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ABSTRACT

More than 50 delegates from 19 Organisation for Economic Cooperation Development (OECD) member countries participated in a seminar examining the implications of technological innovation and economic change for the organization and pedagogy of vocational-technical education (VTE). The discussion focused on the following issues: VTE's responses to technical skills, competencies, and qualifications in the past, present, and future; changing roles/responsibilities for coordinating learning in schools and enterprises in view of technological innovation; and skill profiles and skill formation in tomorrow's factories. Many OECD member countries were found to be experiencing difficulties in attracting/motivating VTE students and finding enough employers willing to provide apprenticeships. Most OECD countries felt the following were needed: a stronger foundation in basic knowledge, closer connections between firms and schools, continuous rather than just initial training, and improved teaching in VTE. There was considerably less consensus regarding strategies to meet those needs. It was concluded that the OECD must determine how the actions of different government ministries, employers, and labor unions influence the effectiveness of VTE and to stimulate conversations within countries about the need for coordination among the various groups whose decisions influence the effectiveness of VTE. (MN)

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THE CHANGING ROLE OF VOCATIONAL AND TECHNICAL EDUCATION AND TRAINING

TECHNOLOGICAL INNOVATION AND ECONOMIC CHANGE: IMPLICATIONS FOR THE ORGANISATION AND PEDAGOGY OF VOCATIONAL AND TECHNICAL EDUCATION AND TRAINING

SYNTHESIS REPORT

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(Note by the Secretariat)

The attached document, prepared by the general rapporteur, Mr. Richard Murnane, presents a synthesis of the discussions at the policy seminar held on 18-20 September 1991 in Sainte-Croix, Switzerland. The seminar was jointly organised by the Swiss Federal Office of Industry and Labour and the OECD in the framework of the Education Committee's activitiy on The Changing Role of Vocational and Technical Education and Training (VOTEC).

More than 50 delegates from 19 Member countries participated in the seminar, which was directed at policy makers and practitioners in the area of vocational and technical education and training.

The discussion focused on the following issues:

i) **"Technical skills, competences and qualifications yesterday and tomorrow -- responses by VOTEC today"**

Changes in the relationship of production workers with machines, materials, products; changing criteria for quality and efficiency; changing skills, competences and qualifications; what needs to be changed and what should be preserved in vocational and technical education and training? What can be learned from experience in different countries?

ii) **"Co-ordinating learning in schools and enterprises -- roles and responsibilities in view of technological innovation"**

Implications of technological innovation and changing skill requirements for the organisation and co-ordination of practical and theoretical learning in schools and enterprises; technical equipement for training; Who decides? Who pays? Who trains? The role of schools, enterprises, and public authorities.

iii) **"Skill profiles and skill formation in tomorrows's factories"**

What will future factories look like? Will production skills be "embodied" in automats and machine systems? Who will be the workers in fully automated factories? Where and how will they be trained? Implications for VOTEC today.

Introduction

1. The seminar in Switzerland highlighted the many respects in which the vocational and technical training systems of member countries face common challenges, and also the diversity in responses to these challenges. The seminar discussions were lively, and a variety of views were represented. The visits to Swiss firms, schools, and training centers provided illuminating illustrations of one country's strategy for providing vocational and technical training. The seminar was made particularly memorable by the outstanding hospitality of the Swiss hosts.

2. This report cannot possibly summarize all of the important issues discussed in the conference (especially since so many thought-provoking interchanges took place during the visits to enterprises and schools). However, it does attempt to organize the topics that were discussed, and highlight important themes.

3. I begin the report by describing the themes of the five papers presented at the seminar, and mentioning the roles these papers played in the discussions. I then examine how the papers and discussions informed understanding of the following four topics:

1. Ways in which technological and economic changes pose new challenges for vocational and technical education.

2. Evidence of strains in national vocational education systems created by technological and economic changes.

3. Common goals to be pursued in improving vocational education.

4. Tensions in the design and governance of vocational education that are increased by technological and economic changes.

