Assessment data of students' competencies for higher education institutions and practice

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Abstract

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Over the past decade, there has been growing interest in various issues related to the provision of higher education. Policy-driven outcome-oriented reforms have changed the higher education sector in a sustainable way. Findings from empirical research on the effectiveness of higher education can serve as a basis for sustainable development on structural, organizational, and individual levels. In the German research program “Modeling and Measuring Competencies in Higher Education” (KoKoHs), models of cognitive and non-cognitive abilities and skills were operationalized through measuring instruments and tested in empirical assessments. Preliminary results show that the KoKoHs program provides valid information on students’ competencies.
**Presentation**

**Assessment data of students’ competencies for higher education institutions and practice**

**Introduction and background**

Over the past decade, there has been growing interest in various issues related to the provision of higher education. Increasing orientation towards learning outcomes, political reform strategies, assessment initiatives, and quality assurance programs (e.g., Bologna reform, OECD’s Assessment of Higher Education Learning Outcome (AHELO) feasibility study, and the European Association for Quality Assurance in Higher Education (ENQA)) have changed higher education for the long term, particularly in OECD countries. Challenges have arisen from increasing internationalization (e.g., mobility of students) and “massification” of and immense increase in access to higher education. These challenges have created an urgent need for international benchmarking standards to provide comparable evidence of student learning outcomes in higher education (Coates 2014; Tremblay et al. 2012; Liu 2011).

In the course of internationalization, stakeholders (e.g., policy makers) seek information on accountability, efficiency, and quality of higher education institutions. They also seek evidence of student learning outcomes. To provide this information, assessment research in higher education requires a sound theoretical and empirical basis. Higher education programs and courses can be effective only if learning outcomes are assessed formatively and summatively and if relevant determinants such as basic generic and domain-specific knowledge and skills are taken into account. Findings from empirical research on the effectiveness of higher education programs can serve as a basis for sustainable development and reforms on structural, organizational, and individual levels. Nevertheless, higher education is still underrepresented in international empirical educational research (Land & Gordon 2013).

Since the implementation of the Bologna reform, the discussion regarding the quality of teaching in higher education has increasingly focused on student competencies as key outcomes of higher education. Orientation towards competencies has given popularity to a central claim: Higher education should not only present students with a general opportunity for attaining top educational achievement in each discipline, but should also foster students’ employability and prepare them for challenging professional positions. In the academic teaching-and-learning process, students should acquire not only field-related competencies in specific domains, but also abilities that will enable them to reflect on and continue to develop their knowledge and skills as well as to apply and adapt them to different areas of professional practice. Moreover, higher education is expected to promote the acquisition of transdisciplinary and multifunctional skills.

**The research program KoKoHs**

**Structure and aims**

In 2010, a comprehensive and systematic analysis of the international state of research in the field of learning outcomes assessment in higher education (Kuhn & Zlatkin-Troitschanskaia 2010) showed some initial approaches to structural stabilization of empirical higher education research. Still, this kind of research was highly underrepresented. The analysis shaped the conceptualization and implementation of the German research program “Modeling and Measuring Competencies in Higher Education” (KoKoHs). The focus of the program has been on modeling domain-specific and generic competencies acquired in higher education while taking into account personal and institutional context factors. These theoretical competency models have been transferred into measuring models and instruments, which were then tested and validated (Blömeke, Zlatkin-Troitschanskaia, Kuhn & Fege 2013).
The KoKoHs research program addresses the specific challenges of modeling and assessing learning outcomes in higher education in Germany and promotes fundamental research by pursuing the following three general objectives:

1. maintaining the quality of the higher education system in Germany in the face of growing international competition;
2. contributing to international research on competencies in higher education by ensuring international compatibility and visibility of KoKoHs research; and
3. creating a framework for evaluating the effectiveness of higher education to enable evidence-based policy decisions and institutional assessment.

The KoKoHs program has attracted considerable research interest. The program encompasses 24 research alliances including 70 single projects at almost 50 higher education institutions in Germany. KoKoHs projects bring together experts from various disciplines working together with cooperation partners on the national and international level. KoKoHs projects take into account curricular and job-related requirements, transform theoretical competency models into suitable measuring instruments, and validate test score interpretations. The KoKoHs program focuses on competencies in selected domains of study, including economic and social sciences, engineering sciences, educational sciences, and teacher training in STEM subjects (science, technology, engineering, and mathematics).

