accreditation mechanisms as only “moderate.” In Switzerland, the main responsibility for education and culture lies with the cantons. They coordinate their work at the national level. The 26 cantonal ministers of education together form a political body called the Swiss Conference of Cantonal Ministers of Education, to carry out this work. The ministers define standards for teacher universities, which cantonal officials then establish. The report’s authors noted that, in the near future, the regional process of accreditation would be unified into a federal one.

Teacher education institutions have to undergo an accreditation process conducted by national and international experts and based on an elaborate application submission from the teacher education university. The process includes analyses of documents as well as interviews with several members of the institution (management, lecturers, administrators, and students).

Teacher education universities are public institutions with rigorous obligations (budget, rules of employment, qualification of professors, admittance of students, standards of examinations, etc.). These universities also have to implement a quality management system, which in most cases is the European Foundation for Quality Management. A forthcoming nationwide accreditation process (instead of the recent regional processes) will be performed by agencies (e.g., the Swiss Center of Accreditation and Quality Assurance in Higher Education) provided by the federal government (www.oaq.ch).

Federal accreditation ordinances define standards for the curriculums of the study programs that lead to a teacher license. Students are required to gain a specified number of credits in each of the different subjects offered.

Group 3: Countries with agencies responsible for accrediting teacher education institutions, based mainly on internal evaluations conducted by the institutions

The defining feature of the Group 3 countries is that although they have agencies responsible for regulating teacher education, their purview extends only to ensuring that providers implement procedures for internal review. In the language of the Eurydice study, these agencies have no power to conduct independent, external evaluations, or to disaccredit programs.

- *Malaysia:* The Malaysian Qualifications Agency (MQA), established in 2007, is responsible for accrediting all higher education programs, including teacher education. Previously, programs for primary teachers were the responsibility of the Teacher Education Division of the Ministry of Education, which provided a centrally determined curriculum for primary teacher education institutes to implement. Programs provided by universities were internally developed and evaluated by the universities, with this work then submitted to the Ministry of Higher Education for approval.

The long-term objective of the MQA is for all institutions to become self-accrediting institutions. To this end, the Ministry of Higher Education has published standards for teacher education. Reviews will be conducted every three to four years, and feedback will be obtained through student evaluations. External assessors will assess program quality and check assessment procedures. The MQA will expect institutions to conduct internal audits, and to have MQA auditors assess programs on site. Transparency of the process will be assured by using nationally agreed guidelines on criteria and standards for educational programs as well as nationally agreed procedures for conducting quality assurance. The Public Service Department will be the agency responsible for recognizing a particular degree, with recognition based on accreditation given by the MQA.

- *Norway:* The Norwegian Agency for Quality Assurance in Education (NOKUT), an independent agency established in 2002, is responsible for conducting external quality assurance in higher education. NOKUT audits an institution's internal quality assurance work in relation to a set of broad national criteria. These now include the European standards and guidelines for internal quality assurance in institutions of higher education, adopted through the Bologna process. NOKUT's evaluations cover an institution's quality-assurance system as a formal structure, the documentation it produces, and the institution's own assessment of quality throughout its portfolio. The audits are designed to detect indications of inferior quality, or instances where documentation of satisfactory internal quality assurance is lacking. They are supposed

to be carried out in a manner that helps the institution develop a quality culture supportive of a state of continuous improvement. The audits cannot themselves lead to an institution's loss of accreditation, but may produce indications that trigger a "revision." NOKUT can evaluate a complete field of higher education, as was done for teacher education from 2004 to 2006.

- *Poland:* Polish higher education institutions have had substantial autonomy in relation to both academic and budgetary functions, although they must operate within national curriculum guidelines for each field of study. Standards exist for each type of teacher education program, including the competencies expected of graduates. The expansion of higher education in the 1990s was accompanied by a dilution in the quality of entering students. Initiatives in the area of external quality assurance emerged in response.

In 1993, the General Council for Higher Education (GCHE), the major advisory body operating within the ambit of Poland's Higher Education Law of 1990, developed a framework for quality assessment of education. In 1997, the government established the Accreditation Committee for Higher Vocational Education (ACHVE). In parallel, higher education institutions began to set up their own peer-accreditation committees for specific types of institutions or fields of study. Between 1993 and 2001, seven such committees were set up for classical, technical, medical, agricultural, pedagogical, and physical education universities, and arts education institutions, with two further committees covering economics, business, and management studies. They now work under the auspices of the Polish Conference of Rectors of Academic Schools.

In 2001, Poland established its State Accreditation Committee (PKA). It took on the responsibilities of the ACHVE and the GCHE with regard to applications for new institutions and programs. The PKA is the only statutory body for mandatory external quality assessment and accreditation whose decisions are legally binding. It is also a fully independent body. In particular, PKA conducts subject-area reviews in higher education institutions, which include site visits and self-evaluations prepared by institutions.

Group 4: Countries that require evaluation of teacher education programs by an independent, external accreditation authority or agency, with power to disaccredit

Countries in Group 4 are similar in the sense that they have a relatively strong system of compulsory external accreditation. In practice, most have actually disaccredited some programs. However, there are marked differences among these systems as well.

- *Botswana:* Botswana includes the English model of an external examiner, usually a highly regarded academic in the field. In addition, its main university, the University of Botswana, is jointly responsible, with the Tertiary Education Council, for quality assurance of teacher education programs provided by other higher education institutions.
- *Canada:* The Ontario College of Teachers, established in 1997, accredits initial teacher education (preservice) programs offered in Ontario that meet regulatory requirements for accreditation. Accreditation is granted to an education program that meets or exceeds the requirements outlined in Regulation 347/02 (Accreditation of Teacher Education Programs). Interestingly, the college invites members of the public to make submissions related to the quality of initial (preservice) teacher education programs under review, and it also posts reports of professional teacher education programs on its website.

- *Chinese Taipei*: The current teacher education system in Chinese Taipei is regulated by the 1994 Teacher Education Act (TEA). After passage of the Act, the Ministry of Education expected that many universities would apply to establish teacher education centers and programs. A fair, objective, and high-quality evaluation system was therefore needed to control the quality of the centers or programs, and to assure teacher quality. To reach this goal, the government established an objective, professional committee in 1995 to evaluate and deliberate on teacher education matters. In the same year, the government also established a Teacher Education Review Committee (TERC; *shi zi pei yu shen yi wei yuan hui*) to address teacher education issues. Later on, in 2002, the government raised the regulation establishing the TERC by one statutory level and included it in an amended TEA. One year later (2003), the government put in place its most recent regulations governing the TERC. These are known as “The Ministry of Education’s Regulations Governing TERC.”

TERC exercises a strong influence over providers. A feature of this quality-assurance system is the extent to which the Ministry of Education entrusts experts and scholars in academia to research, plan, and make proposals through the committee. These proposals are then passed by the Legislative Yuan (Chinese Taipei’s national legislature), signed by the president, and enforced by the Executive Yuan (or cabinet). These regulations establish the targets, institutions, curricula, and related contents of Chinese Taipei’s teacher education system.

Since 2005, TERC has adjusted the admission quota of preservice teachers according to regular evaluations. Institutions that receive a third-level rating have to stop admitting students. Those that receive a second-level rating have to decrease student admissions by 20 percent, and those that receive a first-level rating retain the same admission quota.

Accreditation methods are based primarily on field visits. Evaluations focus on distinguishing features the organization, selection, and counseling of students, use of finance, quality of instructors, planning and execution of programs and teaching, educational practicums and associated counseling, employment counseling, and promotion of inservice teacher education.

For the three years prior to 2005, six teacher education universities received third-level ratings and were disqualified from providing teacher education programs. Furthermore, starting from 2005, some institutions terminated their programs due to a lack of applicants. Seventeen teacher education universities have terminated their programs completely and nine have terminated some of their programs. Key features of accreditation in Chinese Taipei are:

1. A clear legislative base for external review;
2. One agency with national responsibility for program development and evaluation;
3. Major responsibility for implementation of program evaluation placed in the hands of professional experts;
4. The accreditation agency collecting first-hand evidence about programs from a variety of sources; and
5. The agency acting on its evaluations by recommending termination or disaccreditation of weak programs.

- *Thailand:* Thailand requires universities to meet requirements for both internal and external quality-assurance procedures. As part of Thailand's Internal Quality Evaluation System, each university is responsible for demonstrating that internal quality-assessment procedures are in place. Once the faculty/institution has completed its internal quality-assurance evaluation, it must publicly disclose a self-assessment report and pass it on to external bodies, which undertake an independent assessment of the quality-assurance submission. After the university has approved a proposed program, it is passed on to the Commission on Higher Education and the Bureau of Cooperation and Promotion. These organizations lay down basic requirements for teacher education, such as the total number of credits to be earned and the length of attendance that preservice teachers must complete in order to graduate from each of the offered programs.

The bodies responsible for quality assurance of teacher education programs in Thailand are:

1. The Teachers' Council of Thailand, which is responsible for accrediting the degrees and certificates. The council is also responsible for accrediting professional diplomas along guidelines set out by corresponding professional associations.
2. The Commission on Higher Education, which is responsible for policy relating to higher education as well as for planning, regulating, and evaluating this area of educational provision.
3. The University Councils, which are responsible, within each university, for approving curricula and students' graduation.

Thailand's External Quality Evaluation System is the responsibility of the Office for National Education Standards and Quality Assessment (ONESQA), which is a public organization. The office assesses every institute offering teacher education programs every five years. When assessing the programs, the office takes considerable care to safeguard the three principles of academic freedom, institutional autonomy, and accountability.

ONESQA assessments focus on the following aspects of each program:

- Philosophy, objectives, and working plans;
- Teaching and learning;
- Student-development activities;
- Research;
- Academic services to society;
- Arts and cultural preservation;
- Management;
- Finance and budgets; and
- Quality-assurance systems and mechanisms.

ONESQA's assessment procedures consist of document evaluation, interviews with executives, staff, and students, school visits, and follow-up visits. During its first cycle of evaluations from 2001 to 2005, ONESQA assessed 260 institutions. During its second assessment cycle, from 2006 to 2010, and so still ongoing at the time of the TEDS-M data collection, assessments were being conducted at both the institutional level and the program level, with accreditation encompassing three "grades"—pass, conditional pass, and fail.

The ratings used in the second cycle of assessments attracted some negative reactions from participating institutes. After ONESQA's first assessment, some of the results and the criteria used during the assessment process were published, which gave the institutions a better understanding of it. At the time of TEDS-M, these institutions were trying to improve their standards in instruction, management, and other ONESQA assessment criteria, with the expectation of good results in the second assessment.

- *United States:* It is difficult to characterize the system for regulating teacher education in the United States, as the country report makes clear. Although all states require teacher education programs to be approved by state agencies or professional standards bodies, requirements and procedures vary from state to state. Of the approximately 1,300 teacher education institutions in the United States, only about half are accredited at the regional or state levels. In addition, at the state level, even those states which have independent professional standards agencies approving teacher education programs may also have alternative procedures for recruiting and licensing teachers that bypass the statutory responsibilities of these agencies. It is difficult, therefore, to generalize about the rigor of procedures for assuring the quality of teacher education in the United States.

A unique feature of the United States' accreditation system is the additional presence of nongovernmental national agencies providing an accreditation service to providers of preparation programs across the professions. However, unlike the practice with respect to other professions, such as architecture, medicine, and law, national accreditation of teacher preparation programs is voluntary. Nevertheless, as of 2007/2008, almost 40 percent of preparation institutions had been accredited by the two national organizations—the National Council for the Accreditation of Teacher Education (NCATE) and the Teacher Education Accreditation Council (TEAC).⁵

NCATE is at the forefront of developing innovative and more rigorous standards-based approaches to accreditation. It has been exploring outcomes-based approaches to accreditation for some years. However, it is difficult to capitalize on the potential of these approaches to improve teacher education when accreditation is voluntary.

The Special Case of Singapore

Singapore does not fall neatly into any of the above categories because it has only one provider of teacher education, the National Institute of Education (NIE). NIE, as part of Nanyang Technological University, has the authority to certify its own programs. Future teachers, who are sent to the institute by the Ministry of Education, are considered to be fully trained teachers once they have satisfied the academic requirements of the respective programs at NIE.

Singapore has no accreditation agency to certify the quality of the teacher education programs that NIE offers. However, it is clear from the Singapore country report that there is a tight coupling between government policy and NIE. NIE is governed by a council chaired by the Ministry of Education's permanent secretary. This form of governance has the advantage of maintaining the strong link between NIE and the ministry and thereby ensuring the relevance of the teacher education programs that the institute offers the ministry's untrained teachers.

⁵ NCATE and TEAC amalgamated in October 2010 to form the Council for the Accreditation of Educator Preparation (CAEP).

Despite Singapore not having an accreditation agency, a feature of the nation's situation is the extent to which NIE has developed systems for gathering independent feedback about the quality of its programs. The dean of the Foundation Programme Office monitors the quality of programs in several ways.

First, he and his team gather feedback from the future teachers toward the end of their training. This is the period when the prospective teachers return to NIE (after their last practicum) to complete a two-week period of enrichment activities and reflection.

Second, the dean and his team conduct regular meetings with school principals to obtain their comments on the performance of the future teachers during their practicums. They also ask the principals about the performance of newly graduated teachers during their probation period.

Third, the dean can call on several committees and taskforces formed to review the implementation of the programs. For instance, in March 2006, lecturers of curriculum studies courses and education studies courses attended a retreat to map out the links between these two types of core courses. The aims of this process were to strengthen understanding of education theories from the generic and discipline perspectives, to include applications of education theories under different situations, to reduce unproductive overlaps in content coverage, and to streamline submission of assignments to these two types of courses. In the following year, from March to May 2007, the dean carried out several activities designed to further examine various assessment issues (Wong, 2007).

Last, but not least, the Foundation Programme Office (FPO) initiates several longitudinal studies to collect feedback from the future teachers. Interim findings are shared among faculty members but the final results are not known until a few years later.

The academic groups that provide teaching staff for these programs also constantly review the delivery of their courses. They draw on input from the external assessors and on student feedback relating to teaching mandated by the university.

Since their inception, NIE degree programs have been validated through a system that calls on input from external examiners from reputable overseas universities. Initially, these examiners checked the standards of the examination papers and moderated the marking of examination scripts and assignments by independently marking a sample of student work. In 2005, NIE abolished this external validation because it felt confident enough, given its strong faculty and reputable research program, to self-monitor the quality of its degree programs. However, the institute did not entirely abandon calling on external assessors. Under this new scheme, also implemented in 2005, NIE invites distinguished teacher educators and/or experts in relevant disciplines from overseas to provide feedback on the content and delivery of the discipline-based courses in NIE's preservice programs.

