

# Measuring competences in higher education: What next?

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ROLF VAN DER VELDEN

## MEASURING COMPETENCES IN HIGHER EDUCATION: WHAT NEXT?

### INTRODUCTION

The theme of this conference, “Modeling and Measurement of Competences in Higher Education”, indicates that there is a growing awareness that the measurement of competences should not be restricted to primary and secondary education, but should also enter into the domain of higher education. In this contribution, I will provide a sketch of the current state of large-scale skills assessments and the challenges that lie ahead. I will argue that it is important to link the measurement of competences in higher education to economic and social outcomes, and I will provide a short impression of the kind of information that graduate surveys can provide. I will discuss some of the main implications that can be drawn from these graduate surveys for higher education.

### THE STATE OF THE ART<sup>1</sup>

In the last few decades we have seen an increased awareness of human capital as one of the driving forces behind economic development. Research has provided sound evidence that investments in education provide large economic and social returns both for the individual and for society at large. As a result, different actors in society (policy-makers, employers, employees, students) have increasingly invested in education and training as a way of improving the existing stock of human capital.

A development which accompanied this increased interest in education and learning was the need to monitor and assess the stock of human capital. The Organisation for Economic Co-operation and Development (OECD) played a prominent role in this by initiating the so-called Indicators of Education Systems (INES) project, aimed at developing indicators of the input, process and output of education and training. The results of this project are published annually in the publication “Education at a Glance”.

What soon became clear is that education as such is only a poor indicator of the stock of human capital. Individuals of the same level of education show a strong heterogeneity in skills. Likewise, countries that have more or less comparable levels of educational attainment still show large differences in the proficiency levels of different skills. Moreover, skills acquisition does not only take place in education. People also learn through work experience and in daily life, which leads to a further loosening of the link between educational qualifications and the later stock of skills.

This has caused a paradigm shift, from measuring educational attainment to measuring competences or skills. The basic idea is that educational attainment as such may be important, but the driving mechanism behind the effect of education on economic and social outcomes operates through the skills and competences that these educational qualifications represent. A suitable illustration is given in a recent overview by Hanushek and Woessmann (2011). They argue that a net improvement in the literacy scores of 15-year-olds by a quarter of a standard deviation would increase economic growth in OECD countries by almost 300%, or approximately US\$125 trillion, by 2090. They show that skills and competences completely account for the projected effect of increased educational attainment on economic growth in OECD countries.

Over the past few decades, a great deal of progress has been made in assessing so-called generic basic skills, mainly in the areas of literacy, numeracy, science and civics. The most well-known examples are international cross-sectional surveys like the Trends in International Mathematics and Science Study (TIMSS), aimed at assessing the mathematics and science levels of students in primary and secondary education, the Progress in International Reading Literacy Study (PIRLS), aimed at assessing the literacy levels of primary school students, the Program for International Student Assessment (PISA), aimed at assessing the literacy, numeracy and science levels of 15-year-olds, the Civic Education Study (CIVED) and its successor the International Civic and Citizenship Education Study (ICCS), aimed at assessing the civic competences of secondary school students, and the International Adult Literacy Survey (IALS) and its successors the Adult Literacy and Life Skills Survey (ALL) and the Program of International Assessment of Adult Competences (PIAAC), all aimed at assessing the literacy and numeracy levels of 16 to 64-year-olds. However, there are also important national examples of surveys and panel studies that aim to assess the stock of basic skills, like the U.S. National Longitudinal Survey of Youth (NLSY), the Collegiate Learning Assessment (CLA), the Longitudinal Survey of Australian Youth (LSAY), the Dutch Secondary Education Cohort of Students (VOCL) or the recent German National Education Panel Study (NEPS).

