MIDDLE EAST TECHNICAL UNIVERSITY

K-12 Education in Germany: Curriculum and PISA 2015

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January 25, 2017

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1. Introduction

Germany is a federal republic including 16 federal states called *Länder*. Compared to other nations in European Union, it is a very densely populated country. According to the latest figure released by the Federal Statistical Office in 2015, it was estimated that 82,2 million people lived in Germany. 17,1 million of the whole population were reported to have a migration background based on the micro census in 2015 which showed a 4.4 % increase with a year earlier (Destatis, 2017a). Germany's expenditure on education constituted 6,5% of its GDP in 2014 corresponding to €190.7 billion (Destatis, 2017b). European Commission report on education and training in Germany (2016) highlighted that Germany's general government expenditure on education stands below the EU average and is ranked ninth among the European countries spending on educational institutions per pupil.

Rather than having a centralized management system, each state is responsible for regulating schooling and teacher education. Basic administrative structure of German education system resembles the federal structure in the United States since the US government dealt with rebuilding the Germany to facilitate rapid economic recovery based on a liberal market economy after World War II (Cortina and Thames, 2013).

As a core element of having a state status, each state has cultural sovereignty which confers them responsibility for education, science and culture by considering the historical, geographical, cultural and socio-political aspects of their states. Nonetheless, the Standing Conference of the Ministers of Education and Cultural Affairs (called *Kultusministerkonferenz* or KMK) was founded in 1948 in order to keep differences between 16 federal states within certain limits. This consortium includes ministers or senators of each state to discuss educational, research and cultural issues with the aim of forming a joint view and common objectives (KMK, 2017). It also ensures the recognition of educational qualifications and certificates, and allows for mobility across the states. After the disappointing PISA 2000

results, KMK decided to implement competency-based National Education Standards to reduce discrepancies among states. With this aim, the Institute for Educational Quality Improvement (*IQB*) was founded to develop standardized monitoring system that regularly tests the states on their school quality performance, supervises curriculum and performance standards (Hartong, 2015, p. 17).

Against the backdrop of PISA 2015 results, the aim of this study is to review basic structures of German education system by exploring curriculum development process, key features of each educational level and teacher education so that we may grasp how Germany has amended its poor performance after PISA 2000 and persistently improved the quality of education.

2. Curriculum Development Process in Germany

The Ministries of Education and Cultural Affairs in the states are responsible for educational plans. All states are obliged to comply with educational standards which specify the goals. We can say that Germany has adopted the subject centered curriculum approach with emphasis on learner-centered tasks in instruction. In the subject-centered curriculum, courses are divided as separate subjects or disciplines but interdisciplinary approaches are also enabled. This curriculum approach demands scholar teachers who are experts in courses like biology, geometry and history. Interdisciplinary courses as mentioned can be offered as long as the teacher who offers it is well prepared (Ellis, 2013). Teacher education system in Germany which allows students to specialize in two subjects is open to formulate such interdisciplinary courses.

In a curriculum change or revision, a commission is appointed including serving teachers, school inspectors, representatives of school research institute in the state as well as subject matter specialists from higher education institutions. The commission deals with

identifying the major components of curriculum such as determining objectives, selection of the content and identification of the teaching methods. In some states, the curricula are finalized after revising in congruent with the feedback obtained in trial process (KMK, 2015).

Academic supervision in German schools encompasses the internal school matters. The supervisory authorities are responsible for checking the schools in terms of implementation of the prescribed curricula and examination rules. One of the significant features of curricula in German education system is that they are formulated in a general way to leave teachers freedom of adopting appropriate content, teaching methods and assessment tools in their classrooms, which is called *pedagogical responsibility* to teach lessons regarding pupil's interests and needs (KMK, 2015). However, teachers of a specific subject at a school attempt to reach a consensus on methods and assessment criteria.