In 2009, Singapore's FPO set up an External Examiner Panel to review the first cycle of implementation of the institute's revised degree programs. This panel provided feedback on four key areas: teacher education curriculum, teacher education outcomes and standards, teacher performance and management, and the practicum. Most recently, on 1 July 2009, NIE established an Office of Academic Quality Management (OAQM) to develop an evaluation framework designed to strengthen the academic quality of NIE teacher education programs, with emphases on assessing the learning processes and

outcomes of these programs. These activities demonstrate that the quality-assurance mechanism for teacher education programs at NIE is a dynamic process. It responds to current practices, evidence gathered from various sources, alternative perspectives from external experts, and proactive positioning for future challenges.

Changing Nature of Accreditation of Teacher Education Programs

As mentioned above, this review of regulation and accreditation arrangements is based primarily on the situation in 2008 when data were collected for TEDS-M. It is important to again emphasize that the situation in most participating countries is changing so far as accreditation is concerned, in some cases quite rapidly. Georgia, for example, introduced a system for program accreditation, additional to institutional accreditation, in 2010/2011.

In Chile, Law 20.129 (November 2006) established a new independent National Accrediting Commission with responsibility for accrediting higher education institutions. Under this law, all teacher education programs became subject to obligatory periodic accreditation, and had to submit to accreditation within the two years following promulgation of the law. Of the teacher education programs in Chilean traditional universities that put themselves forward for accreditation, 10 out of 17 basic teacher education programs and 10 out of 20 secondary teacher education programs were accredited. However, Law 20.129 does not cover the private universities and institutes that train most basic education teachers.

Countries belonging to the European Union are all in a transition phase given the requirement to develop mutually recognized accreditation systems as part of the Bologna process. Germany, for example, has established a national accreditation council, and a few of its universities are seeing the beginnings of accreditation of their teacher education programs. Nationwide accreditation will require the development of national standards for teacher education, including standards for subject-related pedagogy and subject matter. In Norway, the Norwegian Agency for Quality Assurance in Education (NOKUT) is responsible for ensuring that its work will eventually harmonize with the European standards being developed in accordance with from the Bologna process.

The Omani Accreditation Council has developed a quality audit plan for all higher education institutions (both public and private). The plan includes a timetable for carrying out this task over the next few years. In Spain, the Organic Law on Education 2006 required initial teacher education to adapt to the graduate and postgraduate system of the European Space for Higher Education by 2010. Since 2005, Chinese Taipei has been in the process of implementing its new system for evaluating the country's teacher education centers.

As an observation, it appears that although all these changes come from agencies external to the teacher education institutions, these organizations are actually expected, in most cases, to have their own internal evaluation systems. It would be interesting to know more about this trend. In Singapore, NIE is developing a system of self-improvement that has a new administrative office operating under the auspices of a senior professor. Knowing whether other countries are developing similar procedures for internal evaluations of their teacher education programs would also be interesting?⁶

6 We are indebted to Khoon Yoong Wong from NIE Singapore for this observation.

Who Conducts Accreditation?

The TEDS-M team asked the NRCs, when preparing their country reports, to indicate the extent to which practicing teachers and teacher educators were involved in accreditation procedures. Countries without special regulations for external evaluations would have little opportunity for such involvement. However, with respect to countries where there is an external system, we were interested in who was carrying out the evaluation. The 2006 Eurydice study found that a wide variety of different groups across the countries were involved in this process. The groups, as noted earlier in this volume, included peers, experts in evaluation, inspectors with a teaching background (England), inspectors with an administrative background, students, and foreign experts.

The NRCs rarely mentioned involvement by teachers and school principals, even though these individuals are the ones most likely to be in a good position to make reliable judgments about the preparedness of new teachers. Only two TEDS-M countries reported using formal feedback from former students when evaluating programs. They were Chinese Taipei and Singapore. The Norwegian NRC said teacher educators and students are involved in audits of teacher education institutions carried out by the Norwegian Agency for Quality Assurance in Education.

The NRC reports showed that the extent to which the major responsibility for conducting evaluations was placed in the hands of teacher educators varied. Chinese Taipei and Singapore have already been mentioned as examples of where this is happening to a significant extent. The Teacher Education Review Committee in Chinese Taipei includes 14 professors from teacher education universities, four high school principals, and two teacher representatives among its 27 members.

In Oman, subcommittees chaired by assistant deans for each college of education and a main committee headed by the Deputy Director General of the Directorate General, Colleges of Education, were formed at the beginning of 2003. These committees were assigned the responsibility of supervising implementation of Oman's quality-assurance project.

In Spain, where universities have a high degree of autonomy, the National Agency for Quality Assurance and Accreditation and similar agencies in the different autonomous communities establish committees that consist of a president, academic members, professional members, students (at the discretion of each agency), and a secretary, and makes these individuals responsible for evaluating respective curriculums.

In Botswana, there is a high level of academic involvement through the Centre for Academic Development, the accrediting body, which is based at the University of Botswana. Also, an external examiner is appointed every two years for benchmarking purposes. This person is usually a highly regarded teacher educator and academic.

In the United States, at the national level, there is a high level of professional involvement in the development of the accreditation standards used by the National Council for Accreditation of Teacher Education. Subject associations, such as the National Council for Teaching Mathematics, are also involved in the visitation panels that carry out the assessments. The other national body, the Teacher Accreditation Council, is composed mainly of academics.

In Germany, at the time TEDS-M was conducted, external evaluations were based mainly on peer reviews. In addition, each state had guidelines for teacher education programs, and students had to undergo state examinations. Currently, external evaluations are being carried out by the accreditation institutions in each state. These evaluations use peer reviewers as well as representatives from the state ministries of education.

Accreditation Standards and Procedures

Traditional approaches to accreditation have generally focused on course characteristics or “inputs,” as described by the institution being evaluated. The role of the external visitation panel of experts is to verify this description. Particular attention is given to course descriptions, reading lists, and so on. More recently, and as occurs in many other professions, increasing weight is being placed on evidence about the quality of graduates as measured against the standards expected of beginning teachers. Evidence of quality might be based on classroom observations, tests of professional knowledge (as used in TEDS-M), portfolio entries, surveys of graduate preparedness (also in TEDS-M), and achievement tests of students taught by graduate teachers.

Of the TEDS-M countries requiring external evaluation of teacher education, most were focusing on course inputs. The criteria listed above used by the Office for National Education Standards and Quality Assessment in Thailand (ONESQ) is a good example. ONESQA’s assessment procedures consist of document evaluations, interviews with executives, staff, and students, school visits, and follow-ups.

There were few examples among the country reports of standards-based, or outcomes-based, evaluations. Several states in the United States mandate tests of subject-matter knowledge and pedagogical content knowledge, such as those developed by the Education Testing Service, but these are rarely used in accreditation of teacher education programs. Several states, such as California, mandate classroom observation before granting a license, while other states, such as Connecticut, mandate evidence based on portfolio tasks (Wilson, 2009). These assessments of graduate performance are used for certification purposes, however, not accreditation of the programs that prepared these teachers (Goldhaber, 2010; Sykes & Winchell, 2010).

It is noteworthy that the Commission on Higher Education in the Philippines uses the pass rate for graduates in the Licensure Examination for Teachers (LET), along with adherence to other criteria, in its evaluation(s) of university-based teacher education programs. The LET is administered once a year to all who want to be licensed as teachers at the elementary or secondary school levels.

The Norwegian Agency for Quality Assurance in Education bases its evaluations of teacher education programs on evidence about:

1. *The institution:* Steering of the program, use of resources, staff qualifications, research and development, incentives for development.
2. *The program:* Quality of the program, its professional relevance, inservice education, and mutual knowledge flow between teacher education and the professional field.
3. *The students:* Students’ backgrounds, intake level, working load, rate of course completion, examination results, and students’ final competencies.

The Norwegian country report does not explain how students’ final competencies are assessed before graduating, or what weight is given to such assessments in the evaluation and accreditation of teacher education programs.

In Chinese Taipei, evaluations are based mainly on field visits and include many parts. Evaluations conducted in 2007, included, for example, a status presentation by the teacher education institution, scrutiny of information and related documents, interviews with faculty and staff, interviews with students, field inspections of future teachers' teaching competency, evaluation committee meetings, and comprehensive discussion with evaluators and university staffs. Processes such as these allow the evaluation committee to collect a variety of evidence to aid their understanding of what the evaluated institutions are accomplishing.

As mentioned earlier, the United States has been moving for some time toward outcomes-based accreditation. The National Council for Accreditation of Teacher Education now requires programs to demonstrate evidence that program graduates have acquired relevant subject-matter knowledge and teaching skills, and that they can teach competently (Wise, Ehrenberg, & Leibbrand, 2008).

The council also expects colleges and universities to show that they assess candidate competency before admission, during the course of the preparation program (and including assessment of field-based and clinical experiences), and before the completion of the program and/or before recommendation for licensure. In addition, for each program area (e.g., secondary mathematics, secondary English, elementary education), programs must indicate how candidate assessments relate to the program standards in that area, and they must document evidence of the validity and reliability of those assessments.

In order to secure Teacher Education Accreditation Council accreditation, institutions must provide evidence about the validity and reliability of the assessments they use to determine that their graduates have met performance standards. A team of auditors visits the program to verify the evidence.

We have already noted as a feature of the Singapore situation the extent to which the National Institute of Education (NIE) has developed systems for gathering independent feedback about the quality of its programs. This includes commentary from future teachers at the end of their training and regular meetings with school principals about the performance of these prospective teachers during practicum and about newly graduated teachers during the probation period.

Teacher educators are also given time to attend retreats where they work on committees and taskforces to review the implementation of their programs, to strengthen the coherence of those programs, and to reduce unproductive overlaps in content coverage. Distinguished teacher educators and/or experts in relevant disciplines from overseas are invited to provide feedback on the content and delivery of discipline-based courses, including mathematics, in the preservice programs.

According to the authors of the Singapore report, quality assurance for teacher education programs at NIE is a dynamic, not a one-off, process. It responds, as previously mentioned, to current practices, evidence gathered from various sources, alternative perspectives from external experts, and proactive positioning for future challenges.

Conclusion

This chapter reviewed arrangements that were current in 2008 for the regulation and accreditation of teacher education programs in the 17 countries participating in the IEA TEDS-M survey. The information provided in this chapter shows that these arrangements vary from highly regulated to unregulated across countries. Singapore and Chinese Taipei, for example, had the strongest arrangements, at the time of TEDS-M, for monitoring and evaluating the effectiveness of their teacher education programs in terms of outcomes. While most countries participating in TEDS-M had agencies responsible for the general regulation of higher education, few had rigorous procedures specifically designed for assessing and accrediting teacher education programs.

Many of the TEDS-M countries are, however, in a period of rapid change with respect to accreditation. Given the central importance of teacher quality to student learning, governments are increasingly looking for effective ways to ensure that future teachers are well prepared. The same trend has been apparent for some time in other professions. The common direction is toward more external regulation and accreditation of professional preparation programs based on outcome measures. Some professions, such as engineering and accountancy, have gone further and developed international approaches that provide mutual recognition of accreditation procedures and qualifications across countries (Ingvarson et al., 2006).

We will return to these findings in Chapter 10, which provides a summative discussion of the information provided in this current chapter as well as in Chapters 7 and 9. In summarizing the findings from these chapters, Chapter 10 provides a basis for estimating the relative strength of the quality-assurance arrangements concerning initial teacher education across the TEDS-M countries.

References

- Eurydice. (2006). *Quality assurance in teacher education in Europe*. Brussels, Belgium: European Commission.
- Eurydice. (2009). *Higher education in Europe 2009: Developments in the Bologna process*. Brussels, Belgium: European Commission.
- Gitomer, D. (Ed.). (2009). *Measurement issues and assessment for teaching quality*. Los Angeles, CA: Sage.
- Goldhaber, D. (2010). Licensure tests: Their use and value for increasing teacher quality. In M. Kennedy (Ed.), *Teacher assessment and the quest for teacher quality* (pp. 133–148). San Francisco, CA: Jossey-Bass.
- Ingvarson, L. C., Elliott, A., Kleinhenz, E., & McKenzie, P. (2006). *Teacher education accreditation: A review of national and international trends and practices*. Canberra, ACT: Teaching Australia, the Australian Institute for Teaching and School Leadership. Available online at <http://www.teachingaustralia.edu.au/ta/go/home/projects/teacheraccreditation>
- International Alliance of Leading Education Institutes (IALEI). (2008). *Transforming 21st century teacher education through redefined professionalism, alternative pathways, and genuine partnerships*. Copenhagen, Denmark: Author.
- Kennedy, M. (Ed.). (2010). *Teacher assessment and the quest for teacher quality*. San Francisco, CA: Jossey-Bass.

- Lubinescu, E. S., Ratcliff, J. L., & Gaffney, M. A. (2001). Two continuums collide: Accreditation and assessment. *New Directions for Higher Education*, 113, 5–21.
- Sykes, G., & Winchell, S. (2010). Assessing for teacher tenure. In M. Kennedy, (Ed.), *Teacher assessment and the quest for teacher quality* (pp. 201–224). San Francisco, CA: Jossey-Bass.
- Wilson, S. (2009). Measuring teacher quality for professional entry. In D. Gitomer (Ed.), *Measurement issues in the assessment of teaching quality* (pp. 8–29). Los Angeles, CA: Sage.
- Wilson S., & Youngs, P. (2005). Research on accountability processes in teacher education. In M. Cochran-Smith & K. Zeichner (Eds.). (2005). *Studying teacher education: The report of the AERA Panel on Research and Teacher Education* (pp. 591–644). Washington, DC: American Educational Research Association (AERA).
- Wise, A. E., Ehrenberg, P., & Leibbrand, J. (2008). *It's all about student learning: Assessing teacher candidates' ability to impact P–12 students*. Washington, DC: National Council for Accreditation of Teacher Education (NCATE).
- Wong, K. Y. (2007). *Quality assurance in higher education: A case study from Singapore*. Paper presented at the International Conference on The Challenge for Global Higher Education, Bangkok, Thailand, May 15, 2007.

CHAPTER 9: ENTRY TO TEACHING

Lawrence Ingvarson

Entry to the profession is arguably one of the most critical decision points in assuring teacher quality. Once a teacher gains official entry, he or she may teach for 30 years or more and thereby affect the development of hundreds of students. In some school systems, it can be difficult to remove incompetent teachers without engaging in protracted legal proceedings.

This chapter focuses on policies and practices for assuring the quality of new teachers *after* they graduate from their teacher education programs and *before* they gain full entry to the profession, as described by the TEDS-M national research coordinators (NRCs) in their country reports.

When preparing this section of their country reports, NRCs were asked to address these questions:

- Who decides, and how, whether a beginning teacher has met the requirements for certification and full entry to the profession?
- What policies and agencies are in place to monitor and assure that graduates are competent and qualified to gain certification or a license to teach?

NRCs were also asked about the standards for exit from teacher education programs and entry to the profession for lower-secondary mathematics teachers and primary teachers.

Certification and Entry to the Profession

Various terms are used to refer to an endorsement that an individual has attained a level of knowledge and professional performance necessary to gain full entry to a profession. TEDS-M uses the word *certification*. *Registration* and *licensing* are terms with the same meaning. A government agency, a statutory authority, or an independent professional body may give this endorsement. The certification body is often the same agency as that which is responsible for accrediting professional preparation programs. The Ontario College of Teachers is an example.