As indicated above, all of these surveys assess generic skills. Up to now, no comparable surveys of this kind have been carried out in order to assess vocation-specific skills (one exception is the Mexican Higher Education Exit Assessments, see contribution of Rafael Vidal Uribe in this volume). Nevertheless, there is clear evidence that these specific skills are just as important as general skills (Bishop, 1995; Van der Velden, 2006), especially for economic outcomes. They also constitute a large part of what is being learned in vocational education and higher education. Based on the notion of the importance of specific skills, feasibility studies have been carried out to study such skills in vocational education and training (PISA-VET, Baethge et al., 2006) and higher education (see the contribution by Karine Tremblay of the OECD on the Assessment of Higher Education Learning Outcomes (AHELO) project in this volume). The main reason that assessments in specific areas have not yet become widespread is the sheer variety of specific domains that can be distinguished. While it is easier to define a

limited number of key generic skills and to develop tests in order to assess these skills, the number of specific domains is, by definition, much larger. In addition, in terms of design, it is easier to administer generic skills assessments, as these can be applied to the whole population. For obvious reasons, this is not the case for specific skills, like car mechanics, accounting or carpentry. Nevertheless, there is no reason to believe that these domains are more difficult to assess than generic skills, like literacy or problem-solving.

For higher education, it is important to measure both general academic competences as well as discipline-specific competences (as is the objective of the AHELO project). Both have been shown to strongly determine graduates' success in the labor market (Meng, 2006; Allen & Van der Velden, 2011b). However, there are a few obstacles which are yet to be tackled, which will be discussed below.

### THE DIFFICULT CONCEPT OF COMPETENCES

Educational research has shown the importance of focusing on competences rather than skills, and we have seen a strong movement toward competence-based education. There are many definitions in existence, but that which was formulated during the so-called DeSeCo (Definition and Selection of Competences) project seems to be very useful. This project was initiated by the OECD in order to provide an overarching framework for international skills assessments. Emphasizing the need for competence assessment rather than a narrow focus on skills, competences are defined in this project as “the ability to successfully meet complex demands in a particular context through the mobilization of psychosocial prerequisites (including both cognitive and non-cognitive aspects)” (Rychen & Salganik, 2003, p. 43). The basic difference from previous concepts of skills is the holistic nature of the concept of competence. First, there is a direct link to performance, in the sense that competence relates to meeting demands successfully. Second, the definition clearly refers to a range of cognitive and noncognitive skills rather than just one skill. Thirdly, the concept of competence, refers to the notion of “orchestration”, that is the ability to use these different skills in a meaningful and deliberate way. In this regard, the “whole” that makes up a competence is more than just the “sum of its parts”. Skills are therefore best considered as one of the constituent elements of a competence. Given this definition, all of the aforementioned assessments measure skills rather than competences, which is the reason why I have refrained from using the word competence when referring to these assessments.

### THE CHALLENGES

One of the main challenges for large-scale assessments is to try to broaden their scope to measure competences rather than skills. Some of the current initiatives in the area of problem-solving (PISA and PIAAC) already contain elements that are more holistic in nature and refer to the notion of orchestration. However, they are still far from what has been defined here as competence. It seems to be especially

difficult to broaden the scope to include non-cognitive aspects. Attempts to develop tests of soft skills like teamwork and communication skills have proven very difficult (Murray et al., 2005) and have not yet resulted in tests that can be compared fully across relevant populations. However, many of the so-called 21st century skills involve both cognitive and noncognitive aspects. The term “21st century skills” has been coined to refer to those skills that seem to be specifically relevant in the modern knowledge economy, such as creativity, critical thinking, learning skills, socio-communication skills and self-management skills. It is therefore crucial to include such skills in a competence assessment in higher education.

Another major challenge in this line of research is the identification of underlying causal mechanisms. It is easy to identify a correlation between educational attainment and skill level, or between skill level and earnings, but this is not the same as claiming that education actually imparts these skills, or that these skills actually increase productivity at work. The aim to improve our understanding of causal mechanisms in competence assessments in higher education has a number of implications.