4. I conclude the report by mentioning topics that seem central to the conference agenda, but that were not discussed very much, if at all.

I. The papers

5. Professor Jacques Neirynck's Discussion paper n° 1, SME/ED/WD(91)13 "The Adventure of Technical Progress: Problems and Responsibilities", reminded seminar participants of the importance of asking hard questions about the implications of technological change. He suggested that debates about the future of vocational education should not simply take for granted that technological change is beneficial, and the task for VOCED is to respond to it. Instead, he implied that part of the education process should be to help students to think critically about the implications of technological change, and how it impacts on the lives of citizens today and in the future.

6. Professor Neirynck's paper provided a background for a topic that received some attention, namely, who should control the design of vocational education. His talk reminded participants that societies may be poorly served

by a vocational education system that trains workers to meet the immediate needs of employers and does not develop in students the spirit of inquiry needed for informed participation in democratic societies.

7. Mrs. Campinos-Dubernet's Discussion paper n°2, SME/ED/WD(91)12 "Training and Automation in Production Activities: A Logic of Profiles or of Levels?, explored how technological change impacts on skill requirements in the manufacturing sector, and discussed the implications for the training of production workers. She began by developing a taxonomy of different types of skills needed in production jobs, pointing out that different jobs require different combinations of skills. She then demonstrated that technological change can affect quite dramatically the skill requirements for efficient production, and that this has implications for the wages paid to workers with different types of training. Mrs. Campinos-Dubernet then argued that it was important for the French vocational education system to avoid narrow technical training that would constrain the options of workers and firms in a world in which technological change was rapid. Instead, vocational education should provide workers with the skills to continue to learn and to change jobs over their careers, thereby enhancing social mobility and providing the country with a work force able to respond rapidly to changing skill requirements.

8. Mrs. Campinos-Dubernet's paper addressed a set of issues central to the theme of the conference. In particular, her paper emphasized the importance of focusing on the **content** of training. She also pointed out that the structure and content of vocational education has implications for the distribution of earned income, a topic central to ethical concerns in every country. Despite the centrality of Mrs. Campinos-Dubernet's paper to the theme of the seminar, discussion of the paper was limited. Attempts to develop clearly defined statements about the types of skills that will be most needed in the workforce of the future did not progress very far, and little mention was made of wage differentials associated with different types of training. Later in this report I speculate about the reasons these topics did not play a larger role in the seminar.

9. The paper by Mr. Lindauff and Mr. Roettig, Discussion paper n° 3, SME/ED/WD(91)18, "Training and Development of Skilled Workers in Austrian Industries", had two parts. First, it described problems in the Austrian vocational education system stemming from technological change. These problems include antiquated curricula, the low prestige of graduates, and the lack of opportunities for occupational mobility. A consequence of these characteristics is that it has proven increasingly difficult for the apprenticeship system to attract talented students. This has led to a shortage of skilled workers.

10. The second part of the paper describes Austrian Industries' response to these problems. One element of the response has been the redesign of training programs so as to offer basic training in four broad areas. Only after completion of one of the four training programs do trainees specialize. For example, students preparing to be chemical engineers, chemistry laboratory operators, and plastics technicians all begin with the same training in chemical engineering. One advantage of this strategy is that it facilitates communication among workers in related fields, something that is critical in

responding rapidly to technological change. Another advantage is that it facilitates occupational mobility in that graduates possess the knowledge needed to facilitate further training in specialized fields. Provision of such advanced training is a second element of the Austrian Industries strategy. Austrian Industries believes that its strategy will elevate the social status of skilled workers and enhance their career opportunities. By so doing, it will attract talented students to its training programs, and prepare them to respond efficiently to technological change.