In the past, gaining a university teaching *qualification* often led automatically to gaining *certification* from a professional standards agency and eligibility to be employed in schools as a teacher. Traditionally, many countries assumed that graduation from a teacher education program was, in itself, a guarantee that a teacher was competent to practice. That confidence has weakened in recent years, especially in countries that deregulated their teacher education systems during the 1990s, sometimes for ideological reasons. As a result, there has been a trend toward separating the graduation decision (qualification), which is the responsibility of universities, from the decision to grant full entry to the profession (certification). Responsibility for the latter has been placed increasingly in the hands of government agencies or statutory professional standards boards. Examples include the Teacher Professional Development Center in Georgia, the Training and Development Agency in England, and the Teachers Council of Thailand.

These agencies may require graduates of teacher education programs to meet additional criteria, such as national subject-matter knowledge tests, thesis completion, and/or successful completion of a period of induction or probationary teaching in schools. Certification and full entry to the profession as a competent teacher is only achieved after a period of induction and successful teaching experience in schools (i.e., demonstrated achievement of certification standards).

In theory, there is a strong relationship between certification and accreditation, the topic of the previous chapter. Accreditation is a guarantee that a professional preparation program produces graduates who are able to meet entry (i.e., certification) standards. In situations where there is confidence in the accreditation system, certification is usually contingent on graduating from an accredited professional preparation program.¹

Method of Data Collection

The main sources of information for this chapter were the country reports prepared by the NRCs.² While preparing their reports for TEDS-M, NRCs were asked to address the following questions about standards and requirements for entry to the teaching profession:

1. What agency or authority (or authorities) is responsible for providing certification to teachers in your country (e.g., national and/or state governments, national or state statutory authorities, professional or independent/voluntary bodies)? If more than one, what aspects of the certification process does each authority control?
2. What criteria, standards, or requirements does the agency providing certification lay down for entry to the profession, particularly with respect to the knowledge and capacities of (i) future teachers of lower-secondary school mathematics, and (ii) future primary teachers? These criteria might relate to course content, nature and level of mathematics, knowledge of students and student learning, amount of school experience, and so on.
3. Who sets these entry standards?
4. How does the agency determine whether its certification standards, criteria, and capabilities have been met?
5. What evidence does the agency require to determine whether future teachers are ready to teach effectively and should be granted certification (e.g., tests of subject-matter knowledge, observation of classroom practices, completion of induction/mentoring programs, preparation of a portfolio, etc.)?

Requirements for Entry to the Teaching Profession in the TEDS-M Countries

It was clear from the NRCs' country reports that certification policies and practices varied widely at the time TEDS-M was conducted. For some countries, any student who had met the graduation requirements of his or her training institution was deemed, thereby, to have met the requirements for full entry to the teaching profession. There was no other assessment of their readiness to teach and their eligibility to apply for

¹ While certification aims to guarantee that a teacher is competent to teach in a particular field of teaching, teachers in some countries may be placed in situations where they are expected to teach "out of field;" that is, they may be expected to teach subjects they are not trained to teach.

² A full list of country reports and their authors appears on pages 19–20 of this volume.

teaching positions in schools. Other countries had several “filters” at this stage (see, in this regard, Chapter 5 of this publication), including external examinations (e.g., of subject-matter knowledge), a probationary period in a school, and assessments of performance.

When analyzing this information, we had to find an appropriate basis on which to compare the policies and practices countries were using to ensure that graduates were competent to enter the profession. After examining the country reports, we concluded that the TEDS-M participating countries fell into the following three broad groups (also shown in Exhibit 9.1). We also recognized, however, that there was still some variation across the countries within each group.

1. Countries where graduation from a teacher education institution is sufficient to gain entry to the teaching profession and eligibility to teach in schools.
2. Countries where entry to the profession depends on passing further tests set by external certification agencies (e.g., tests of professional knowledge).
3. Countries where certification and/or entry to the profession depend on passing further tests of professional knowledge and formal assessments of performance during a probationary period.

Exhibit 9.2 sets out in more detail the requirements for entry to the teaching profession in each TEDS-M country, other than those set by the respective teacher education institutions themselves. Most TEDS-M countries fall into Group 1. Any student who met the graduation requirements of their training institution is deemed to have met the requirements for full entry to the teaching profession. These countries do not have an external agency or professional standards authority with responsibility for certifying or licensing new teachers. Nor are new teachers expected, after a probationary period in schools, to undergo an evaluation of their ability to meet professional standards before gaining full certification or a license to teach.

Graduate teachers in the Groups 2 and 3 countries are not eligible to enter the profession until they have fulfilled additional requirements or “filters” beyond graduation set by an external regulatory authority. It should be noted that the Exhibit 9.2 summaries present conditions related to gaining entry to the teaching profession and eligibility to apply for teaching positions, such as certification, a license, or registration. It does not provide information about conditions related to employment with particular employers, such as contract periods or tenure.

Group 1: Countries where graduation leads automatically to certification and/or entry to the teaching profession

Poland is typical of countries in Group 1. Graduates with the required educational qualifications are considered competent to teach and enter the profession. There are no further mechanisms for assuring their quality. Nor are graduates required to undertake external examinations or assessments for entry to the profession or certification after graduation. Arrangements in the Russian Federation are similar.

Exhibit 9.1: Requirements governing entry to the teaching profession in the TEDS-M countries

Regulation of Teacher Education	Country	Special Features
Group 1: Countries where graduation leads automatically to official entry to the teaching profession	Botswana	Graduates from colleges of education and the university are eligible to be employed by the Department of Teaching Service Management as teachers to teach in primary and secondary schools after a probationary period. Botswana does not have an agency or authority responsible for licensing teachers.
	Chile	The sole requirement to be appointed to a teaching position for the first time is to have a degree and /or a teaching diploma granted by a teacher education program.
	Georgia	Currently, any candidate holding a Bachelor of Arts in pedagogy, or any other field taught in schools, can enter the profession. However, a new certification scheme will require successful completion of a probationary year and a standards-based test of professional skills and subject-matter knowledge.
	Malaysia	No further requirements after graduation.
	Norway	The government does not require graduates to pass any further national test or to complete any probationary period in school in order to gain full registration and entry into the teaching profession.
	Poland	All candidates who have the required educational qualifications are allowed to teach. There are no arrangements for licensing, nor are there external examinations for candidates wanting to enter the teaching profession after graduation
	Russian Federation	No further requirements after graduation.
	Singapore	Singapore has an integrated system of teacher recruitment and training. Graduates from the National Institute of Education are automatically qualified to teach in the public schools.
	Spain	In Spain, the only requirement to enter the profession is to graduate from a teacher education program. However, to be appointed to a primary teaching position in a state school, graduates have to pass a competitive state examination, which allows them to join the official body of civil service teachers.
	Switzerland	The teaching certificates/diplomas count as the qualification for entry to the teaching profession on probation. There are no further requirements.
	Thailand	Graduates must obtain a Teacher Profession License issued by the Teachers Council of Thailand.
	Canada	In Ontario, graduate teachers must complete 194 days of "successful" teaching to gain registration. The method of assessment was not specified in the country report.
	Group 2: Countries where entry to the profession depends on passing further tests set by external agencies (e.g., licensure tests of professional knowledge)	Oman
Philippines		Graduates are required to take the Licensure Examination for Teachers, administered by the Board of Teachers, under the Professional Regulation Commission. Specialist mathematics teachers must pass a set of specified items in eight mathematics content areas.

Exhibit 9.1: Requirements governing entry to the teaching profession in the TEDS-M countries (contd.)

Regulation of Teacher Education	Country	Special Features
<p><i>Group 3:</i> Countries where entry to the profession or gaining employment depends on passing further tests of professional knowledge and assessments of performance</p>	<p>Chinese Taipei</p>	<p>To be officially qualified as a teacher by the Ministry of Education, graduates must take a common national test, the Teacher Qualification Assessment, held once a year. To gain a teaching position, qualified teachers must then undergo a “screening” process administered by the local governments in two stages. The first consists of written tests designed to assess applicants’ professional and subject-matter knowledge. Qualified teachers who make the second round are assessed through a demonstration of their teaching and through a personal interview.</p>
	<p>Germany</p>	<p>The first and the second state examinations at the end of the two phases of teacher education play the major quality-assurance role. They are conducted by special state institutions. The state establishes examination committees and employs teachers or principals to administer the two state examinations externally. The examinations include assessments of performance.</p>
<p><i>Group 4:</i> Countries where entry to the profession depends on passing further tests set by external agencies (e.g., licensure tests of professional knowledge)</p>	<p>United States</p>	<p>Most states (40) have professional standards boards with requirements for teacher certification additional to graduation, such as tests of subject-matter knowledge and/or performance assessments. However, cut-off scores for passing tests and gaining a license vary markedly from state to state. Various types of alternative routes to certification are also common in some states.</p>

Exhibit 9.2: Requirements governing entry to the teaching profession (additional to graduation)

Country	Is There an External Body Responsible for Certification?	Are There Teaching Standards for Certification?	Are Graduates Required to Sit Written Tests (e.g., of Subject Matter-Knowledge)?	Is There a Period of Provisional Certification?	Is There an Assessment of Performance During Provisional Certification?
<i>Group 1</i>					
Botswana	No certification body	No	No	No. Graduates eligible for employment in Ministry of Education schools	None, but there is a proposal for a registration agency
Chile	No certification body	Yes, but voluntary at this stage	No	No	None
Georgia	Teacher Professional Development Center	Proposed	Proposed	Proposed	Proposed
Malaysia	Yes, the Ministry of Education. No certification body	No	No	Yes—as probationary education officers, for three years	Performance report by school principal and school inspectors
Norway	No certification body	No	No	No	No
Poland	No certification body	No	No	No	No
Russian Federation	No certification body	No	No	No	No
Singapore	No certification body	No, but the National Institute of Education has a set of “Graduate Teacher Competencies”	The National Institute of Education is responsible for the “standards” of its graduates; no further certification after graduation	No, graduates become trained teachers; probation is included but not part of additional certification	No. Assessment during probation is not for certification; it is about performance
Spain	Government	No	No. However, teachers who wish to work in the state school system must pass the state examination	No	No
Switzerland	No certification body	No	No	No	No
Thailand	Teachers Council of Thailand	Yes, the Teaching Performance Standards	No	No	No
<i>Group 2</i>					
Canada	Yes (e.g., the Ontario College of Teachers)	Yes	No	Ontario, for example, requires 194 days of “successful” teaching	Method of assessment not known
Oman	Government	No	Written test and interviews	No	No
Philippines	Professional Regulation Commission	Yes	Yes—licensure examination	No	Left to schools
<i>Group 3</i>					
Chinese Taipei	Ministry of Education	No	Yes, the Teacher Qualification Assessment	No. However, “qualified” teachers must pass a performance assessment before gaining a teaching position	Yes
Germany	The state— <i>Studienseminar</i>	Yes	Yes, second state examination (full day)	No, but the second phase includes a thesis and substantial time teaching in schools	Yes, varies from state to state; several lessons are reviewed, usually by principals
United States	State education departments or professional standards	Yes, in most states	Yes, in 42 states (e.g., Praxis II), but passing standards vary	Yes, in 32 states	Yes, in most states (e.g., Praxis III or equivalent)

At the time of TEDS-M, Botswana did not have an agency or authority responsible for registering and licensing teachers. However, the revised national policy on education (Government Paper No 2 of March 1994) specifies that there should be a taskforce that looks into the formation of a body responsible for registering teachers in Botswana.

The author of the Chile report pointed out that the sole requirement for appointment to a first-time teaching position is to have a degree and /or a teaching diploma granted by a teacher education program within a university or professional institute. There is no other form of certification, nor is there a registration requirement. If a qualified teacher is not available, people who do not have a formal qualification may be allowed to teach if they have a degree or qualification in a related field. They must also obtain permission from Ministry of Education authorities to take up the position on offer. There are no curriculum or practicum requirements. At the time of TEDS-M, teachers entering the public system had to meet no other requirement than a degree or certification by a recognized higher education institution.³

Chile is actually moving in an interesting direction. A Ministry of Education project (Avalos, 2002) produced a set of generic standards consisting of 21 descriptions of what future teachers should know and be able to do. The author of the Chilean country report anticipated that these performance standards would be used in the future as new agencies take on the task of accrediting programs certifying new teachers.

In Georgia, any candidate holding a Bachelor of Arts in pedagogy, or any field taught in schools, can enter the teaching profession. Such candidates do not need an extra certificate issued by any of the responsible authorities. However, as stated in the report from Georgia, a new certification scheme was about to be implemented. Under this scheme, candidates would need to successfully complete a probationary year and a test of professional skills and subject-matter knowledge administered by the National Examination Center. The certificate would be issued by the Teacher Professional Development Center. Provided candidates received a good recommendation from the schools in question, the Teacher Professional Development Center would permit them to take a certification examination administered by the National Examination Center. The examination would consist of two parts—a professional skills test and a subject-matter test. The first one would test whether or not a candidate possessed relevant knowledge as a teacher, as defined by the Teacher National Standard, and it would consist of two basic parts—the actual knowledge of the subject matter and the methodologies required to teach it.

Although it is mandatory for teaching candidates in Georgia to possess a state certificate in order to be considered as eligible to enter the profession, it is not mandatory for the schools to employ only certified teachers. As officials at the Teacher Professional Development Center admit, the areas where individuals do not hold a state-acknowledged certificate are areas, such as remote ones, that traditionally experience shortages of teachers.

Malaysia does not have a body for licensing teacher qualifications. However, graduates with teaching qualifications are required to apply to the Teacher Services Commission, which “vets” the applications and interviews applicants. Based on manpower

³ Today, the General Education Law of 2009 formally recognizes that graduates in relevant disciplines may teach in secondary schools, without a teaching degree, but only for up to four years. After that, they must get a teaching qualification.

requirements for teachers determined by the Ministry of Education, the commission recommends applicants suitable for employment in schools throughout Malaysia. The ministry then selects teachers suitable for “emplacement” in public schools. Public school teachers are first appointed as probationary “education officers” and gain permanency based on positive annual performance reports prepared by the school principal over the first three years.

Future teachers in Norway who have completed an accredited teacher education program do not have to pass any further national test or complete a probationary period in school in order to gain full registration and entry into the teaching profession. Some investigations are underway to pilot a system of support for starting teachers that involves mentoring. This proposal has been strongly featuring in current discussions about reforming teacher education in Norway.

As noted in Chapters 7 and 8, Singapore operates an integrated system of teacher recruitment and training. It does not have an agency to grant licenses for teachers to teach in Singapore. Under Ministry of Education provision, student teachers who graduate from the National Institute of Education are automatically qualified to teach in the public schools.