First, we need to be able to assess the added value of higher education. Higher education institutes differ in terms of their selection mechanisms, and part of the difference in output results simply from differences in input. It is therefore important to have a longitudinal design with repeated measures of competence at the beginning and end of higher education.

Second, we need to be able to link the development of these competences to characteristics of the study program, for example, the modes of teaching and learning. Are certain competences better developed in student-centered environments like project and problem-based learning than in more traditional classroom settings? What is the effect of internships on the development of specific skills? What is the role of engaging in research activities? A competence assessment in higher education needs to be able to link differences in learning outcomes to different settings/environments in order to improve our understanding of the causes of these differences.

Third, we need to have a design that will help us to deal with unobserved heterogeneity. Having good control variables like input characteristics and good measures of the competences at the start of higher education is one step, but it will still not rule out the problem of unobserved heterogeneity. This is a general problem in large-scale assessments which are based on survey data rather than experimental data. Over the past two decades, new statistical techniques have been developed in order to address this problem, such as propensity score matching, difference-in-difference or instrumental variables. However, the success of applying these techniques depends greatly on the quality of the relevant control variables or instrumental variables. Although researchers have been very innovative in the creation of instruments, this process usually occurs after the data have been collected. In order to successfully identify causal relations, it is important to build some experimental variation or good instrumental variables into competence assessments in advance.

## THE NEED TO MEASURE OUTCOMES

The value of a competence assessment in higher education will be greatly enhanced when it is linked to graduate surveys for two reasons. The most obvious reason is that it is not enough to measure acquired competences in higher education. We also need to examine the way in which graduates cope with the requirements of their work. The proof of the pudding is in the eating, and it is important to assess how competences determine labor market success. Graduate surveys are also important for another reason, as they provide a means to evaluate the standards that have been set for the assessment in question. Usually, these standards are formulated by subject matter experts, but graduate surveys provide an opportunity to evaluate how these standards work in practice. Are the levels that have been set sufficient to function well on the labor market? Moreover, having information on both the acquired level of competences (through the assessment) and the required level (through the graduate survey) provides an opportunity to examine the mismatch in the labor market. Skills shortages and the underutilization of skills are both undesirable and lead to a loss of productivity. Linking competence assessments in higher education to graduate surveys will provide further insight into the prevalence of these types of skills mismatch.

Many countries have already conducted some form of graduate survey, but there are only a few international comparative studies: the CHEERS survey (Careers After Higher Education: A European Research Study; see <http://www.uni-kassel.de/wz1/tserregs.htm>) and its successor the REFLEX project (Research into Employment and Professional Flexibility, see <http://www.reflexproject.org>). Both surveys focus on the transition from higher education to work and were carried out three (CHEERS) and five years (REFLEX) after graduation.

## THE REFLEX PROJECT

The REFLEX project<sup>2</sup> was carried out in approximately 20 European countries and Japan. It is based on a representative sample of around 100,000 graduates, five years after they left higher education. The survey was carried out in 2005 (initial REFLEX sample) and 2008 (the extension to Eastern Europe, the Higher Education as a Generator of Strategic Competences (HEGESCO) project, see <http://www.hegesco.org>). Today, the REFLEX project constitutes the largest existing graduate database. REFLEX gathered detailed information on careers in higher education, the characteristics of the study program, the modes of teaching and learning, entry into the labor market, the characteristics of graduates' first and current job and the acquired and required level of skills. In this section, I will provide a short impression of the most relevant findings. For more detailed information, see Allen and Van der Velden (2009, 2011b).