11. The paper by Mr. Rentznik and his colleagues, Discussion paper n° 4, SME/ED/WD(91)16, "Coordinating Learning in Schools and Enterprises -- Roles and responsibilities in view of Technological Innovation", described the Swiss system of vocational education, and explained how the system responded to the challenges posed by technological change. One interesting statement in the paper was that the Swiss system aimed at producing "generalists" committed to further training [rather] than specialists who perform well today but who are unable to cope with tomorrow." In providing a clear description of one national system of vocational education, the paper on the Swiss system provided a useful example to which participants from other countries could compare their systems. The subsequent discussions illustrated how much variation there is in the design of national vocational education systems, including the role of work-based learning, and the percentage of students who participate in the system.

12. The paper by Mr. Rentznik and his colleagues mentioned two aspects of the Swiss system that seem important to the topic of the seminar, but that received little explicit discussion. The first is the content of examinations. The paper explained how the examination in machine mechanics included carrying out a complicated practical project, which, after January 1992, could be done using either conventional or CNC machine-tools. Thus, the nature of the examination had responded to technological innovation -- namely, to the introduction of new computer-guided tools. It would have been interesting to discuss how difficult it was to attain agreement on altering the examination so as to reflect the new technology.

13. A second interesting aspect of Mr. Rentznik's and colleagues' paper was the brief discussion of the federal government's use of subsidies to cantons aimed at promoting the development and introduction of computer integrated manufacturing strategies. This example suggests that the Swiss system of vocational training is part of a more general industrial policy aimed at fostering competitiveness in the midst of rapid technological change. As discussed in more detail below, there was little discussion at the seminar of the extent to which the effectiveness of national vocational educational systems depended on their being part of broader national economic policies.

14. Mr. Thorel's paper, Discussion paper n°5, SME/ED/WD(91)14 "Skills profiles and skill formation in tomorrow's factories" discussed many of the issues raised in other papers, but did so from the perspective of a representative of workers. One issue concerned the consequences of technological change. Like Professor Neirynck, Mr. Thorel did not view technological change as unambiguously beneficial. He pointed out that, by rendering skills obsolete, it can jeopardize job security, and it can also reduce the quality of jobs. He also argued, however, that technological change

need not have these consequences. Proper design of training, reorganization of work, and enlightened industrial relations are critical in harnessing technological change to serve society.

15. Mr. Thorel argued that training must be broad-based, with a focus on teaching workers to "learn how to learn" (also a theme of Mrs. Campinos-Dubernet's paper). He also emphasized the importance of providing training opportunities to experienced workers, many of whom find that their skills have been made obsolete by technological change. These are issues also discussed in the paper by Mr. Rentznik and his colleagues, but with a significant difference in tone. Mr. Rentznik, writing from the perspective of a large, technologically progressive firm (Bobst), implied that the Swiss training system did quite a good job of providing broad-based training and opportunities for skill upgrading. Mr. Thorel implied that the Swiss system was in crisis, particularly in regard to the training provided by small firms. (It is interesting that Mr. Lindauff and Mr. Roettig made the same point about the training provided by small firms in Austria.) Both Mr. Thorel and Mr. Rentznik emphasized the need for ongoing negotiations among the social partners (employers, workers, and governments) to keep the education and training system responsive to the demands posed by technological change.

16. Mr. Thorel also raised the issue of the organization of work. He argued that teamwork was important in using new technologies in a manner that made the most of workers' skills. He also pointed out that it is difficult to design job structures that foster teamwork, and argued that not only did technological change pose challenges for training production workers, it also posed enormous challenges for the training of managers. This point -- that discussions of vocational education should also concern the education of managers -- aroused significant interest among seminar participants. Unfortunately, it arose only in the very last session of the conference.

II. Four Themes

A. Challenges Posed by Technological and Economic Changes

17. Technological change and economic change increase the importance of developing a workforce that can learn new skills frequently and rapidly. One reason is that the skills needed in particular fields change. (We saw in our visits that the job of watch making has been radically transformed by the introduction of electronic components, and the job of tool making has been transformed by the introduction of computer-controlled tools). A second reason is that technological and economic changes increase uncertainty about which firms and industries will survive. (One participant commented that the steel industry in his country had completely collapsed in recent years, rendering obsolete the skills of tens of thousands of workers previously employed in that industry, and presenting a massive retraining task.) Thus, a central challenge of vocational education is to provide workers with the ability to learn continuously.