In Switzerland, the country’s teaching certificates and diplomas count as the qualifications for entry to the teaching profession. There are no further requirements for entry to it, although future teachers spend a long period in schools toward the end of their teacher education programs, and their performance there is subject to assessment.

In Thailand, graduates wishing to take up a teaching position must hold a Teacher Profession License issued by the Teachers Council of Thailand. The country report from Thailand provides details of the standards that graduate teachers must meet in order to complete their teacher education programs successfully and to gain entry to teaching. These cover knowledge-gathering and professional experiences, teaching performance, and self-integrity.

As is evident in Exhibit 9.2, countries in Group 1 usually do not have an external body that sets examinations or licensing requirements for entry to teaching positions. Nor do they have teaching standards for certification (licensure or registration). They furthermore do not have a designated probationary period of provisional certification during which graduate teachers undergo a formal assessment of performance to gain full certification and entry to the profession.

In Spain, the only requirement for becoming a certified teacher is graduation from a teacher education program. Graduation is also sufficient for entering a teaching position in a private school. However, teachers who wish to become civil-servant teachers and teach in state schools must pass a further test. Teacher Certificate graduates⁴ have to pass a postgraduate competitive examination that each autonomous community designs according to national criteria.

These examinations consist of two clearly distinct parts. The first part includes content relating to detailed and specific knowledge about the cultural, scientific, and artistic scope of the profession, and the second part includes topics on general educational content, as well as the basic content of the different subjects taught in primary schools.

4 Note, however, that other certificates and degrees are accepted.

The process is carried out in three phases:

1. The state examination, which consists of some written and oral tests, and are designed to assess candidates' knowledge about the areas of the curriculum they will have to teach in primary school classrooms. The tests also assess candidates' command of pedagogical and teaching resources.
2. A second competitive phase, during which candidates are considered on their merits. Here, various matters are taken into consideration, including, amongst others, the overall average of marks obtained during academic studies, other relevant qualifications, teaching performed outside the system (e.g., when teaching as a supply teacher), and participation in or attendance at conferences.
3. Teaching practice for applicants selected after the first two phases. The aim of this third phase is to evaluate candidates' aptitude for teaching on the basis of their work in classrooms.

In order to be admitted to the official body of secondary education mathematics teachers, candidates must be university graduates, architects, or engineers. They are required to have done the corresponding teaching conversion course and to have taken a specific state examination in the area they are going to teach. This examination is similar to the one described for primary teachers, but it also includes specific tests (during the first phase) of mathematics knowledge and the teaching of mathematics.

In certain cases, a candidate can be appointed to a teaching post in a state educational institution, as in the case of substitute teachers. This situation occurs in order to fill vacancies or to provide a stand-in for a civil servant teacher on leave. Applicants who have taken the above-mentioned competitive state examination, but have not obtained a post as a civil servant teacher, usually fill these vacancies. The appointment and position is for a limited period of time, and the status of these "temporary" teachers can be revoked when their services are no longer required.

Group 2: Countries where entry to the profession depends on passing further tests set by external agencies (e.g., licensure tests of professional knowledge)

It is difficult to generalize about Canada, but provinces such as Ontario and British Columbia have statutory professional standards agencies (e.g., the Ontario College of Teachers) that provide certification (registration) to graduates from universities that they have accredited. All local employing authorities (school boards) and other provinces across Canada recognize this certification. In Ontario, graduate teachers must complete 194 days of successful teaching to gain registration. However, the method of assessment is determined locally.

Oman considers future teachers academically successful when they fulfill all requirements of the teacher education program, including specialization courses and educational courses that cover curricula contents, methods of teaching, practicum courses, and cultural courses for the specified number of credit hours. Graduates are then awarded the Bachelor's degree, which enables them to teach in both public and private schools after fulfilling other requirements such as passing an interview and a written test. Students on a consecutive teacher preparation program need to obtain two certificates, a Bachelor of Science and a professional education diploma, before they can work as teachers in schools.

A special feature of the Philippines is that graduate teachers are required to take the Licensure Examination for Teachers (LET). This is prepared and administered by the Board of Teachers for the Professional Regulation Commission (PRC), an agency that grants licenses to all professions. The board schedules the examination, selects examination centers/sites, and ensures that test security is maintained. It oversees the electronic scoring of the tests and the release of the names of successful candidates. Specialist mathematics teachers must pass a specified number of test items in eight mathematics content areas.

The scope of the LET differs for elementary and secondary teachers. It consists of two parts for elementary teaching applicants—professional education and general education, which have respective weightings (in terms of the total LET score) of 60 percent and 40 percent. The test for secondary-level candidates consists of three parts—professional education, general education, and the field of specialization. The three parts have weightings of 40 percent, 20 percent, and 40 percent, respectively. The mathematics specialization component consists of eight subject content areas: arithmetic and number theory (worth 20% of the total score), basic and advanced algebra (25%), plane geometry (15%), circular and trigonometric functions (10%), probability and statistics (10%), analytic geometry (10%), business mathematics (5%), and calculus (5%).

For both elementary and secondary teachers, the professional education examination consists of 200 items that cover, amongst other content, educational theory, foundations of education, and tests and measurements. The general education test consists of 200 items distributed across science, mathematics, English, literature, history, general information, and values education.

The only criteria that the PRC has in place for allowing teacher education graduates to gain entry into teaching are passing the LET and subsequently gaining a license. Institutions that employ licensed teachers may impose additional requirements on applicants for teaching positions. These could include an interview and/or a teaching demonstration, to make sure that applicants are ready to teach. Readiness to teach is also assessed in the practicum or teaching practice component of the pre-licensure curriculum.

The licensing agency (PRC) leaves the employing institution to conduct assessments to determine whether standards criteria and capabilities have been met. If applicants are required to undertake a teaching demonstration, they are usually observed by a panel of educators and administrators from the hiring institution. Sometimes the applicant is required to take a test of subject-matter knowledge. In some school divisions, applicants for teaching positions undertake a competitive examination. This usually occurs when there are many more applicants than teaching positions available.

Some private schools in the Philippines highly concerned with maintaining their standards and reputation hire mathematics teachers prior to their licensing, but obviously only if they consider these applicants have exceptional ability and potential. However, once they have hired these individuals, they make sure they take the LET as soon as possible. These institutions may even help these individuals maximize their chances of passing the licensure test by having them take advanced education courses designed to aid their professional advancement.

In order to assure the quality of new teachers, countries in Group 2 generally require graduates to take an external entry test, in addition to gaining a university qualification. The responsible body is usually a state or a national government.

Group 3: Countries where entry to the profession depends on passing further tests of professional knowledge and assessments of performance during a probationary period

Graduates from teacher education programs in Chinese Taipei face a rigorous set of quality-assurance procedures before they finally gain a tenured teaching position. After completing their teacher education program with a passing grade, graduates have to take the Ministry of Education's Teacher Qualification Assessment (TQA). If they pass this test, the ministry issues a teaching credential, which officially qualifies graduates to teach. However, if graduates apply for a teaching position in a particular region, they must participate in additional onsite screening and selection processes.

The TQA is held once every year. It takes place two months after the students have finished the education practicum, which occurs at the end of March. The TQA is not only a common national test but also the last step of the quality control of preservice teachers, apart from onsite screening. The TQA is developed by the Ministry of Education's Teacher Qualification Verifying Committee and an administrative work institution appointed by the ministry.

To gain a teaching position, qualified teachers must then undergo a "screening" process that is administered by the school district in two stages. The first stage consists of written tests designed to assess each applicant's professional pedagogical knowledge and subject-matter knowledge. Only a few applicants usually pass the first round. Graduates who make it through to the second round are assessed in terms of a demonstration of their teaching and a personal interview, with these evaluations usually being conducted by two sets of three to five judges, respectively. The judges are usually school teachers and a principal, but occasionally also include university faculty members.

Exit examinations play a major role in the German education system. The same applies to teacher education. The first and the second state examinations, conducted by special state institutions at the end of the two phases of teacher education, also play a major quality-assurance role in the German education system. The state establishes examination committees and employs teachers or principals to administer the two state examinations on an external basis. The second state examination leads to the certificate that allows future teachers to enter the teaching profession. The state carefully monitors the selection process. The institution that delivers the prior training is responsible for meeting the state-determined standards.

Special state institutions (e.g., *Prüfungsamt für Lehramtsprüfungen* for the federal state of Berlin)⁵ carry out the first and the second state examinations at the end of the two phases of teacher education. The head of the examination committee for the first examination must be a teacher who can be exempted from his or her teaching position for this purpose. In larger federal states and in subjects with a high number of graduates, teachers are employed fulltime to organize and administer the examinations. The state also hires the professors responsible for preparing future teachers to carry out the examinations in their areas of specialization. They not only give self-prepared written assignments to the future teachers but are fully responsible for assessing these assignments. The examination committee carries out the final oral examinations in each subject and in general pedagogy. The head teacher (school principal) has the right to ask questions as well at this time, and he or she is also part of the assessment.

5 Cf. http://www.berlin.de/sen/bildung/lehrer_werden/pruefungsaemter/

The second state examination is also carried out by an examination committee established at a *Prüfungsamt für Lehramtsprüfungen*. The teacher educators from the *Studienseminar* who prepare the future teachers are part of this committee. Because these examinations are often full-day ones, the teachers involved are usually principals. The assessment procedures consist of self-prepared assignments, and the assessment criteria used to assess a future teacher's performance can vary considerably.

Teacher education in Germany can therefore be described as state controlled. The state establishes examination committees and employs teachers or principals to administer the two states examinations externally. The extent of professional involvement appears to be a feature of the German system. However, these state officials mainly assure that the formal examination requirements described above are fulfilled. In this context, it has to be pointed out that the output control is not standardized. Because the examinations consist of self-prepared assignments, they are only valid locally.

In the United States, the states are responsible for determining teacher licensure requirements and granting teaching licenses. One or more of the following state agencies is involved in formulating such requirements: the state legislature, the state education agency, the state board of education, and the professional standards boards.

As of 2005/2006, more than 40 states had professional standards boards involved in some way in developing teacher licensure requirements. These state agencies are responsible for developing or adopting teaching standards and for setting licensure requirements regarding coursework and students' teaching practicums. They are also responsible for determining whether to create or adopt licensure tests, and for ascertaining when candidates have met the state's licensure requirements.

Over the past 10 to 15 years, virtually all states have adopted or revised teaching standards that delineate the general knowledge and skills that candidates should demonstrate in order to earn a license. Most states have also adopted or revised their specific standards for elementary candidates and secondary mathematics candidates. In many cases, state teaching standards reflect teaching standards documents developed by the Interstate New Teacher Assessment and Support Consortium, the National Board for Professional Teaching Standards, and professional associations such as the National Council for Teachers of Mathematics. In Connecticut, for example, the secondary mathematics standards address teachers' knowledge of mathematics content and their ability to set up mathematics tasks, engage students in mathematics discourse, create an intellectual learning environment, and analyze their mathematics teaching and student learning (Connecticut State Department of Education, 1999).

Twenty-six states require secondary mathematics candidates to complete coursework in mathematics, suggesting that many middle-school mathematics teachers acquire strong content knowledge in mathematics during their teacher preparation. Twenty-four states do not require secondary mathematics candidates to complete mathematics coursework. Data on the mathematics coursework completed by elementary teaching candidates, many of whom eventually teach middle-school mathematics, are limited.

States also vary markedly in the licensure tests they employ to ensure that candidates can demonstrate relevant teaching knowledge and skills. As of 2007/2008, 38 states required candidates to pass tests of basic literacy and numeracy skills, 41 states mandated that candidates pass tests of content knowledge, and three states did not require candidates

to pass either type of test. Most states employ multiple-stage licensure systems in which candidates are required to meet additional requirements after earning an initial license and entering teaching. As of 2005/2006, these additional requirements included passing a state performance assessment (17 states) or a local district performance assessment (15 states), completing a minimum number of semester hours of coursework (12 states), or earning a Master's degree (12 states) (Loeb & Miller, 2006).

The United States' *No Child Left Behind* legislation mandated that all teachers in core content areas, including secondary mathematics and elementary education, be "highly qualified" by 2005/2006. In order to meet this requirement, newly hired elementary teachers needed to possess a Bachelor's degree and to have passed tests of subject-matter knowledge and teaching skills in reading/language arts, writing, and mathematics. For their part, newly hired middle-school and high-school mathematics teachers were required to demonstrate subject-matter knowledge by either passing a subject-matter examination, majoring in mathematics as an undergraduate, earning a graduate degree in mathematics, completing the coursework equivalent to an undergraduate degree, and/or holding advanced certification from the National Board for Professional Teaching Standards or the American Board for the Certification of Teaching Excellence.

States vary with regard to their requirements regarding coursework, student teaching, licensure tests, and additional requirements associated with multiple stages of licensure. In some states, state agencies grant a professional teaching license when (a) candidates provide evidence that they have earned passing scores on required licensure tests, and (b) their respective preparation programs provide evidence that they have met state requirements regarding coursework, student teaching, and/or other aspects of preparation. In other states, candidates earn an initial teaching license when they fulfill requirements (a) and (b). However, they must also complete additional requirements in their first years of teaching to earn a professional license. These additional requirements include state and district performance assessments, Master's degrees, and additional coursework. The United States report provides two examples of innovative state performance assessments.

In Connecticut, second-year teachers in most content areas have been required since 2007/2008 to prepare a content-specific portfolio of their teaching in order to earn a professional teaching license. When assembling their portfolios, the teachers are required to complete several entries that are integrated around a unit of instruction. These entries include a description of their teaching context, a set of lesson plans, two videotapes of instruction during the unit, samples of student work, and written reflections. As part of their portfolio work, the teachers also have to focus on two students during the unit and write about how they would modify their instructional practices and assessments to address those students' needs.

Two trained assessors independently score each portfolio. The assessors must be teaching in the same content area as the candidate they are evaluating. Assessors first examine each portfolio entry and record and summarize evidence that is relevant to a set of guiding questions. For example, the guiding questions for the secondary mathematics portfolio include these ones:

- How appropriate are the mathematical tasks for the instructional goals and objectives?
- How does the teacher promote student discourse?

- How does the teacher assess student learning?
- How does the teacher learn from the experience?

In order to answer these guiding questions, assessors compare and integrate evidence from multiple parts of the portfolio. After summarizing the evidence and answering each question, they use a scoring rubric to determine the teacher's overall level of performance. On average, assessors take three to four hours to score a portfolio.

Each completed portfolio reveals information about the logic and coherence of the teacher's curriculum, the appropriateness of his or her instructional decisions for students, and the range of pedagogical strategies used. The portfolios also provide rich data about the quality of the teachers' assignments, their skill in assessing student learning, and their ability to modify their teaching based on evidence of student learning (Wilson, Darling-Hammond, & Berry, 2001).

The second example in the United States' TEDS-M report of an innovative approach to assessing teacher performance for professional certification came from Ohio. There, all first-year teachers have been required, as of 2007/2008, to successfully complete Praxis III, developed by the Educational Testing Service (ETS). Praxis III requires each teacher to be interviewed and observed by a trained assessor. During the preobservation interview, teachers are asked about their goals, methods, activities, and materials, and how they learned about students' prior knowledge and skills. Throughout the observation, the assessor records teacher and student statements and behaviors that relate to the 19 Praxis III criteria.