Participation of all stakeholders in decision making process is ensured in two ways: teachers' conference and school conference. In teachers' conference, the teaching staff discusses on instruction and education without violating the freedom of the teacher to implement his/her lesson as he/she deems suitable. One of the responsibilities of the teachers' conference is to select the textbooks among the lists approved by the Ministry. In many states, the representatives of parents and students' may have a right to express their opinion. The school conference is a more comprehensive meeting between the head staff, teachers, students and parents as well as external cooperation partners. This conference deals with organization of school life, teaching and events outside school. It can also take decisions on crucial matters such as homework, students' workgroups and pilot projects (KMK, 2015).

3. Basic Structure of German K-12 Education System and Curricula

Compulsory education encompasses between the ages of 6 and 15 in the majority of the states except for Berlin and Brandenburg which oblige children to remain in the system until

the age of 16. For children who do not attend a full-time school, part-time education is compulsory for them until the age of 18 (Eurydice, 2011). The following table shows the distribution of students across educational levels registered in 2015/2016.

Table 1
Distribution of students among education levels in 2015/2016

Education Level	Number of Students
Schools of General Education	8,335,061
Vocational Schools	2,496,954
Schools for Nurses, Midwives	153,036
Students in Higher Education	2,757,799
Total	13,742,850

Source: Destatis, 2017c

Teaching takes place either five or six-days a week corresponding respectively to 188 days or 208 days a year. Regardless of the differences in the number of days in a week, the total number of teaching hours per year is the same. The school year starts on 1st August and ends on 31st July. In total, the duration of school holidays is 75 working days. Appendix-1 was developed to show the structure of education system in Germany from early childhood education to the end of secondary level.

3.1 Early Childhood Education

Early childhood education is divided into two parts. Children under the age of three years old are looked after in Créches. From the age of three until they start primary school, children are taken care in Kindergarten. There are no prescribed curricula in these schools but activities and educational areas are determined in line with the objectives laid down by the states. Education for children under three years old is considered as a holistic complementing development. The education naturally takes place through play, social interaction and communication in Créches. Children in Kindergarten (3-5 years old) are guided by their interests, needs and situations. What is aimed through the expansion of early childhood is to

support the child's upbringing in the family and to help parents in integrating employment (KMK, 2015).

Main objectives of Early Childhood Education:

- To develop and strengthen personal resources in order to motivate children and prepare them to cope with future challenges.
- To encourage the child's development to be an autonomous and responsible member of the community.

Table 2
Key features of Early Childhood Curriculum

Early Childhood Education	Needs / Educational Areas	Instruction	Assessment
Créches (1-3 years)	- Loving attention, - Unconditional acceptance - Safety and security - Empath and support in stressful situations	- To improve language skills, use songs and picture books. - In motor development, open space activities, songs and movement games.	- No formal assessment. - Regular observation and documentation of development and abilities.
Kindergarten (3-5 years)	- Language, writing, communication - Body, movement, health - Nature and cultural environments - Fine arts and working with different media	- Have a holistic approach. - Emphasize project work relevant to child's environment and interests. - Self-organized learning, learning from mistakes. - Investigation and experiment.	- No assessment - Monitoring and documenting the child's development.

3.2 Primary Education

The primary school (*Grundschule)* covers grades 1-4 and is attended by all school-age children between the ages of 6 -10. In Berlin and Brandenburg, the primary school is comprised by six grades. The main function of primary school is to equip students with independent thinking, learning and working, and provide experience of interacting with other people. Pupils attend lessons from 20 to 29 periods a week and each lesson lasts 45 minutes. Lessons are

usually held in the morning and may take up to six periods a day. All-day supervision and care are provided through youth welfare offices. Participation in the extracurricular activities is voluntary and involves both revision of the teaching concepts in compulsory lessons and activities which are complementary to lessons.