18. In a number of sessions, participants tried to move from abstract generalizations to more concrete statements about what skills were made increasingly important by technological and economic changes. This proved difficult to do. While participants seemed to agree that workers needed a stronger general knowledge base, there was ambiguity about the implications for curricular content and for the design of vocational education. In my view, there are three reasons why it was difficult to move from generalizations to ideas for specific strategies.

19. First, knowledge from cognitive science about the types of general skills that are most helpful in enabling individuals to solve new problems is quite limited. This is particularly true in systems that have been successful in providing all students with basic literacy and numeracy skills. It is not completely clear what type of knowledge beyond these basic cognitive skills will be most helpful in enabling, for example, a machinist to learn to use new computer-controlled tools, or a displaced steelworker to learn a new trade.

20. Second, even in countries in which agreement has been reached that students need a stronger fundamental knowledge base, it is not clear how best to achieve this. Several participants pointed out that what may be the obvious strategy, increasing the amount of time spent in formal school-based classes, may not work well because many students lack motivation for school-based learning, and an increase in school-based learning may result in a higher dropout rate from training programs. "Dual systems" of vocational education and training are thus demonstrating what the research of cognitive scientists also confirms: that many students acquire basic cognitive skills, such as reading comprehension, most effectively when it is taught in the context of real work settings. This highlights the importance of distinguishing between a goal of vocational education, helping students to develop a stronger knowledge base, and the method of achieving this, which may involve instruction tied to real work.
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21. Third, the type of skills that workers need in specific jobs depends on the design of the work. As was discussed briefly on the last day of the conference, it is rare that technology completely determines the design of work. Instead, the impact of technology on the skills workers need depends on management decisions about the organization of work. For example, computer technology can be used to design production so that workers analyze data, exercise judgment, and make significant decisions. Computer technology can also be used, however, to reduce the skill levels demanded of workers. Thus, the design of vocational education that will provide a good "match" with the needs of employers, and will provide jobs for workers compatible with their training depends critically on management decisions about the design of production. This topic, which appears central to the design of vocational education and training, was only touched upon during the discussions. The likely reason is that the conference participants were primarily individuals concerned with vocational education, not employers concerned with choices about the design of work.

B. Evidence of Strains

22. Two types of strains on national systems of vocational education were common among countries represented at the seminar. The first concerned motivation for students. One common objective of all vocational education systems is to attract students who want to participate, who are motivated to complete their programs, and who have the abilities to do so. A number of participants pointed to evidence that their systems were experiencing difficulties in meeting this objective. These difficulties, which varied across countries, reflecting the variation in national systems, included:

-- not enough apprentices to fill available positions;
-- an increase in the number of apprentices who did not complete their contracts;
-- an increase in the dropout rate from school-based systems;
-- an increase in the number of students who choose to attend academic secondary schools rather than participate in vocational education programs, but who end up in vocational education programs after failing to gain admission to a university.

23. A second type of strain common to many countries concerned the roles of employers. Improvements in transportation and information technologies have increased international competition for many firms, leading them to be increasingly cost conscious. In some countries, this has created difficulties in finding enough employers willing to provide apprenticeships.

C. Common Goals

24. The following common goals for improving vocational education in the face of rapid technological change emerged from the seminar:

1. The need for a stronger foundation in basic knowledge. The underlying notion is that a stronger knowledge base will facilitate continuous learning over a working lifetime. As the speaker from Bobst also pointed out, a strong, broad knowledge base facilitates communication and teamwork among workers with different specialties.

2. Closer connections between firms and schools. One reason for close linkages is the need to make training responsive to changes in skill requirements, and employers are an important source of knowledge of skill requirements. A second reason is that, as the paper by Senta Raizen points out, many students acquire knowledge more effectively when taught in the context of real jobs.