During the postobservation interview, assessors ask the teachers to reflect on how the lesson went, after which the assessors consider the evidence provided for each of the 19 criteria and select the most salient evidence of performance for each. They then write a summary statement for each criterion, linking the evidence to the scoring rules for that criterion and assigning a score from 1.0 to 3.5 to it. Ohio and other states that use Praxis III when making licensure decisions are required by the ETS to administer the assessment at least twice during each candidate's first year of teaching (Youngs, Odden, & Porter, 2003).

The United States country report points out that, prior to 2005/2006, many lower-secondary mathematics teachers in the United States were not licensed to teach mathematics. Having analyzed data from the 1993/1994 Schools and Staffing Survey, Ingersoll (1999) reported that approximately one-third of all secondary school teachers who were teaching mathematics had neither a major nor a minor in mathematics, mathematics pedagogy, and/or related disciplines. According to the findings of a follow-up study conducted by Jerald and Ingersoll (2003) and based on the 1999/2000 SASS survey, this situation had worsened, with the biggest increases occurring in schools with high numbers of students from low socioeconomic and/or ethnic minority backgrounds.

Several possible explanations have been provided for the high percentage of teachers teaching out of field. They include shortcomings in how teachers are trained in the United States, the role of teacher unions in negotiating labor contracts, and the issue of teacher shortages. Ingersoll (1999) also provided evidence that these explanations only accounted for some of the high rate of out-of-field teaching. He argued that principals' decisions regarding teaching assignments also contributed to this phenomenon.

Exhibit 9.2 above showed that countries in Group 3 generally require graduates to take not only an external entry test, in addition to gaining a university qualification, but also to present evidence that they can meet a set of performance standards. This latter requirement may be assessed in schools after graduation as part of an induction program and/or during a period of provisional certification. Or, as in Chinese Taipei, local authorities may insist on qualified teachers meeting this requirement before they can gain a teaching position. The responsible body may be a statutory agency for professional standards, as in Thailand and most states in the United States, or a state or a national government, as in Chinese Taipei.

Conclusion

This chapter has illustrated the variation in requirements that individuals need to meet in order to enter the teaching profession across the countries that participated in TEDS-M. For most future teachers, eligibility to apply for a teaching position generally follows automatically on gaining a university or college qualification in teacher education, and after passing police checks.

In order to assure the quality of new teachers, Oman, the Philippines, and Spain generally require graduates to take an external entry test and/or some kind of competitive examination, in addition to gaining a university qualification. The responsible body is usually a state or a national government one. Chinese Taipei, Germany, and some states in the United States have the strongest filters of the TEDS-M countries for assuring the quality of entrants to the profession. These countries have agencies separate from universities that require formal assessments of entrants' classroom performance (in addition to passing examinations) before they can gain a position in a school, or access to the civil service (as in Germany), or certification (as in the United States).

This chapter has also made evident the increasing trend for countries to clearly distinguish the requirements for graduation from the requirements to gain official entry to the profession (i.e., receive certification). Responsibility for the latter is increasingly being placed in the hands of government agencies or statutory professional standards boards. Examples include the Ontario College of Teachers, the Teacher Professional Development Center in Georgia, and the Teachers Council of Thailand. In part, this trend is an acknowledgment that it is difficult to make an accurate prediction about a teacher's capacity until he or she has worked in schools for a period of time and so experienced authentic teaching responsibilities. This trend is leading to increasing interest in effective mentoring and induction programs and in more valid ways of assessing teacher performance against professional standards.

In several TEDS-M countries, the agency responsible for official entry or certification is essentially the national or state government, or a ministry of education. This is the case in career-based systems, for example, where teachers gain access to the civil service through a state examination after graduating from a university teacher education program. In Singapore, it is the Ministry of Education. In such cases, the government is the body that regulates the teaching profession.

In the Philippines, the responsible body is the Professional Regulation Commission, the agency that grants licenses to practice in all professions. In Chinese Taipei, entry is a two-stage process. Graduates must pass a national test, the Teacher Qualification Assessment, to be officially qualified by the Ministry of Education. However, gaining a

position in schools depends on another screening process that operates at the local level. This involves more written tests, and assessments of teaching performance as well.

In the United States, certification, or licensing, is a state government responsibility, but this function is increasingly being delegated to a state professional standards body, such as the California Council for Teacher Credentialing. The council has strong regulatory powers in that it will only provide certification to teachers who demonstrate that they can meet the council's performance standards during an induction period in schools. A similar trend is evident in countries such as the United Kingdom, Australia, and New Zealand, which have established independent professional standards agencies. However, these organizations are ultimately and directly accountable to the countries' respective ministers of education.

References

- Avalos, B. (2002). *Profesores para Chile: Historia de un Proyecto* [Teachers for Chile: History of a project]. Santiago, Chile: Ministry of Education.
- Connecticut State Department of Education. (1999). *Connecticut's common core of teaching*. Hartford, CT: Division of Teaching and Learning, Bureau of Curriculum and Teacher Standards, Connecticut State Department of Education.
- Ingersoll, R. M. (1999). The problem of under qualified teachers in American secondary schools. *Educational Researcher*, 28(2), 26–37.
- Jerald, C. D., & Ingersoll, R. (2003). *All talk no action: Putting an end to out-of-field teaching*. Pittsburgh, PA: The Education Trust, University of Pennsylvania Graduate School of Education Publications.
- Loeb, S., & Miller, L. C. (2006). *A review of state teacher policies: What are they, what are their effects, and what are their implications for school finance?* Stanford, CA: Institute for Research on Education Policy and Practice, School of Education, Stanford University.
- Wilson, S. M., Darling-Hammond, L., & Berry, B. (2001). *A case of successful teaching policy: Connecticut's long-term efforts to improve teaching and learning*. Seattle, WA: Center for the Study of Teaching and Policy.
- Youngs, P., Odden, A., & Porter, A. C. (2003). State policy related to teacher licensure. *Educational Policy*, 17(2), 217–236.

CHAPTER 10:

QUALITY ASSURANCE AND TEACHER EDUCATION: SUMMARY OF FINDINGS

Lawrence Ingvarson

The previous three chapters summarized arrangements for assuring the quality of teacher education programs in countries participating in TEDS-M. This chapter brings those findings together by summarizing the arrangements for assuring the quality of teacher education programs in the TEDS-M countries. The key components of the various quality-assurance systems considered include policies and practices related to:

1. *Recruitment and selection*: The focus here is on the policies and agencies a country has in place to monitor and assure the quality of entrants to teacher education. The policies most focused on were those concerning the following:
 - Enrolment in teacher education;
 - Making teaching an attractive career option; and
 - Mathematics requirements for admission to teacher education.
2. *Accreditation of teacher education institutions*: The focus here is on the policies and agencies in place to monitor and assure the quality of teacher education institutions and their programs.
3. *Entry to the teaching profession*: Here, the focus is on policies and agencies to ensure that graduates are competent and qualified to teach before gaining certification and full entry to the profession.

These are the three main mechanisms by which countries seek to ensure the quality of future teachers. A particular aim of this chapter is to bring together information about these mechanisms in order to provide an estimate of the relative strength of the quality-assurance arrangements in each TEDS-M country. With this information at hand, we were able to explore questions such as the following ones:

- What is the relationship between the mathematics knowledge of future teachers and the relative strength of national quality-assurance systems?
- Are opportunities to learn mathematics during teacher education programs greater in countries with strong quality-assurance systems?
- Do future teachers from countries with strong controls over standards for *entry* to teacher education programs have more knowledge of mathematics than future teachers from countries that focus on standards for the *accreditation* of programs?
- Is there less variation in future teachers' perceptions of the quality of their training and their preparedness to teach in countries that have rigorous and compulsory *accreditation* systems?

Many similar questions could also be explored.

The main purpose of this chapter, however, is to explore the first question—the relationship between quality-assurance systems in TEDS-M countries and the quality of graduates from teacher education programs in those countries, in terms of their mathematics content knowledge (MCK) and their mathematics pedagogical content knowledge (MPCK).

Summary of Quality-Assurance Policies in the TEDS-M Countries

Exhibit 10.1 brings together the findings about quality-assurance arrangements presented in Chapters 7 to 9. In line with the three quality-assurance mechanisms listed above, these arrangements are underpinned by policies and overseen by agencies formulated and established to achieve the following:

1. Monitor and assure the quality of *entrants* to teacher education;
2. Monitor and assure the quality of *teacher education programs*; and
3. Ensure that *graduates* of teacher education programs are competent and qualified to enter the profession.

Exhibit 10.1 also shows the extent to which countries vary in these arrangements. The depth of shading indicates the strength of quality-assurance arrangements. Darker shading indicates stricter quality-assurance policies and processes. To illustrate, using Botswana as an example, Exhibit 10.1 reflects the fact that Botswana exerts relatively strong controls over supply of and demand for teachers and thereby entry to teacher education. However, the authors of the Botswana country report noted concerns about the country's ability to attract stronger students into mathematics teacher education programs.

The exhibit also shows that Botswana has stronger arrangements than countries such as Chile and Georgia and weaker arrangements when compared with Chinese Taipei and Singapore. The exhibit furthermore indicates that Botswana has measures to make teaching a relatively attractive career option for abler high school graduates, and that the country has specific mathematics requirements for entry to teacher education and moderately strong arrangements for evaluating and accrediting teacher education programs. However, although Botswana has a probationary period for beginning teachers, there are no formal requirements to assess graduates before they gain entry to the profession. Overall, Botswana has moderately strong arrangements for quality assurance. Its quality-assurance arrangements can therefore be rated as moderate in strength in relation to the other countries participating in TEDS-M.

By applying this analytical approach to each country, we have also been able to show in Exhibit 10.1 that, of the 17 countries participating in TEDS-M, Chinese Taipei and Singapore have the strongest and most coordinated quality-assurance systems overall. Although the two countries differ in terms of detail, both have relatively strong policy arrangements in place to assure the quality of future teachers. Both countries also have quotas on the number of teacher education places and have developed policies over many years to ensure that teaching is a relatively attractive career option for abler students. A rigorous system for external evaluation of teacher education programs is in place, and—in the case of Chinese Taipei—entry to the profession does not follow automatically on graduation from a teacher education program. Full entry to the profession depends on graduates undergoing an additional assessment of their professional knowledge, while gaining a teaching position depends on a satisfactory assessment of performance capabilities after a probationary period in schools.

Exhibit 10.1: Quality-assurance mechanisms in teacher education in the TEDS-M countries

Country	Recruitment and Selection		Accreditation of Teacher Education Programs	Entry to the Teaching Profession	Relative Strength of Quality-Assurance System
	Control over supply of teacher education students	Promotion of teaching as an attractive career			
Botswana					Moderate
Canada					Moderate/high
Chile					Low
Chinese Taipei					High
Georgia					Low
Germany					Moderate/high
Malaysia					Moderate
Norway					Moderate/low
Oman (secondary only)					Low
Philippines					Low
Poland					Moderate
Russian Federation					Moderate
Singapore					High
Spain				Civil service	Moderate/low
Switzerland					Moderate
Thailand					Low
United States					Moderate/low



As evident in Exhibit 10.1, five of the TEDS-M countries—Canada, Chinese Taipei, Malaysia, Oman, and Singapore—have strong controls over the number of entrants accepted into teacher education programs. Canada, Chinese Taipei, and Singapore have specific policies to ensure teaching is an attractive career, making recruitment of able high school graduates more tenable. Singapore has the highest requirements for mathematical courses before entry to the professional training component of teacher education programs, and Chinese Taipei requires prospective teachers to successfully complete university-level courses before gaining entry to teacher education programs.

The German country report did not report mathematics requirements for entry to the first phase of university study. However, Germany requires successful completion of mathematics courses during this phase before students can gain entry to the second phase, which, unlike the first phase, is organized by the teacher training institutes (*Studienseminare*).

Chile, Georgia, Norway, Oman, Thailand, and the Philippines are in a period of rapid transition and development with respect to quality-assurance arrangements, but at the time of the TEDS-M data collection, these arrangements were not as strong as in other countries. Chile and Norway,¹ for example, were both in the process of reorganizing teacher education to match changes in their school systems. One aim of these changes is to meet the need for teachers with more specialized skills in the subjects and the levels they teach.

Another feature to note in Exhibit 10.1 is that rigorous procedures for assessing and accrediting teacher education programs are rare in the TEDS-M countries, a situation at variance with many other professions, such as engineering and accountancy, which are using outcome measures and moving to international approaches that provide mutual recognition of accreditation procedures and qualifications. The National Council for Accreditation of Teacher Education (NCATE) in the United States provides a respected system for assessing and accrediting teacher education institutions. However, in most states, accreditation is voluntary. Singapore and Chinese Taipei have the strongest arrangements for monitoring and evaluating the effectiveness of their teacher education programs in terms of outcomes.

As evident in Exhibit 10.1, graduation from university programs in most of the TEDS-M countries leads automatically to full entry to the profession. Canada, Chinese Taipei, Germany and, the United States are exceptions. For instance, in the Canadian province of Ontario, new teachers must demonstrate a probationary year of successful teaching before they can apply for full registration, which is signed off by the superintendent of the local school board. The authors of the country report for Canada did not, however, comment on the rigor and consistency of the methods Ontario uses to assess success.

In the United States, some states have procedures for assessing beginning teacher performance in some states, but the procedures do not apply consistently across institutions and programs. Some states also allow for “emergency” certification of teachers in areas where there are shortages and alternative routes into teaching. Chinese Taipei enforces its quality control over entrants more consistently than the other countries in TEDS-M. We can also place Germany in this group because future teachers in the second phase of training spend at least the equivalent of one school-year taking full responsibility for a class and participating in other tasks in the school. They work with mentor teachers, and their performance must be assessed as part of the second state examination.

¹ White Paper on teacher education in Norway titled *The teacher: The role and the education* (Report to the Storting No. 11, 2008/2009).

The Relationship Between Quality Assurance and the Quality of Future Teachers

We also used the data reported in Exhibit 10.1 to estimate the relative strength of quality-assurance arrangements in the TEDS-M countries. For each country, we rated each stage of quality assurance (promotion, recruitment and selection, and accreditation and entry) as strong, moderate or weak, using the information provided in Chapters 7, 8, and 9. We then aggregated these to yield a single rating for each country, as shown in the exhibit. This rating procedure provided a crude but nonetheless reasonably robust measure of the relative strength of quality-assurance arrangements in the TEDS-M countries. The TEDS-M national research coordinators (NRCs) checked and endorsed the relative ratings for their country.