Courses in primary school curriculum focus on reading, writing and arithmetic. In addition to these courses, German, a foreign language, art, music and sport are also included. According to the Basic Law, religious instruction is a part of the curriculum in public schools and is given in line with the doctrine of the religious community. Until the child reaches the age of 12, parents decide whether children receive religious education. From the age 12 to 14, parents must have the child's consent in decision making process. After the child turns 14, he/she is free to decide whether to attend religious instruction. In case of not attending the religious instruction, students are obliged to study ethics as a standard subject (KMK, 2015).

In most states, compulsory foreign language, predominantly English or French, start in Grade 3. Real-life situations, authentic materials and action-based methods are used in language instruction. The languages of the neighbor countries (e.g., Danish, Dutch and Czech) and the languages spoken by foreign citizens (e.g., Italian, Russian and Turkish) are also offered in primary education. Students are expected to be competent at A1 level in a second language when they complete the primary education.

Main objectives of Primary Education:

- To provide pupils with the basis for the next educational level and lifelong learning.
- To improve linguistic competence and to help pupils comprehend the basic understanding of mathematical and scientific concepts.
- To make pupils capable of understanding the world around them.
- To develop their psychomotor skills and social behavior.

Table 3
Key features of Primary School Curriculum

	Educational Areas	Instruction	Assessment
Primary Education Grade: 1-4 Age: 6-10	- Language education, - Mathematical education: promoting logical thinking and problem solving. - Media education: using media in a critical way - Aesthetic education: creative activities and sensory experiences - Environment and health: treating nature and one's body in a responsible way	- Build on pupil's personal experience and aim to widen their horizons. - Consider pupil's questions, concerns, knowledge and abilities.	- No formal assessment on grade 1 and 2, only observations - Starting from Grade 3, observations + written and oral examinations

3.3 Secondary Education

The secondary education system is strikingly different in Germany compared to other nations. It is divided into two parts: lower-secondary and upper-secondary education. Having completed the primary education, every pupil is placed one of the tracks based on their academic achievement. The early selection of students into three different types of secondary school which lead to different qualifications is argued about standing in contrast with the principle of equal opportunity (Cortina and Thames, 2013). As well as the various secondary schools across the states, there are traditionally three types of secondary school: *Hauptschule* (vocational track), *Realschule* (intermediate track) and *Gymnasium* (academic track). Regardless of what type of school the child attends, Grades 5 and 6 are planned as an orientation phase in which the pupil's future educational path is determined.

The Hauptschule provides pupils with a basic general education which enables them to continue their education in courses leading to vocational qualification. It is a compulsory school unless the child attends any other type of schools. The Realschule provides students with a more extensive general education (KMK, 2015). According to their performances and preferences, this school enables pupils to continue their education to have a vocational

qualification or to enroll a higher education institution. Graduates of Hauptshule are said to be the most vulnerable group to the change in the market conditions as their formal training does not meet the requirements in the workforce. Therefore, they are easily affected by economic downturns (Cortina and Thames, 2013). To overcome this drawback of Hauptschule, the curricula of two non-academic tracks (i.e., Hauptschule and Realschule) have been integrated in some states. The third track, The *Gymnasium*, offers an intensified general education. Its program comprises both the lower and upper secondary level, and covers grades 5 to 12. The in-depth education in the Gymnasium aims at preparing students to have a higher education entrance qualification.

According to the framework laid down to determine core subjects, German, mathematics, the first foreign language, natural and social sciences are taught as compulsory core courses in every type of schools at lower secondary education. Music, art and sport have to be offered among the other compulsory or elective courses. The acquisition of a foreign language is a crucial part of education at all secondary school levels. Language courses are characterized by systematic learning and a higher level of abstraction. Based on students' interests, their aptitudes and nationalities, compulsory and elective language courses are offered. Students are aimed to be competent at B1 (Pre-intermediate) level upon completing lower secondary education and B2 (Intermediate) level after upper secondary level. At all levels of education system, natural sciences and technical education which they called as MINT (mathematics, information technology, natural sciences and technology) are of great importance.

Main objectives of Secondary Education:

- To help students become autonomous and independent learners.
- To bear their share of personal, social and political responsibility.