3. Continuous training, not just initial training. One reason is the demographic reality that most of the workforce of the year 2000 is already in the workplace. The low birth rates in most member countries means that the average age of the workforce will continue to rise in the years ahead. Therefore, maintaining a productive workforce in the face of technological change requires not only high quality training for new entrants, but also retraining of older workers. A second reason is that displacement of workers creates the need for retraining for new occupations.

4. Upgrading the teaching in vocational education programs, both in terms of keeping teachers aware of newest technologies, and enabling them to become more effective in helping students to see connections between theory and practice.

25. It is not possible to generalize from the site visits to firms and schools about how well the Swiss system meets the goals listed above. Indeed, the difference in tone between the papers by Mr. Thorel and Mr. Rentznik and his colleagues suggests that this is a topic of ongoing debate in Switzerland. The site visits, however, did illustrate strategies for meeting these goals. For example, the teachers at the Ste-Croix school had ongoing longterm contacts with local firms which kept them up to date on technical matters and facilitated R&D transfer between the School with its extremely modern equipment and local enterprises. Communication between the School and local firms was facilitated by the Director of the Technical School serving on the board of directors of the local music box factory.

26. Another example concerns the vocational education program at Bobst. Coordination between the firm's workplace training and school-based instruction is facilitated by Mr. Rentznik's (from Bobst) serving on the board of directors of the school that provides instruction to Bobst apprentices. Bobst encourages the most talented apprentices to continue their education at engineering schools rather than staying with the firm. It would have been interesting to discuss whether many other Swiss firms follow this practice, which facilitates occupational mobility, a goal in many countries, but which would also seem to result in Bobst losing many of its best apprentices.

D. Tensions in Designing Improvement Strategies

27. All of the interest groups concerned with vocational education in each country would probably support the three goals outlined in the previous section. However, agreement on goals is easier to attain than agreement on strategies to reach these goals. Discussions at the seminar highlighted a number of tensions present in attempting to design a strategy to achieve these goals. This section describes these tensions.

1. A common response to the perceived need for students to have a stronger knowledge base is to add material to the curricula of vocational education programs, especially material that will be taught in schools as opposed to on the job. It is difficult to get agreement on material to drop from curricula. Consequently, instead of having the new material replace material that may be obsolete, it is added to existing curricula, making the training programs longer in duration and/or more intellectually demanding. One consequence of this is that more students drop out of training programs because they find the curriculum either difficult or boring. (This tension suggests the potential value of a seminar that would explore in greater detail the pressures for expanding curricula, and strategies particular countries have adopted to avoid growth in curricula.)

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2. A related tension introduced by the need for a stronger knowledge base concerns the funding of vocational education. Participants from a number of countries with apprenticeship programs mentioned employers' concerns about extension of the school-based part of training from one day per week to two days per week. Such extensions reduce the time apprentices spend with employers, and reduce the value of apprentices to employers. Participants reported that the change in time allocation between workplace and school jeopardized agreement on the distribution of the costs of vocational education The argument of employers is that an increase in the proportion of time apprentices spend in school should be accompanied by an increase in the share of the cost of training borne by government.

   Mr. Thorel's paper suggests that the question of "who pays" is also a critical one in the design of vocational education for experienced workers. He argued that the training should take place during regular working hours for which employees are paid, and should be a substitute for their regular work during the training period. He implied that firms want workers to assume part of the burden of training costs by participating in training after regular work hours, when their time is not compensated.

3. Attempting to develop stronger connections between employers and schools exacerbates tensions concerning the control of vocational education, and the governance structure. While there is no question that an effective vocational education system must be responsive to the changing needs of employers for skilled workers, the papers by Professor Neirynck and Mr. Thorel emphasized the importance of other goals, including awareness of environmental issues and the needs of workers.