By using this scale, we can show a high rating for Chinese Taipei because of its strong quality-assurance mechanisms in all of the above three quality-assurance areas. Chile and Georgia both have a low score because their quality-assurance procedures are limited or nonexistent in all three areas. The United States gained a moderate to low rating, because controls over entry to conventional teacher education programs are limited. However, course approval and accreditation arrangements and controls over certification for graduates of these programs are moderately strong, though variable, from state to state. Controls over entry to teaching are also variable, with several states allowing alternative routes into teaching.

As a measure of teacher quality, TEDS-M gathered data about the mathematics content knowledge (MCK) of students in their final year of preparation for teaching and their mathematics pedagogical content knowledge (MPCK). Exhibits 10.2 and 10.3 are based on these data.

Exhibit 10.2 shows the mean scores (and standard errors) for the primary teacher education programs on the two tests.² Here we can see that the future primary teachers from Chinese Taipei and Singapore scored significantly higher on both tests than the future primary teachers from the other TEDS-M countries. The relative strength of the quality-assurance systems in these two countries is also high compared with the strength of these systems in the other TEDS-M countries.

Exhibit 10.3 shows the mean scores for programs preparing teachers who will be eligible to teach mathematics at the lower-secondary level for each country. As might be expected, teachers who graduate from programs that make them eligible to teach across the range of grades in secondary school (e.g., from Grade 7 through to Grades 12 or 13) scored significantly higher on both the MCK and the MPCK tests than teachers from programs that made them eligible to teach up to Grade 10 only. Even though the latter group of teachers are usually not as specialized as the former group, these findings may have implications for policies to promote the quality of opportunities that lower-secondary school students have to learn mathematics.

Note that students in Norway's ALU+ program undertake the same preparation program as students in the ALU program except that they have elected to take extra mathematics courses. Also noteworthy is the finding that although future generalist teachers in the Russian Federation are only eligible to teach up to Grade 4, the TEDS-M future teachers scored significantly higher on MCK than did the future teachers from most of the other TEDS-M countries.

² Different MCK and MPCK tests were administered to the primary and the secondary teachers. Scores were standardized to an international mean of 500 and a standard deviation of 100.

Exhibit 10.2: Relative strength of quality-assurance system, mathematics content knowledge, and mathematics pedagogical content knowledge of TEDS-M future primary teachers

Type of Program	Country (Grade Levels for which Teachers are Prepared)	Mathematics Content Knowledge		Mathematics Pedagogical Content Knowledge		Relative Strength of Quality-Assurance System
		Mean	(SE)	Mean	(SE)	
Primary Generalist Teachers	Chinese Taipei (1–6 max.)	623	(4.2)	592	(2.3)	High
	Singapore (1–6 max.)	586	(3.7)	588	(4.1)	High
	Norway (ALU+) (1–10 max.)	553	(4.3)	564	(5.5)	Moderate/low
	Switzerland (1–6 max.)	548	(1.9)	539	(1.8)	Moderate
	Russian Fed. (1–4 max.)	536	(9.9)	512	(8.1)	Moderate
	United States (1–6 max.)	518	(4.5)	544	(2.7)	Moderate/low
	Switzerland (1–4 max.)	512	(6.4)	519	(5.6)	Moderate
	Norway (ALU) (1–10 max.)	509	(3.1)	539	(2.8)	Moderate/low
	Germany (1–4 max.)	501	(2.9)	491	(4.7)	Moderate/high
	Spain (1–6 max.)	481	(2.6)	492	(2.2)	Moderate/low
	Poland (1–4 max.)	456	(2.3)	452	(1.9)	Moderate
	Botswana (1–10 max.)	441	(5.9)	448	(8.8)	Moderate
	Philippines (1–6 max.)	440	(7.6)	457	(9.7)	Low
	Chile (1–10 max.)	413	(2.1)	425	(3.7)	Low
Georgia (1–4 max.)	345	(3.9)	345	(4.9)	Low	
Specialist Mathematics Teachers in Primary Schools	Poland (4–9)	614	(4.8)	575	(4.0)	Moderate
	Singapore (1–6)	600	(7.8)	604	(7.0)	High
	Germany (1–9/10)	555	(7.5)	552	(6.8)	Moderate/high
	Thailand (1–12)	528	(2.3)	506	(2.3)	Low
	United States (4–9)	520	(6.6)	545	(5.9)	Moderate/low
	Malaysia (1–6)	488	(1.8)	503	(3.1)	Moderate

Note: The shaded areas identify data that, for reasons explained in the TEDS-M international report, cannot be compared with confidence to data from the other TEDS-M countries.

Displaying the information in Exhibits 10.2 and 10.3 somewhat differently in Exhibits 10.4 to 10.8 allowed us to explore the relationship between quality assurance and the quality of graduates, as measured by MCK and MPCK.

Exhibit 10.4 shows countries classified according to the mean MCK test scores for graduates from primary teacher education programs. The vertical axis shows the standardized scores for mathematical knowledge, with a mean of 500 and a standard deviation of 100. The horizontal axis shows the relative strength of the quality-assurance arrangements. Exhibit 10.5 shows countries classified according to the mean MPCK test scores for graduates from primary teacher education programs and the relative strength of their quality assurance arrangements.

These two exhibits make evident the strong relationship between the mathematics knowledge of future primary teachers and the quality-assurance arrangements in their country. Teachers prepared in countries with stronger quality-assurance arrangements, as measured in this study, were more likely to score higher on the TEDS-M tests of MCK and MPCK. Several countries were exceptions to this pattern. Students in Norway's ALU+ program for future primary teachers scored more highly than might be expected, given that the information provided by the Norwegian NRCs indicated that the quality-assurance arrangements in that country are relatively weak. Students from Poland and Botswana did not score quite as well as might be expected, given that the NRCs from those countries indicated that their quality-assurance arrangements are "moderate" in strength. Students from the Philippines had comparable scores to students from Poland

Exhibit 10.3: Relative strength of quality-assurance system, mathematics content knowledge, and mathematics pedagogical content knowledge of TEDS-M future secondary teachers

Type of Program	Country (Grade Levels for which Teachers are Prepared)	Mathematics Content Knowledge		Mathematics Pedagogical Content Knowledge		Relative Strength of Quality-Assurance System
		Mean	(SE)	Mean	(SE)	
Lower-Secondary Mathematics Teachers (to Grade 10 max.)	Singapore (to Grade 8 only)	544	(3.7)	539	(6.1)	High
	Switzerland	531	(3.7)	548	(5.9)	Moderate
	Poland	529	(4.2)	520	(4.5)	Moderate
	Germany	483	(4.9)	515	(6.3)	Moderate/high
	United States	468	(3.7)	471	(3.9)	Moderate/low
	Norway (ALU+mathematics)	461	(4.5)	480	(6.2)	Moderate/low
	Philippines	442	(4.6)	450	(4.7)	Low
	Botswana	436	(7.3)	435	(8.5)	Moderate
	Norway (ALU)	435	(3.4)	455	(4.1)	Moderate/low
	Chile	354	(2.5)	394	(3.8)	Low
Lower- and Upper-Secondary Mathematics Teachers (Grade 12 & above)	Chinese Taipei	667	(3.9)	648	(5.2)	High
	Russian Federation	593	(12.8)	566	(10.1)	Moderate
	Singapore	587	(3.8)	562	(6.1)	High
	Germany	585	(4.4)	586	(6.7)	Moderate/high
	United States	553	(5.1)	542	(5.8)	Moderate/low
	Poland	549	(4.4)	528	(6.2)	Moderate
	Norway (PPU & Master's)	503	(9.8)	495	(17.7)	Moderate/low
	Malaysia	493	(2.4)	472	(3.3)	Moderate
	Thailand	479	(1.6)	476	(2.5)	Low
	Oman	472	(2.4)	474	(3.8)	Low
	Botswana	449	(7.5)	409	(15.6)	Moderate
	Georgia	424	(8.8)	443	(9.6)	Low

Note: The shaded areas identify data that, for reasons explained in the TEDS-M first findings report, cannot be compared with confidence to data from the other TEDS-M countries.

and Botswana, even though the NRCs from the Philippines rated the country’s quality-assurance arrangements as weak.

Exhibits 10.6 and 10.7 show countries classified according to the mean MPCK test scores for graduates from secondary teacher education programs and the relative strength of these countries’ quality-assurance arrangements.

These two exhibits indicate that TEDS-M countries with stronger quality-assurance arrangements are the countries most likely to be producing future secondary teachers with a sound knowledge of the mathematics they will be expected to teach.³ (However, caution is warranted in interpreting these results because of the small number of countries.)

Exhibits 10.6 and 10.7 also indicate some notable exceptions to this rule. Students in the group of programs in the United States that prepare specialist mathematics teachers to teach up to senior high school level did better than might have been expected, given the moderate to low-quality assurance rating for this grouping. We suspect that the quality-assurance arrangements for this group of programs may have been stronger than the arrangements, on average, for all teacher education programs in the United States.

³ Oman did not participate at the primary level; Spain did not participate at the secondary level. Response rates for Canada did not meet IEA standards. Only specialist mathematics teachers from Malaysia participated in TEDS-M, not generalists, so they are not included in the tables for future primary teachers.

Exhibit 10.4: Strength of quality-assurance arrangement and scores on the TEDS-M test of mathematics content knowledge (MCK) for future TEDS-M primary teachers

MCK Mean	Low Quality Assurance	Moderate/Low Quality Assurance	Moderate Quality Assurance	Moderate /High Quality Assurance	High Quality Assurance
600+					Chinese Taipei (Grades 1–6 max.)
575–599					Singapore (Grades 1–6 max.)
550–574		Norway (ALU+) (Grades 1–10 max.)			
525–550			Switzerland (Grades 1–6 max.) Russian Federation (Grades 1–4 max.)		
500–524		United States (Grades 1–6 max.) Norway (ALU) (Grades 1–10 max.)	Switzerland (Grades 1–4 max.)	Germany (Grades 1–4 max.)	
475–499		Spain (Grades 1–6 max.)			
450–474			Poland (Grades 1–4 max.)		
425–449	Philippines (Grades 1–6 max.)		Botswana (Grades 1–10 max.)		
400–424	Chile (Grades 1–10 max.)				
< 400	Georgia (Grades 1–4 max.)				

Note: Brackets indicate level to which teachers are eligible to teach.

Exhibit 10.5: Strength of quality-assurance arrangement and scores on the TEDS-M test of mathematics pedagogical content knowledge (MPCK) for future TEDS-M primary teachers

MCK Mean	Low Quality Assurance	Moderate/Low Quality Assurance	Moderate Quality Assurance	Moderate /High Quality Assurance	High Quality Assurance
575–599					Chinese Taipei (Grades 1–6 max.) Singapore (Grades 1–6 max.)
550–574		Norway (ALU+) (Grades 1–10 max.)			
525–550		United States (Grades 1–6 max.) Norway (ALU) (Grades 1–10 max.)	Switzerland (Grades 1–6 max.)		
500–524			Switzerland (Grades 1–4 max.) Russian Federation (Grades 1–4 max.)		
475–499		Spain (Grades 1–6 max.)		Germany (Grades 1–4 max.)	
450–474	Philippines (Grades 1–6 max.)		Poland (Grades 1–4 max.)		
425–449			Botswana (Grades 1–10 max.)		
400–424	Chile (Grades 1–10 max.)				
< 400	Georgia (Grades 1–4 max.)				

Note: Brackets indicate level to which teachers are eligible to teach.

Exhibit 10.6: Strength of quality-assurance arrangement and scores on the TEDS-M test of mathematics content knowledge (MCK) for future TEDS-M secondary teachers

MCK Mean	Low Quality Assurance	Moderate/Low Quality Assurance	Moderate Quality Assurance	Moderate /High Quality Assurance	High Quality Assurance
600+					Chinese Taipei (to Grade 11+)
575–599			Russian Federation (to Grade 11+)	Germany (to Grade 11+)	Singapore (to Grade 11+)
550–574		United States (to Grade 11+)			
525–550			Poland (to Grade 11+) Poland (to Grade 10 max.) Switzerland (to Grade 10 max.)		Singapore (to Grade 8 only)
500–524		Norway (PPU & Master’s) (to Grade 11+)			
475–499	Thailand (to Grade 11+)		Malaysia (to Grade 11+)	Germany (to Grade 10 max.)	
450–474	Oman (to Grade 11+)	United States (to Grade 10 max.) Norway (ALU+mathematics) (to Grade 10 max.)			
425–449	Philippines (to Grade 10 max.)	Norway (ALU) (to Grade 10 max.)	Botswana (to Grade 11+) Botswana (to Grade 10 max.)		
400–424	Georgia (to Grade 11+)				
< 400	Chile (to Grade 10 max.)				

Note: Brackets indicate level to which teachers are eligible to teach.

Exhibit 10.7: Strength of quality-assurance arrangement and scores on the TEDS-M test of mathematics pedagogical content knowledge (MPCK) for future TEDS-M secondary teachers

MCK Mean	Low Quality Assurance	Moderate/Low Quality Assurance	Moderate Quality Assurance	Moderate /High Quality Assurance	High Quality Assurance
600+					Chinese Taipei (to Grade 11+)
575–599				Germany (to Grade 11+)	
550–574				Russian Federation (to Grade 11+)	Singapore (to Grade 11+)
525–550		United States (to Grade 11+)	Switzerland (Grade 10 max.) Poland (to Grade 11+)		Singapore (to Grade 8 only)
500–524			Poland (to Grade 10 max.)	Germany (to Grade 10 max.)	
475–499	Thailand (to Grade 11+)	Norway (PPU & Master’s) (to Grade 11+) Norway (ALU+mathematics) (to Grade 10 max.)			
450–474	Oman (to Grade 11+) Philippines (to Grade 10 max.)	United States (Grade 10 max.) Norway (ALU) (to Grade 10)	Malaysia (to Grade 11+)		
425–449	Georgia (to Grade 11+)		Botswana (Grade 10 max)		
400–424			Botswana (to Grade 11+)		
<400	Chile (to Grade 10 max.)				

Note: Brackets indicate level to which teachers are eligible to teach.

Other exceptions to the trend indicated by the two exhibits include Malaysia and Botswana. The MCK and MPCK test scores of the future secondary teachers prepared in these countries were not as high as the quality-assurance ratings for those countries. It would be interesting to have the NRCs from these countries speculate on the reasons for this situation. However, as with the data for the future primary teachers, these data indicate a strong relationship between the mathematics knowledge of future secondary teachers and the quality-assurance arrangements in their country.

The Relationship Between Students’ Mathematics Achievement on TIMSS and the Quality-Assurance Arrangements in the TEDS-M Countries

The findings reported here also invite questions or speculation about the relationship between quality-assurance arrangements and student performance—for example, student performance as measured in the IEA Trends in International Mathematics and Science (TIMSS) surveys. TIMSS measures the mathematics achievement of students in Grades 4 and 8. The pertinent question with respect to TEDS-M is whether student performance in TIMSS is higher in countries with strong quality-assurance arrangements than in countries with less strong arrangements. It is not possible, of course, to provide a definitive answer to questions such as this one, but it is possible to

examine whether the TEDS-M findings are at least consistent with such a relationship. Further studies will nonetheless be needed to examine the impact of quality-assurance policies and student achievement more rigorously.