- To promote students understanding of the connection between globalization, economic development, consumption, environment pollution, population development, health and social conditions through sustainable development education.
- To equip students with constructive and critical skills to examine media.

Table 4
Key features of Secondary Education

	Educational Areas / Cross-Curricular Topics)	**Instruction**	**Assessment**
Secondary Grade: 5-12/13 Age: 10- 18/19	- Language education - MINT (Mathematics, information technology, natural sciences and technology) - Sustainable development - Democracy education - Human rights education - National Socialism and Holocaust - Media Education - Consumer Education	- Interdisciplinary activities - Self-regulated learning - Learner-centered instruction	- Written, oral and practical work

4. Teacher Education and Training

Until the first of half the twentieth century, teacher education was very basic in Germany. Thanks to the efforts of Weimar Republic after the demise of German monarchy, teacher education was reformed to meet the standards of industrialization (Cortina and Thames, 2013). Similar to the different tracks in schooling at secondary education, there are variations in teacher education. Teacher education differs between elementary school, middle/junior high school and high school. Also, there is a distinction between academic and non-academic tracks (i.e. Gymnasium versus Haupt- and Realschule). In line with rigorous curriculum of Gymnasiums, they require highly qualified teachers whereas teachers in Hauptschules do not need to be so academically qualified since they offer basic qualifications and practical skills (Cortina and Thames, 2013).

In general, teacher education in Germany is divided into two phases. In most states, teacher education to take the first phase examination require six-semesters of full-time university education for candidates in order to teach at elementary or lower secondary level while the future Gymnasium teachers have to study eight semesters. During this phase, students can choose at least two teaching subjects and specialize in them throughout their education. Most of the courses in teacher education program focus on content knowledge with little emphasis on pedagogical topics. It is noted that only 5% of the total coursework in the first phase is related to practice teaching in schools or pedagogical topics (Cortina and Thames, 2013). That phase ends with the first state examination and focuses on academic training and involves little pedagogical content

In the second phase of teacher education, student teachers who passed the first examination are hired by the states with full-salary at a public school that matches his/her certification. This process is called *Referendariat* and usually lasts two year (18 months in some states). It includes a highly structured and monitored in-school induction program which emphasizes classroom management skills and pedagogical content knowledge. During Referendariat, student teachers are paired with experienced mentor teachers and supervised by a state-run teacher education institute at the school district level. They also take classes in these institutes which are usually organized once a week. Student teachers are in charge with developing their own curricula and lesson plans. They also have to prepare and teach showcase lessons which are evaluated by a representative of teacher education institution. It is emphasized that new teachers are given full responsibility for their classes they teach but also they are closely monitored (Cortina and Thames, 2013).

When we investigate the current situation of teachers, Germany is said to have older teachers than other European countries. It is estimated that half of the staff in general education will have retired in the next 10-15 years. European Commission report published in 2016

underlined that most teachers are needed in chemistry, mathematics, physics, English and music until 2020. Though teachers in Germany go through a rigorous academic and practice phases, they have been coping with some challenges in teaching. It is argued that the first phase (emphasis on content knowledge) and the second phase (practicum) of teacher education are disjointed. Also, the pedagogical courses in the first phase are claimed to be inadequate to prepare student teachers for the actual challenges of the classroom (Cortina and Thames, 2013).

Another key issue that was highlighted in the European Commission report that German teachers do not actively take place in in-house training. One of the reasons why teachers do not participate in training can be due to their high job security. After certified teachers are hired by the state and reviewed three years, they are accepted as *Beamte* (i.e., civil servants) which bring about several benefits and seniority-based promotion regardless of quality assessments or student achievement (Cortina and Thames, 2013). Therefore, we can conclude that German education system in terms of encouraging teachers to improve themselves lacks external regulators and heavily relies on teachers' individual incentives.