*What Does the World of Work Look Like to Higher Education Graduates?*

The world of work for higher education graduates is best described by the following keywords:

- International: almost 40% of the graduates work in organizations that have an international scope;
- Competitive: approximately 85% of the graduates working in the private sector work in firms which face strong competition, mainly on quality. Even in the public sector, a sizeable minority of the organizations in which the graduates work face strong competition;
- Innovative: 70% of the graduates are in some way engaged in innovative activities. These innovative activities are often related to innovation in knowledge and methods;
- Insecure: 50% of the graduates have experienced some form of reorganization since starting work with their current employer. Note that these figures date from the period prior to the economic crisis of 2009 and 2010, and so this is more a structural than a temporary phenomenon;
- Professional: graduates are often required to act as an authoritative source of advice for their colleagues. They are expected to take the initiative to engage in professional contact and they experience a high level of professional autonomy.

*What are the Relevant Areas of Competence?*

In the REFLEX project, we have identified five relevant areas of competence for graduates: professional expertise; functional flexibility; innovation and knowledge management; mobilization of human resources; and international experience.

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***Items per area of competence***

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*Professional expertise*

Mastery of one's own field or discipline

Analytical thinking

Ability to assert authority

*Functional flexibility*

Knowledge of other fields or disciplines

Ability to acquire new knowledge rapidly

Ability to negotiate effectively

*Innovation and knowledge management*

Ability to use computers and the Internet

Ability to generate new ideas and solutions

Willingness to question one's own and others' ideas

Alertness to new opportunities

*Mobilization of human resources*

- Ability to perform well under pressure
  - Ability to use time efficiently
  - Ability to work productively with others
  - Ability to mobilize the capacities of others
  - Ability to make one's meaning clear to others
  - Ability to coordinate activities
- 

For the first four domains, we developed scales with items reflecting different aspects of these domains. Respondents were asked to indicate the extent to which these competences were required in their current job and the degree to which they actually possessed them. The items relating to these domains are listed in the table above. In addition, questions were asked about the respondents' foreign language proficiency and international experience in order to indicate their international orientation.

How were these domains evaluated? The results show that first and foremost, graduates need to be professional experts, as professional expertise drives labor market success. A high level of professional expertise is directly linked to a lower chance of becoming unemployed, a better chance of finding a job that matches one's level of education and higher earnings. Moreover, professional expertise is also relevant when graduates are working outside their own domain. Graduates who are experts in their own domain are also able to use their knowledge and skills to the full when working outside their own domain.

The second most important area of competence is what we have called the "mobilization of human resources". This is defined as the ability of graduates to use their own and others' capacities. The basic idea is simple: if human capital is the driving force behind the economy, then mobilizing this human capital is crucial. It is obvious that a graduate who is unemployed or who is working in a job in which his/her knowledge and skills are not fully utilized is contributing very little to the overall economic growth. Therefore, it is important that graduates possess the competences to mobilize their own capacities, such as self-management skills, organizational skills and so on. Moreover, graduates can be called upon to mobilize the capacities of others. This can relate to direct leadership skills, but it also includes the ability to create synergy in teams. Moreover, it involves the capacity to mould the work environment so as to better fit one's own competences and those of one's colleagues or subordinates. The results show that possessing the ability to mobilize human resources has a positive effect on finding a job quickly as well as on the earnings associated with that job.

The third important area relates to international orientation. As a result of globalization, graduates are increasingly expected to work in an international environment. This not only implies a good command of foreign languages, but also requires an ability to understand and empathize with other cultures and to reflect on the limitations of one's own culture. An important way of improving one's international orientation is to spend time abroad for study or work. Unsurprisingly, the results show that this kind of international experience has a positive effect on the probability of being internationally mobile after graduation or the chance of



obtaining work that requires international competences. In addition, it is also related to higher wages in general.

A fourth area which is relevant relates to functional flexibility, which is the ability to cope with changes in the work environment. As indicated above, many graduates are faced with important changes in their work environment (such as reorganization) which have an impact on their work tasks. Graduates must be able to deal with such changes and, in some cases, must even be prepared to take up tasks which are not directly related to their own field of expertise. Our findings show that competences in this area are needed, but not directly rewarded. Having a certain level of functional flexibility should not be seen as an investment that will directly pay off, but more as an insurance policy that will safeguard job opportunities when graduates are faced with change. In this sense, this concept is closely related to employability.