Exhibit 10.8 shows that there was some overlap between countries that participated in the primary component of TEDS-M and TIMSS 2007. The last two columns in the table show, for example, that Chinese Taipei, Singapore, the Russian Federation, the United States, Norway, Germany, and Georgia participated in TEDS-M and TIMSS 2007 at the Grade 4 level. The right-hand column shows the countries that participated in TIMSS at the Grade 8 level. (Chile and the Philippines did not participate in TIMSS 2007, but their 2003 scores are included in the table.)

The second column of Exhibit 10.8 shows the average scores for future generalist primary teachers on the TEDS-M mathematics knowledge tests in each country, while the third column shows the relative strength of the quality-assurance arrangements. Although the data in Exhibit 10.8 provide no grounds for any claims about the relationship between quality-assurance arrangements and student achievement on TIMSS 2007, they do suggest that this is a relationship worth exploring further through later studies. It is noteworthy, however, that countries in TEDS-M with relatively strong

Exhibit 10.8: Relationship between TEDS-M and TIMSS: Findings for future primary generalist teachers and student achievement

TEDS-M Country (Grade Levels for which Teachers are Prepared)	TEDS-M Average Mathematics Knowledge Score for Future Teachers (SE)	TEDS-M Relative Strength of Quality- Assurance System	TIMSS 2007 Average Scale Score, Grade 4	TIMSS 2007 Average Scale Score, Grade 8
Chinese Taipei (Grades 1–6 max.)	623 (4.2)	High	576	598
Singapore (Grades 1–6 max.)	586 (3.7)	High	599	593
Norway (ALU+) (Grades 1–10 max.)	553 (4.3)	Moderate/low	–	469
Switzerland (Grades 1–6 max.)	548 (1.9)	Moderate	–	–
Russian Federation (Grades 1–4 max.)	535 (9.9)	Moderate/high	544	512
United States (Grades 1–6 max.)	517 (4.5)	Moderate/low	529	508
Switzerland (Grades 1–4 max.)	512 (6.4)	Moderate	–	–
Norway (ALU) (Grades 1–10 max.)	509 (3.1)	Moderate/low	473	469
Germany (Grades 1–4 max.)	501 (2.9)	Moderate/high	525	–
Spain (Grades 1–6 max.)	481 (2.6)	Moderate/low	–	–
Poland (Grades 1–4 max.)	456 (2.3)	Moderate	–	–
Botswana (Grades 1–10 max.)	441 (5.9)	Moderate	–	364
Philippines (Grades 1–6 max.)	440 (7.6)	Low	358 (TIMSS 2003)	378 (TIMSS 2003)
Chile (Grades 1–10 max.)	413 (2.1)	Low	–	387 (TIMSS 2003)
Georgia (Grades 1–4 max.)	345 (3.9)	Low	438	410

quality-assurance arrangements, such as Chinese Taipei and Singapore, were among the highest scoring countries in TIMSS 2007, at both the fourth- and eighth-grade levels. Students in the TEDS-M countries with weaker quality-assurance arrangements, such as Georgia, had, on average, relatively low student scores on TIMSS 2007. As noted above, Chile and the Philippines did not participate in TIMSS 2007, but the average TIMSS 2003 scores for these countries were also relatively low.

While the information in Exhibit 10.8 also suggests a relationship between TIMSS scores and scores on the mathematics knowledge tests developed for TEDS-M, there is, of course, no link between the students to whom the TIMSS tests were administered in 2007 and the future teachers who participated in TEDS-M in 2008. The relationship between the mathematics knowledge of graduating teachers and the relative achievement of the students they eventually teach would appear to be worth investigating in later IEA studies.

Conclusion

This chapter reviewed policies for assuring the quality of future teachers across the 17 TEDS-M countries. The main finding is the considerable variation in policies related to quality assurance, in particular the quality of entrants to teacher education programs, the quality of teacher education programs, and the quality of graduates who gain full entry to the teaching profession.

We found a strong relationship between the strength of these quality-assurance arrangements and the quality of graduates, as measured by the tests of mathematics content knowledge (MCK) and mathematics pedagogical content knowledge (MPCK) used in TEDS-M. Countries with strong quality-assurance arrangements, such as Chinese Taipei and Singapore, scored highest on these measures. Countries with weaker arrangements, such as Georgia and Chile, tended to score lower on the measures of MCK and MPCK.

These findings have obvious implications for policymakers concerned with promoting teacher quality. Quality-assurance policies and arrangements make a difference. This study points to the importance of ensuring that policies designed to promote teacher quality are coordinated and mutually supportive. They need to cover the full spectrum—from policies designed to make teaching an attractive career to abler students to policies for assuring that entrants to the profession have attained high standards of performance.

Our analysis in this volume of TEDS-M data also builds on and extends research of teacher quality, such as that reviewed in Chapter 6. Some studies, such as the McKinsey study (Barber & Mourshed, 2007), focused on the influence of stringent recruitment and selection policies in a small number of countries that included Singapore and Finland. TEDS-M not only included a wider range of countries but also gathered more comprehensive data about other aspects of countries' quality-assurance systems, such as accreditation and certification. TEDS-M shows, for example, that countries such as Chinese Taipei and Singapore which do well on international tests of student achievement such as TIMSS (Mullis et al., 2008) work hard to ensure the quality of entrants to teacher education. They have strong systems for reviewing, assessing, and accrediting teacher education providers. They also have strong mechanisms for ensuring that graduates meet high standards of performance before gaining certification and full entry to the profession. These country-level relationships between quality-assurance policies and student achievement call for further investigation.

References

Barber, M., & Mourshed, M. (2007). *How the best performing school systems come out on top*. New York, NY: McKinsey & Co.

Mullis, I. V. S., Martin, M. O., Olson, J. F., Berger, D. R., Milne, D., & Stanco, G. M. (Eds.). (2008). *TIMSS 2007 encyclopedia: A guide to mathematics and science education around the world* (Vols. 1 and 2). Chestnut Hill, MA: Boston College.

APPENDICES

APPENDIX A:
SUPPLEMENTARY EXHIBITS RELATING TO
CHAPTER 2

Exhibit A2.1: Sources of national demographic and human development statistics

Country	Population (millions)	Area (,1000s of sq. kms)	Population Density (People per sq km)	Urban Population (% of total)	Life Expectancy at Birth (Years)	Rank in total GDP	GNI per Capita (Purchasing Power Parity)	Levels of Wealth
Botswana	1.9 ¹	582 ²	3 ³	59 ⁴	54 ⁵	113 ⁶	13,250 ⁷	Middle ⁸
Canada	33.3	9,985	3	80	81	10	38,490	High
Chile	16.8	756	22	88	79	45	13,430	Middle
Chinese Taipei	22.9 ⁹	36 ¹⁰	637 ¹¹	80 ¹²	78	20 ¹³	32,700 ¹⁴	(High)
Georgia	4.3	70	62	53	72	117	4,860	Low
Germany	82.3	357	230	74	80	4	37,510	High
Malaysia	27.0	331	82	70	74	40	13,900	Middle
Norway	4.8	324	12	77	81	23	60,510	Very high
Oman	2.8	310	9	72	76	74	24,530	Middle
Philippines	90.3	300	301	64	72	47	3,940	Low
Poland	38.1	313	122	61	76	21	17,640	Middle
Russian Federation	141.4	17,098	8	73	68	12	19,770	Middle
Singapore	4.6	1	6,545	100	81	43	52,000	Very high
Spain	44.5	506	88	77	81	9	32,060	High
Switzerland	7.5	41	183	73	82	19	42,220	Very high
Thailand	67.4	513	131	33	69	32	7,830	Low
United States	311.7	9,629	32	81	78	1	47,100	Very high

Notes:

- Based on United Nations data, "Country Profile" (2008), *World Statistics Pocketbook*, United Nations Statistics Division: <http://data.un.org/>
Note in particular: numbers are rounded to the nearest tenth (e.g., 44,486,000 = 44.5); numeric citations refer to entire column, with the exception of Chinese Taipei
- Based on United Nations data, "Country Profile" (2008), *World Statistics Pocketbook*, United Nations Statistics Division: <http://data.un.org/>
Note in particular: numbers are rounded to the nearest tenth (e.g., 505,992,000 = 506)
- Based on United Nations data, "Country Profile" (2008), *World Statistics Pocketbook*, United Nations Statistics Division: <http://data.un.org/>
Note in particular: numbers are rounded to the nearest whole number (e.g., 3.3 = 3)
- Based on United Nations data, (2007), *World Statistics Pocketbook*, United Nations Statistics Division: <http://data.un.org/>
Note in particular: numbers are rounded to the nearest whole number (e.g., 58.9 = 59)
- Based on "World Development Indicators" (2008), World Bank: <http://data.worldbank.org/>
- Based on "World Development Indicators" (2008), World Bank: <http://data.worldbank.org/>
Note in particular: numbers are calculated in international dollars
- Range: low (\$3,000–8,000), medium (\$13,000–\$25,000), high (\$32,000–\$39,000), very high (\$42,000–\$61,000)
- Based on NationMaster data (2008) derived from World Bank Development Indicators Database and the *CIA World Factbook*: http://www.nationmaster.com/time.php?stat=peo_pop&country=tw
- Based on *CIA World Factbook*: <https://www.cia.gov/library/publications/the-world-factbook/geos/tw.html>
- Based on Ministry of Interior, Department of Statistics, Chinese Taipei (2007): <http://www.moi.gov.tw/stat/english/interior.asp>
- Based on Directorate-General of Budget, Accounting, and Statistics, Chinese Taipei (2008): <http://www.dgbas.gov.tw/ct.asp?xItem=15408&CtNode=4594&mp=1>
- Based on *CIA World Factbook* (2009): <https://www.cia.gov/library/publications/the-world-factbook/geos/tw.html>
- Based on *CIA World Factbook* (2009), US dollars: <https://www.cia.gov/library/publications/the-world-factbook/geos/tw.html>
- Based on *CIA World Factbook* (2009), US dollars: <https://www.cia.gov/library/publications/the-world-factbook/geos/tw.html>

Exhibit A2.2: Sources of national youth and education statistics

Country	Total Fertility Rate ¹	Population Age Composition Ages 0–14 (%)	Public Expenditure on Education	Net Enrollment Ratio in Education		Primary Student–Teacher Ratio
				Secondary	Primary	
Botswana	3 ²	34 ³	8.1 ⁴	90 ⁵	64 ⁶	25 ⁷
Canada	2	17	4.9 ⁸	100 ⁹	94 ¹⁰	17 ¹¹
Chile	2	23	3.4 ¹²	95 ¹³	85 ¹⁴	25 ¹⁵
Chinese Taipei	1 ¹⁶	17 ¹⁷	4.2 ¹⁸	97 ¹⁹	95 ²⁰	29 ²¹
Georgia	2	17	2.7 ²²	99 ²³	81 ²⁴	9 ²⁵
Germany	1	14	4.4 ²⁶	100 ²⁷	89 ²⁸	13 ²⁹
Malaysia	3	30	4.5 ³⁰	96 ³¹	68 ³²	15 ³³
Norway	2	19	6.7 ³⁴	99 ³⁵	96 ³⁶	11 ³⁷
Oman	3	32	4.0 ³⁸	72 ³⁹	78 ⁴⁰	12 ⁴¹
Philippines	3	34	2.6 ⁴²	92 ⁴³	61 ⁴⁴	34 ⁴⁵
Poland	1	15	4.9 ⁴⁶	96 ⁴⁷	94 ⁴⁸	11 ⁴⁹
Russian Federation	1	15	3.9 ⁵⁰	91 ⁵¹	–	17 ⁵²
Singapore	1	17	2.8 ⁵³	–	–	19 ⁵⁴
Spain	1	15	4.4 ⁵⁵	100 ⁵⁶	95 ⁵⁷	12 ⁵⁸
Switzerland	1	16	5.3 ⁵⁹	99 ⁶⁰	85 ⁶¹	13 ⁶²
Thailand	2	22	4.9 ⁶³	89 ⁶⁴	72 ⁶⁵	16 ⁶⁶
United States	2	20	5.5 ⁶⁷	93 ⁶⁸	88 ⁶⁹	14 ⁷⁰

Notes:

1. Births per woman
2. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SP.DYN.TFRT.IN>
Note, in particular: nationmaster data (2008) includes decimals; numeric citations refer to entire column or to a specific country statistic. Chinese Taipei’s statistics came from separate sources
3. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SP.POP.0014.TO.ZS>
Note in particular: data are presented in whole numbers
4. Based on “World Development Indicators” (2007), World Bank: <http://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS>
5. Based on United Nations data (2006), “total net enrollment ratio in primary education, both sexes”: <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
Note in particular: these United Nations numbers are rounded to nearest whole number
6. Based on “World Development Indicators” (2005), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR>
7. Based on “World Development Indicators” (2006), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
8. Based on 2007 data
9. Based on United Nations data (2000), “total net enrollment ratio in primary education, both sexes”: <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
10. Based on (1999) data: http://www.nationmaster.com/graph/edu_sch_enr_sec_net-education-school-enrollment-secondary-net
11. Based on 2001 data: http://www.nationmaster.com/graph/edu_pup_rat_pri-education-pupil-teacher-ratio-primary
12. Based on 2007 data
13. Based on United Nations data (2007), “total net enrollment ratio in primary education, both sexes”: <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
14. Based on “World Development Indicators” (2007), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR>
15. Based on “World Development Indicators” (2007), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
16. Based on Ministry of Interior, Department of Statistics, Chinese Taipei (2008): <http://www.moi.gov.tw/stat/english/interior.asp>
17. Based on Ministry of Interior, Department of Statistics, Chinese Taipei (2008): <http://www.moi.gov.tw/stat/english/interior.asp>
18. Based on Ministry of Education, Chinese Taipei (2006): <http://english.moe.gov.tw/ct.asp?xItem=8395&ctNode=815&mp=11>
19. Based on Ministry of Education, Chinese Taipei (2006): <http://english.moe.gov.tw/ct.asp?xItem=8395&ctNode=815&mp=11>