5. Germany's Progress from PISA 2000 to PISA 2015

PISA, which stands for *The Programme for International Student Assessment,* is an international survey that is held every three year to evaluate education systems worldwide by testing the skills and knowledge of 15-year-old students (OECD, 2017). Students are tested in the fields of reading, mathematics and science. Each time, one of those domains is the main focus of assessment. The highlighted cells in table 6 shows the main focus of PISA in previous surveys.

Table 5
Domains Tested in PISA

	2000	2003	2006	2009	2012	2015
Reading						
Mathematics						
Science						

PISA results are expected to help shape education reforms assuming that countries are willing to learn about each other successes. To illustrate the impact of PISA on countries' education policies, reform movements in Germany after PISA 2000 results ought to be mentioned. As a result of the first PISA results in 2000 whose focus was reading, Germany learned that they were not as good as they had assumed. German students scored below the baseline level of proficiency in all tested areas. It was also revealed that the gap between poor and rich students in Germany was the largest among OECD countries. The following table demonstrates the rank of Germany in PISA 2000 with OECD average.

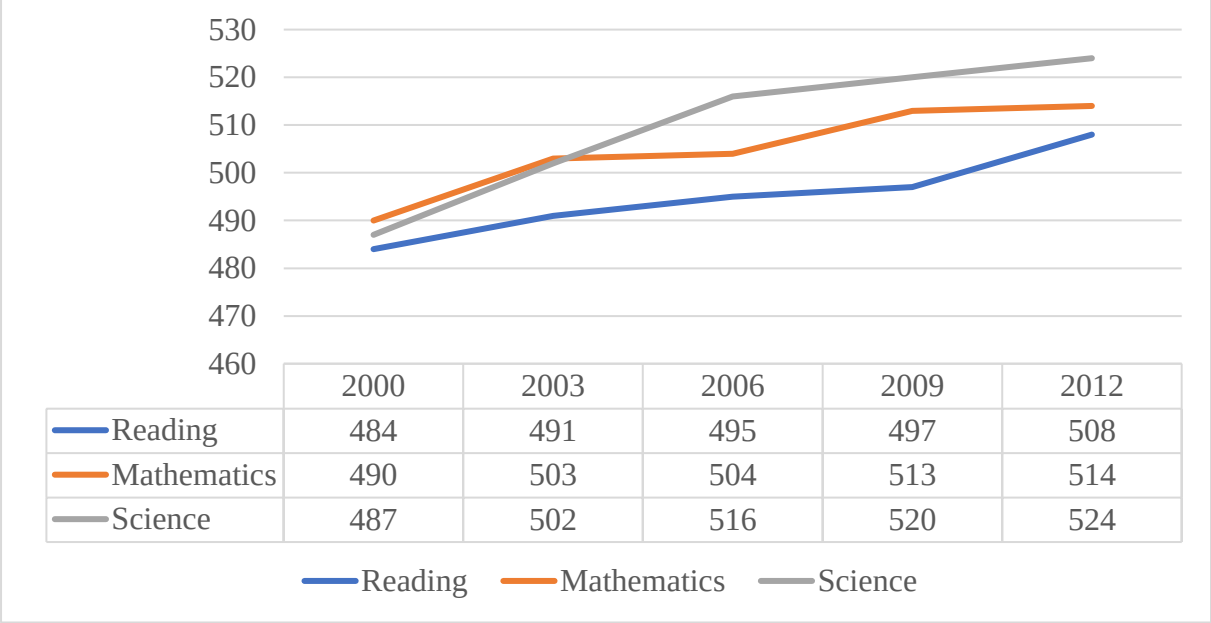
Table 6
PISA 2000 Germany Results

PISA 2000	Germany's Score	Ranking (31 countries)	OECD Average
Reading	484	21	500
Mathematics	490	20	500
Science	487	20	500

These results encouraged policy makers in Germany to take action. The government introduced binding education standards and standards-based tests for students in grades three and eight (OECD, 2017). Instead of penalizing schools for poor performance and publicizing school-level test scores, it has provided school-based support, monitored and targeted the most disadvantaged students.