Finally, graduates are expected to play a role in the area of innovation and knowledge management. This relates not only to pure research and development activities but more generally to the ability to create an environment in which knowledge production and diffusion is optimized and in which innovations are implemented. This involves creativity, an ability to notice new opportunities as well as the organizational ability to implement innovations within the organization. Our findings show that innovative competences are important, but only when graduates are directly involved in actual innovative activities. Although most innovation takes place in large organizations, these organizations do not always fully utilize the innovative competences of the graduates they employ as a result of the internal division of labor.

*What are The Lessons That can be Drawn from The REFLEX Study for Higher Education?*

The findings of the REFLEX project suggest that there is clear evidence of a dual orientation in higher education. The most successful programs in terms of labor market outcomes are programs that have either a strong academic reputation or a strong vocational orientation. Both types of program give their graduates a competitive advantage on the labor market. Strong academic programs signal a high learning ability and strong academic skills based on selective entry requirements as well as a high-quality academic learning environment. Strong vocational programs, on the other hand, impart relevant vocational skills that can be deployed immediately on the labor market. Due to the heavy involvement of employers in the latter type of program, they also ensure a smooth transition to the labor market. There is a need for both types of program on the labor market, and it is important for higher education programs to opt for either one or the other.

Another relevant finding is that the acquisition of relevant competences is closely related to the demands of the study program. More demanding programs impart more relevant competences, which is a simple result of "time spent on task". More demanding programs require students to work harder and spend more hours studying. The overall impression is that higher education programs are not

very demanding, although there are significant differences both between and within countries.

As indicated above, professional expertise is the driver of labor market success, even when graduates are working outside their own domain. This finding is particularly relevant in the context of a discussion about whether higher education should produce generalists or specialists. It suggests that a good education in a particular field not only provides graduates with skills that are needed in jobs that match that field, but also provides a basis for the development of more general analytical skills that can be applied in other areas as well. In this sense, training in a specific field of knowledge serves as a carrier through which generic skills can be developed. Academic skills cannot be developed without some relation to content and it is this content that constitutes the heart of the specific discipline or field of study. The importance of specific knowledge should therefore not be underestimated.

In the past decade, higher education has become more internationally oriented. More and more students spend part of their study period abroad. However, it seems that today, the world in which graduates are working is changing even more rapidly. Graduates are now expected to have a strong international orientation and excellent foreign/English language proficiency. The findings show, however, that this is the area in which most graduates indicate that they have serious shortages.

There is evidence from the graduate surveys that student-centered methods like project and problem-based learning positively affect general academic skills (Meng, 2006). These generic academic skills are better developed in such environments than in a traditional classroom setting. However, there is also a strong indication that discipline-specific skills are better developed in an environment in which the teacher acts as an important source of advice. Meng (2006) therefore concludes that problem-based learning in which the teacher plays a strong role provides the best environment in which to develop both kinds of skills. This implies that the role of the teacher in student-centered methods should not be limited to merely a “coach of the learning process”, but should also be more active, particularly in transferring specific knowledge (e.g., through lectures).

Finally, there is evidence that the learning process is determined not only by the curriculum, but also by assessment, as assessment drives learning. Higher education institutes should be more aware that the way in which they assess students should be in line with the kind of skills they want to develop. Multiple-choice exams do not foster academic skills, but merely reflect the short-term memory of students. The findings from the REFLEX survey confirm this theory and show that students learn more from essays and oral exams than from multiple-choice exams.

## NOTES

<sup>1</sup> The following section is based largely on Allen and Van der Velden (2005) and Allen and Van der Velden (2011a).

<sup>2</sup> The initial REFLEX project was financed by the European Sixth Framework Program (Contract No: CIT2-CT-2004-506-352) and the HEGESCO project was financed by the ERASMUS lifelong learning program.

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