20. Based on Ministry of Education, Chinese Taipei (2006): <http://english.moe.gov.tw/ct.asp?xItem=8395&ctNode=815&mp=11>
21. Based on Ministry of Education, Chinese Taipei (2006): <http://english.moe.gov.tw/ct.asp?xItem=8395&ctNode=815&mp=11>
22. Based on 2007 data
23. Based on United Nations data (2008), “total net enrollment ratio in primary education, both sexes:” <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
24. Based on “World Development Indicators” (2007), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR>
25. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
26. Based on 2006 data
27. Based on United Nations data (2007), “total net enrollment ratio in primary education, both sexes:” <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
28. Based on “World Development Indicators” (1996), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR?page=2>
29. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
30. Based on 2007 data
31. Based on United Nations data (2007), “total net enrollment ratio in primary education, both sexes:” <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
32. Based on “World Development Indicators” (2007), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR>
33. Based on “World Development Indicators” (2007), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
34. Based on 2007 data
35. Based on United Nations data (2008), “total net enrollment ratio in primary education, both sexes:” <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
36. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR>
37. Based on “World Development Indicators” (2004), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS?page=1>
38. Based on 2006 data
39. Based on United Nations data (2008), “total net enrollment ratio in primary education, both sexes:” <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
40. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR>
41. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
42. Based on 2007 data
43. Based on United Nations data (2008), “total net enrollment ratio in primary education, both sexes:” <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
44. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR>
45. Based on “World Development Indicators” (2007), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
46. Based on 2007 data
47. Based on United Nations data (2007), “total net enrollment ratio in primary education, both sexes:” <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
48. Based on “World Development Indicators” (2007), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR>
49. Based on “World Development Indicators” (2007), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
50. Based on 2006 data
51. Based on 2004 data: http://www.nationmaster.com/time.php?stat=edu_sch_enr_pri_net-education-school-enrollment-primary-net&country=rs-russia
52. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
53. Based on 2008 data
54. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SE.PRM.ENRL.TC.ZS/countries>
55. Based on 2007 data
56. Based on United Nations data (2008), “total net enrollment ratio in primary education, both sexes:” <http://data.un.org/Data.aspx?q=education+enrolment&d=MDG&f=seriesRowID:589>
57. Based on “World Development Indicators” (2008), World Bank: <http://data.worldbank.org/indicator/SE.SEC.NENR>

APPENDIX B:

LISTINGS OF ORGANIZATIONS AND INDIVIDUALS RESPONSIBLE FOR TEDS-M

TEDS-M Joint Management Committee

- MSU: Maria Teresa Tatto (chair), Sharon Senk, John Schwille
- ACER: Lawrence Ingvarson, Ray Peck, Glenn Rowley
- IEA: Hans Wagemaker, Barbara Malak (*ex-officio*)
- DPC: Dirk Hastedt (*ex-officio*), Ralph Carstens (*ex-officio*), Falk Brese (*ex-officio*), and Sabine Meinck (*ex-officio*)
- Statistics Canada: Jean Dumais (*ex-officio*)

The International Study Center at Michigan State University (TEDS-M Lead Institution)

- Maria Teresa Tatto, TEDS-M executive director and principal investigator
- Sharon L. Senk and John Schwille, co-directors and co-principal investigators
- Kiril Bankov, University of Sofia, senior research coordinator for mathematics and mathematics pedagogy knowledge
- Michael Rodriguez, University of Minnesota, senior research coordinator for statistics, measurement, and psychometrics
- Martin Carnoy, Stanford University, senior research coordinator for the cost study
- Yukiko Maeda, research associate for statistics, measurement, and psychometrics
- Soo-yong Byun, research associate for statistics and data analysis
- Mustafa Demir, Todd Drummond, Richard Holdgreve-Resendez, Nils Kauffman, Wangjun Kim, Patrick Leahy, Yang Lu, Sungworn Ngudgratoke, Irini Papaieronymou, Eduardo Rodrigues, and Tian Song, research assistants
- Inese Berzina-Pitcher, consortium coordinator
- Ann Pitchford, administrative assistant

The Australian Council for Educational Research (ACER)

- Lawrence Ingvarson, co-director
- Ray Peck, co-director, primary mathematics
- Glenn Rowley, co-director, statistics and measurement

International Association for the Evaluation of Educational Achievement (IEA)

- Hans Wagemaker, executive director
- Barbara Malak, manager membership relations
- Juriaan Hartenberg, financial manager

IEA Data Processing and Research Center (IEA DPC)

- Dirk Hastedt, co-director
- Falk Brese, project coordinator
- Ralph Carstens, project coordinator
- Sabine Meinck, sampling methodologist/coordinator

TEDS-M International Sampling Referee

- Jean Dumais, Statistics Canada

TEDS-M International Sampling Adjudicator

- Marc Joncas, Statistics Canada

TEDS-M National Research Coordinators (NRCs)

Country	Name	Affiliation
Botswana	Thabo Jeff Mzwini Tuelo Martin Keitumetse	Tlokwen College of Education
Canada	Pierre Brochu	Council of Ministers of Education, Canada, Pan-Canadian Assessment Program
Chile	Beatrice Avalos Davidson	Ministry of Education, Chile, Unit of Curriculum Evaluation
Chinese Taipei	Feng-Jui Hsieh Pi-Jen Lin	National Taiwan Normal University, Department of Mathematics National Hsinchu University of Education, Department of Applied Mathematics
Georgia	Maia Miminoshvili Tamar Bokuchava	National Assessment and Examination Center
Germany	Sigrid Blömeke	Humboldt University of Berlin, Faculty of Arts IV
Malaysia	Mohd Mustamam Abd. Karim Rajendran Nagappan	Universiti Pendidikan Sultan Idris
Norway	Liv Grønmo	University of Oslo, Department of Teacher Education and School Development
Oman	Zuwaina Al-maskari	Ministry of Education, Math Curriculum Department
Philippines	Ester Ogena Evangeline Golla	Science Education Institute, Department of Science and Technology
Poland	Michał Sitek	Polish Academy of Sciences, Institute of Philosophy and Sociology
Russian Federation	Galina Kovaleva	Russian Academy of Education, Center for Evaluating the Quality of Education, Institute for Content of Methods of Learning,
Singapore	Khoon Yoong Wong	Nanyang Technological University, National Institute of Education
Spain	Luis Rico Pedro Gomez	University of Granada
Switzerland	Fritz Oser Horst Biedermann	University of Fribourg
Thailand	Precharn Dechsri Supattra Pativisan	The Institute for the Promotion of Teaching Science and Technology
United States	William Schmidt	Michigan State University

TEDS-M Expert Panels and Meetings

Specialist Advisory/Expert Panel Meetings for TEDS-M, November 2002

Meeting	Participants	Country/Affiliation
Special IEA advisory meeting on approval of TEDS-M Study, Brussels, Belgium November 4–5, 2002	Fernand Rochette	
	Belgium (Flemish)	
	Liselotte Van De Perre	Belgium (Flemish)
	Ann Van Driessche	Belgium (Flemish)
	Marcel Crahay	Belgium (French)
	Julien Nicaise	Belgium (French)
	Per Fibæk Laursen	Denmark
	Bjarne Wahlgren	Denmark
	Gerard Bonnet	France
	Catharine Regneir	France
	Ranier Lehmann	Germany
	Georgia K. Polydores	Greece
	Bruno Losito	Italy
	Ryo Watanabe	Japan
	Andris Kangro	Latvia
	Jean-Claude Fandel	Luxembourg
	Jean-Paul Reeff	Luxembourg
Seamus Hegarty	UK	
Arlette Delhaxe	Eurydice	
Barbara Malak-Minkiewicz	IEA Secretariat	
Maria Teresa Tatto	MSU	

Specialist Advisory/Expert Panel Meetings for TEDS-M, June 2003

Meeting	Participants	Country/Affiliation
IEA TEDS-M expert panel meeting, Amsterdam, The Netherlands, June 16–21, 2003	Peter Fensham	Australia
	Kiril Bankov	Bulgaria
	Martial Demebele	Burkina Faso and Québec-Canada
	Beatrice Avalos Davidson	Chile
	Per Fibæk Laursen	Denmark
	Sigrid Blömeke	Germany
	Frederick Leung	Hong Kong SAR
	Losito Bruno	Italy
	Ciaran Sugrue	Ireland
	Lee Chong-Jae	Korea
	Loyiso Jita	South Africa
	Marilyn Leask	UK
	Christopher Day	UK
	Michael Eraut	UK
	Drew Gitomer	USA
	Susanna Loeb	USA
	Lynn Paine	USA
	David Plank	USA
	Paul Sally	USA
	William Schmidt	USA
Adrian Beavis	IEA-TEDS-M ACER	
Lawrence Ingvarson	IEA-TEDS-M ACER	
Jack Schwille	IEA-TEDS-M MSU	
Maria Teresa Tatto	IEA-TEDS-M MSU	

Specialist Advisory/Expert Panel Meeting for TEDS-M, December 2003

Meeting	Participants	Country/Affiliation
IEA TEDS expert panel meeting, Hamburg, Germany, December 1–5, 2003	Peter Fensham	Australia
	Kiril Bankov	Bulgaria
	Beatrice Avalos Davidson	Chile
	Per Fibæ Laursen	Denmark
	Sigrid Blömeke	Germany
	Frederick Leung	Hong Kong
	Ciaran Sugrue	Ireland
	Bruno Losito	Italy
	Tenoch Cedillo Avalos	Mexico
	Marcela Santillan-Nieto	Mexico
	Loyiso C. Jita	South Africa
	Marilyn Leask	UK
	Angelo Collins	USA
	Lynn Paine	USA
	Hans Wagemaker	IEA
	Pierre Foy	IEA DPC
	Dirk Hastedt	IEA DPC
	Lawrence Ingvarson	IEA-TEDS-M ACER
Jack Schwillie	IEA-TEDS-M MSU	
Maria Teresa Tatto	IEA-TEDS-M MSU	

Specialist Advisory/Expert Panel Meetings for TEDS-M, June 2006

Meeting	Participants	University
Expert panel for review of TEDS-M items and data from field trial East Lansing, Michigan, USA June, 2006	Edward Aboufadel	Grand Valley State University
	Sandra Crespo	MSU
	Glenda Lappan	MSU
	Vince Melfi	MSU
	Jeanne Wald	MSU
	Rebecca Walker	Grand Valley State University

Specialist Advisory/Expert Panel Meetings for TEDS-M, September 2006

Meeting	Participants	University
Expert panel for review of primary TEDS-M items for mathematics content knowledge and mathematics pedagogy content knowledge, Melbourne, Australia September 18, 2006	Doug Clarke	Australian Catholic University
	Peter Sullivan	Monash University
	Kaye Stacey	Melbourne University
	Gaye Williams	Deakin University
	Barb Clarke	Monash University
	Ann Roche	Australian Catholic University
	Ray Peck	IEA TEDS-M ACER
	Lawrence Ingvarson	IEA TEDS-M ACER

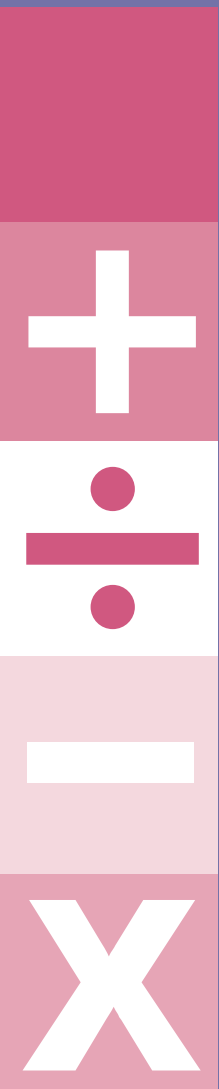
Specialist Advisory/Expert Panel Meetings for TEDS-M, September 2006

Meeting	Participants	Country/Affiliation
Expert panel for review of TEDS-M test items and questionnaires, Grand Rapids, Michigan, USA September 29–30, 2006	Kiril Bankov	Bulgaria
	Jarmila Novotna	Czech Republic
	Paul Conway	Ireland
	Ruhama Even	Israel
	Kyungmee Park	Korea
	Maarten Dolk	Netherlands
	Ingrid Munck	Sweden
	Hyacinth Evans	West Indies
	Lynn Paine	IEA-TEDS-M MSU
	Sharon Senk	IEA-TEDS-M MSU
	Jack Schwille	IEA-TEDS-M MSU
	Maria Teresa Tatto	IEA-TEDS-M MSU

Specialist Advisory/Expert Panel Meetings for TEDS-M, June and July 2009

Meeting	Participants	University
TEDS-M Mathematics and Mathematics Pedagogy Scale Anchoring Workshops in East Lansing, MI.	<i>Mathematicians Primary</i>	
	Anna Bargagliotti	University of Memphis
	Hyman Bass	MSU
	Michael Frazier	University of Tennessee
	<i>Mathematicians Lower Secondary</i>	
	Roger Howe	Yale University
	Cathy Kessel	Independent consultant
	Alejandro Uribe	University of Michigan
	Jeanne Wald	MSU
	<i>Mathematics Educators—Primary</i>	
	Lillie Albert	MSU
	Sandra Crespo	MSU
	Cynthia Langrall	Illinois State University
	Edward Silver	University of Michigan
	Alejandra Sorto	Texas State University
	Rebecca Walker	Grand Valley State University
	<i>Mathematics Educators—Lower-Secondary</i>	
	Jennifer Bay Williams	University of Louisville
	Jeremy Kilpatrick	University of Georgia
	Glenda Lappan	MSU
	Xuihui Li	California State University
	Sharon McCrone	University of New Hampshire
	Rheta Rubenstein	University of Michigan
	Denisse Thompson	University of South Florida

Note: The objective of these workshops was to develop descriptions of the characteristics of persons whose scores on the mathematics and mathematics pedagogy tests placed them at various locations on the scales.



The Teacher Education and Development Study (TEDS-M) is the first crossnational study to examine the mathematics preparation of future teachers for both primary and secondary school levels. The study, conducted under the auspices of the International Association for the Evaluation of Educational Achievement (IEA), collected data from representative samples of future teachers and their educators. During the 55 years of its activities, IEA has conducted over 30 comparative research studies focusing on educational policies, practices, and outcomes in various school subjects in more than 80 countries around the world. TEDS-M is the first IEA project to address tertiary education.

The study's key research questions focused on the relationships between teacher education policies, institutional practices, and the mathematics and pedagogy knowledge of future teachers at the end of their preservice education. Seventeen countries participated in TEDS-M. Data were gathered from approximately 22,000 future teachers from 750 programs in about 500 teacher education institutions. Teaching staff within these programs were also surveyed. They included close to 5,000 mathematicians, mathematics educators, and general pedagogy educators.

This report presents various characteristics of teacher education systems. It shows that, of the TEDS-M participating countries, those where future teachers have greater knowledge of mathematics and mathematics teaching pedagogy are also those that place greatest emphasis on policies directed toward accomplishing the following: enabling the teaching profession to compete for high-ability secondary school graduates; balancing teacher demand and supply; ensuring a rigorous system of assessment/accreditation of teacher education programs; and setting high standards for entry to the profession (i.e., gaining registration licensing) after graduation. These results are consistent with teacher education policy discussions occurring nationally and internationally about the most successful processes for assuring teacher quality. The results also provide information useful for policymakers in their endeavors to improve policy and practice relating to preparing teachers of mathematics.

This report is the fourth publication arising out of the TEDS-M project. The three preceding reports focused on the TEDS-M conceptual framework, findings from the future teachers' and their educators' surveys, and teacher salaries within the context of student achievement. IEA will also publish a teacher education encyclopedia and a technical report. The TEDS-M publications are complemented by the TEDS-M database (and its associated user guide), which contains the study's international findings and so offers opportunity for secondary analysis of this information.