To tackle with the inequalities among diverse groups through an assuring way, Germany has initiated all-day schooling in almost 60% of compulsory school to complement morning teaching with afternoon activities. In accordance with this expansion, €260 million has been budgeted till the end of 2017 so that more teachers will have been enabled to participate in afternoon sessions. However, only 38% of children attend all-day schools (European Commission, 2016). Despite the increase in participation for all educational levels and all groups including disadvantaged ones, European Commission report still notes the significant impact of socioeconomic background on education outcomes (2016). As a result of these reform movements and ongoing efforts, Germany achieved progressing below average performance in all domains in 2000 to above average in 2015 PISA. And, most of this achievement is considered to be resulted from the lowest achieving and disadvantaged students. When we look at Germany's PISA results in retrospect, it is obvious that Germany has improved its scores in all domains. It is acknowledged that Germany is one of the few countries to improve in all subjects since 2000.

Table 7
Germany's PISA Results from 2000 to 2012



	2000	2003	2006	2009	2012
Reading	484	491	495	497	508
Mathematics	490	503	504	513	514
Science	487	502	516	520	524

The latest PISA results in 2015 confirmed Germany's persistent improvement in reading since PISA 2000 whereas it showed that the country's mean mathematics performance has not changed significantly since 2003. The striking difference was in science score of Germany in PISA 2015 with a decrease of 15 points compared to 2012 (OECD, 2017). The following table shows Germany's PISA 2015 averages in all domains and OECD averages.

Table 8
PISA 2015 Germany Results

PISA 2015	Germany's Score	Ranking (72 countries)	OECD Average
Reading	509	16	493
Mathematics	506	16	490
Science	509	16	493

One of the key points highlighted in PISA 2015 report about Germany is that 16% of the variation in student performance is associated with their socio-economic status whereas OECD average is 13%. Nonetheless, it is underlined that this ratio has decreased by 4% in Germany since 2006 which can be a good indicator of the equality efforts in the country. Another significant point emphasized in the report is about the results of immigrant students which are 72 points lower than non-immigrant students. Considering the rise in the number of immigrant students from 9% in 2006 to 12% in 2015, we can suggest that the ongoing effort to improve the conditions of disadvantaged students should be accelerated as a parallel to the increase in their numbers and demands. All in all, we can infer that Germany is aware of the fact that the key to economic development and prosperous life is strictly related to the quality of education, and it is decisive about making it accessible for all diverse groups within the country.