   Discussions at the seminar pointed out that there are many different strategies for bringing about closer connections between employers and schools; apprenticeships are one model, but not the only model. In every system, however, there are tensions surrounding issues of governance and control, and who pays for vocational education.

   One issue that surfaced at the seminar concerned the extent to which employers disagree on what they want from a national system of vocational education. Mr. Roettig, the speaker from Austrian Industries, suggested that small employers in his country want different things from vocational education than do large employers. This comment raised the question of the nature of the differences among employers' priorities, whether technological change has altered the distribution of priorities for vocational education among employers with different characteristics, and whether the same pattern is present across member countries. A similar question could be asked about the effects of technological change on the priorities for vocational education among groups of workers with different characteristics. In other words, the overall question is the extent to which technological and economic changes have altered the priorities among the social partners concerned with the design and administration of vocational education.

4. One respect in which technological change exacerbates tensions surrounding governance and control is the need for rapid responses. Maintaining competitiveness in an environment of global competition requires that the system of vocational education respond rapidly to charges in skill requirements brought about by technological change. At the same time, successful implementation of vocational education requires consultation and negotiation among the various interest groups -- a process that is inevitably time-consuming. Attempts to change the vocational education system without consultation and negotiation with key participants can result in failure resulting from a lack of cooperation from employers, educators, or students.

   The structure of governance may play a role in determining the speed with which national systems of vocational education can respond to technological changes. One participant mentioned that an obstacle to rapid change in his country was that apprenticeships were part of labor law, while schooling was part of school law. A lack of coordination among these critically related aspects of the vocational education system inhibited rapid changes. Thus, the challenge is to devise a governance system that provides for negotiation with critically interested parties, but yet is responsive to changes in skill requirements.

5. One arena in which the tensions brought about by technological change is evident concerns the role of credentials. Some systems of vocational education include national examinations, and provide graduates with nationally recognized certificates of competence. In some systems, these certificates are licenses without which individuals cannot pursue a trade. One advantage of nationally recognized credentials is that they facilitate mobility of workers, because employers know that license holders have mastered a common set of skills. Mobility is important because it eases dislocations brought about by technological and economic change.

28. Another consequence of national examinations is that they tend to influence the curricula of vocational education programs because, to continue to remain in operation, programs must provide students with the knowledge and skills to pass the licensing examinations. This influence of examinations on curricula and instruction can be an important strength if the examinations do, in fact, test the skills that are most important in being a successful practitioner of a particular occupation. On the other hand, the influence of a national examination on the curriculum of vocational education programs can be problematic if the content of examinations is slow to respond to changes in training brought about by technological change. For example, one participant mentioned that the training program for steel workers in his country still had to devote time to technologically obsolete methods of making steel because the national examination contained questions dealing with this method.

29. The Hotel School at Lausanne provided an interesting contrast to situations in which the curricula of individual training programs is held hostage to the content of a national licensing examination. Since the Hotel School is a private institution that is not part of the dual system of

training, it devises its own examinations. Thus, it was able to alter its examinations recently at the same time that it undertook major revisions of its curriculum. We must be careful, however, in generalizing from the Hotel School experience. As an internationally known institution, its established reputation serves the role of providing graduates with credentials that are widely accepted. Thus, in its case, reputation served as the alternative to national licenses as an assurance of competence. In industries in which there are many small training institutions, it is doubtful that the reputations of individual training institutions could serve as assurances of competence. This explains the use of national licensing examinations in many countries.

30. The role of licensing examinations was mentioned several times during the seminar, but was not discussed extensively. However, this important topic will play a central role in a seminar that will take place in Portugal in the near future.

III. Relevant Topics That Were Not Discussed

31. This section describes briefly topics relevant to improving vocational education, but that were not the subject of extensive discussion at the seminar.