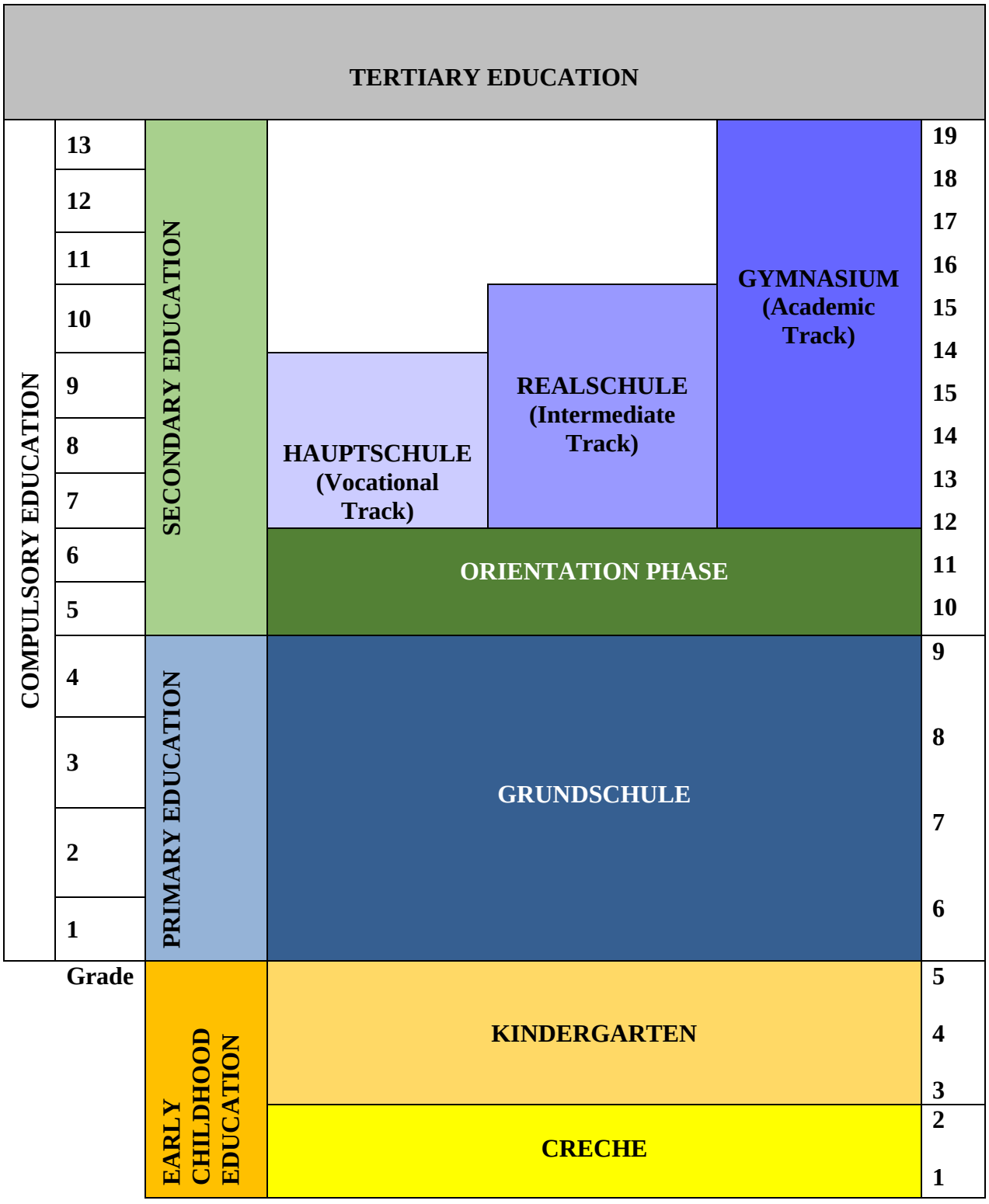
6. Conclusion

German education system with its diverse governing bodies and high number of students compared to top countries in PISA results has been dealing with some issues. The Federal Republic of Germany is constituted sixteen federal states which have cultural sovereignty in education and research as well as political issues. The disparity among states challenges the country to form a unified system in which each state would offer similar quality of education and provide equal opportunities for all types of schools. To overcome this problem and keep countries within certain limits, the Standing Conference of the Ministers of Education and Cultural Affairs (KMK) which includes ministries or senators from each state determined the binding standards for all federal states after PISA 2000 results.

Another significant issue is the tripartite secondary education which is criticized and considered to multiply inequality due the early selection of students. Though students are studied in the orientation phase at Grade 5 and 6 in the tracks that they are accepted (Hauptshule, Realschule or Gymnasium), the shift among different tracks, especially from Hauptschule to Gymnasium, is quite rare. Students' socio-economic status and whether having an immigrant background are determinant in their academic achievement in primary school. Despite the fact that Germany has become one of the few countries that improved its PISA results from 2000 to the latest one, the gap between poor and rich students still poses a remarkable problem.

Last but not least, teacher education is very rigorous in Germany with two different phases but it is argued to lack pedagogical principles. In the first phase of teacher education that lasts 6 or 8 eight semesters, student teachers focus on attaining content knowledge with little emphasis on pedagogy. Due to this lack, student teachers complain that they are inadequate to deal with the real problems in classroom when they start the second phase of teacher education which emphasizes the use of pedagogy and practise of content knowledge.

Appendix – 1
Basic Structures of Education in Germany



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