1. While the need to increase the knowledge base in vocational education programs was discussed at the seminar, little attention was devoted to factors affecting the motivation of students to master a more demanding training program, such as the attractiveness of the jobs they can anticipate, and the wage levels they can expect. This is understandable since job designs, working conditions, and wages lie outside the control of national ministries responsible for the administration of vocational education programs. However, the motivation of youth to enter and work hard in vocational education programs will depend on these factors.

   Most analysts now accept that technological change rarely dictates job design, working conditions, and wages. Instead, technological changes, especially those involving the use of computers, widen the options for how work can be organized. Computers can be used to reduce the skill requirements of jobs, and to monitor the speed with which workers complete routine tasks. Understandably, the wages attached to such routinized jobs tend to be low. Computers can also be used to increase the skill requirements of jobs, to make jobs more varied, and to provide workers with the tools to engage in significant decisionmaking. The wages attached to such jobs tend to be high.

   The success of vocational education programs in attracting able students and in motivating them to master more demanding curricula will depend critically on the expectations about the jobs they will be able to obtain. Unfortunately, little is known about the factors that influence firms' decisions about job design in the face of technological change. In particular, little is known about the

extent to which government policies such as training subsidies, legislatively imposed minimum wages, and tax policies and affect the job design decisions of firms. While government fiscal policies initially may seem unrelated to the effectiveness of vocational education, it is possible that they have a central impact through their influence on the types of jobs available to graduates.

The training of managers may also play a critical role in determining whether firms respond to technological change by decreasing skill requirements and reducing wages or by increasing skill requirements and offering higher wages. Thus, as discussed in the last seminar session, it is important to view vocational education not only in terms of training employees, but also in terms of training managers. The limited discussion raises the question of how to design a seminar that could fruitfully explore this topic.

2. While the topic of extending training over the life of every worker was discussed at the seminar, the implications for the structure of vocational education were not explored. One reason that this topic did not receive detailed attention concerns the structure of national ministries of vocational education. Conversations with seminar participants suggested that many, if not all, governments had offices concerned with the initial training of workers, and other offices concerned with training for older workers. Each of these offices pursued their mission quite independently of the work of the other offices. A question that should be explored is whether the need to foster continuous learning has implications for coordination between the offices responsible for different aspects of vocational education. A set of question that might be fruitfully explored concerns the obstacles to effective training for older workers, and whether these obstacles could be reduced by a redesign of initial training.

3. The implications of demographic changes for the design of effective vocational education programs was touched on, but not intensively discussed, at the seminar. One change affecting many member countries is the increase in the proportion of new labor market entrants who come from lower income countries, and who received their primary education in their country of origin. This demographic trend will lead to greater diversity in the educational backgrounds of entrants to vocational education programs in the future. This increasing diversity may pose significant challenges for the design of effective vocational education programs.

32. In a concluding comment, I would like to speculate about the tensions involved in designing OECD seminars on vocational education. While the participants in the Swiss seminar varied in background and in interests, a large percentage of them were individuals with operational responsibilities within government for the design or operation of vocational education. In one sense, this was a strength of the seminar in that the participants had many common interests, and faced many common problems in their jobs. There were many lively conversations, for example, about the merits of alternative

strategies for increasing the knowledge base in vocational education programs. My guess is that these conversations were valuable to many of the participants. Had the seminar participants been a more varied group, with a larger proportion, for example, of private sector employers, representatives of labor unions, and government officials concerned with fiscal policies, it would have been more difficult to find the common interests that led to so many fruitful conversations.

33. At the same time, the similarity in the jobs held by the seminar participants resulted in an inevitable focus on policies that could be directly affected by government offices responsible for vocational education, and to a neglect of factors that may critically influence the effectiveness of vocational education, but that lie outside the control of ministries of education. These factors include government fiscal policies, government immigration policies, and employers' decisions about job design.

34. In summary, a difficult challenge for the OECD is to explore the ways in which the actions of different government ministries, employers, and labor unions influence the effectiveness of vocational education, and to stimulate conversations within countries about the need for coordination among the various groups whose decisions influence the effectiveness of vocational education.