**Theoretical background and methodological framework**

As an initial step, KoKoHs projects defined competencies holistically as latent cognitive, affective-motivational, volitional, and social underpinnings of performance (Weinert 2001), that is, “a combination of skills, abilities, and knowledge needed to perform a task” in a specific context (U.S. Department of Education 2002). Over time and in individual situations, competencies are considered relatively stable trait dispositions that can be influenced by dynamic state components. From a developmental perspective, competencies can increase through learning or decrease through forgetting. Competencies acquired in higher education are assumed to be multidimensional and specific to a field of study or at least to higher education (e.g., general research competencies), which distinguishes them from intelligence and general cognitive abilities. Models of cognitive abilities and skills were operationalized through measuring instruments and tested in empirical assessments. This complex and multi-dimensional research area calls for complex and multi-dimensional research methods. To generate suitable measurement instruments, projects needed to formulate and test hypotheses on the dimension, grading, and development of generic and domain-specific competencies. Research efforts aimed to establish validity of the interpretation of the evidence and to address the key question: What can we infer from the cognitive representations elicited by the assessment of the actual competencies of individual students?

The general assessment framework in KoKoHs was based on the Assessment Triangle by Pellegrino et al. (2001, p. 44), which covers three aspects that are fundamental to assessment: “a model of student cognition and learning in the domain, a set of beliefs about the kinds of observations that will provide evidence of students’ competencies, and an interpretation process for making sense of the evidence” (see also Shavelson 2013; Webb et al. 2012). These three aspects corresponded with key objectives of KoKoHs:

1. defining the construct to be assessed (cognition),
2. developing and using suitable models and measuring instruments (for observation), and
3. drawing valid inferences from the assessment data (interpretation).

The Assessment Triangle provided the cornerstones for an assessment connecting theoretical constructs of students’ competencies with empirical evidence, that is, estimates based on limited instances of students’ knowledge and skills, in an argument-based approach of “reasoning from evidence” (Mislevy 1994).
The projects have carried out systematic internationally compatible fundamental research on theoretical modeling and empirical assessment and validation of student competencies in higher education (Zlatkin-Troitschanskaia, Kuhn & Toepper 2014). Based in Germany, the KoKoHs program has incorporated international best practice models, has adapted and validated international approaches, and is driving methodological innovation in competency assessment and higher education research (Zlatkin-Troitschanskaia, Shavelson & Kuhn 2015).

**KoKoHs results**

KoKoHs research projects developed 41 competency models of generic and domain-specific competencies in higher education. Content validity (including curricular validity) was ensured through analyses of almost 1,000 documents, such as module descriptions and study regulations from more than 250 institutions of higher education throughout Germany. Furthermore, construction of test items was informed by analyses of items and tasks from almost 1,500 documents (e.g., exams, exercises, lecture notes).

The teams of the 24 project alliances created new assessment instruments based on the competency models developed, and/or adapted existing international instruments to their needs, if available. Overall, 63 paper-pencil tests and 36 computer-based instruments were developed and used to assess approximately 50,000 students from more than 220 institutions of higher education. The competency models, assessment designs, and measuring instruments developed and tested in the projects provide a solid foundation for assessment of learning outcomes in higher education in Germany. Preliminary results indicated a high quality of the developed models and instruments and good reliability of the information obtained on the competency constructs.

**Further research**

Assessments provide “knowledge for decision-making” for university management and political administration, for example, in regard to questions of credit approval and admissions, which are becoming increasingly relevant with greater internationalization of higher education, but also regarding effectiveness and efficiency of academic teaching in general. Moreover, valid assessment of student competencies developed over the course of studies is central to many research studies on the conditions, design, and effects of teaching and learning in higher education.

To help address these challenges, the research program “Modeling and Measuring Competencies in Higher Education” (KoKoHs) focused on fundamental research, developing theory-driven models of generic and domain-specific competencies as well as corresponding assessment instruments during the first funding phase from 2011 to 2015.

The program was continued for another five years in 2015 with a focus on “Competency Models and Instruments of Competency Assessment in Higher Education – Validation and Methodological Innovations” (KoKoHs II). The general aim is to build new and to strengthen existing research and development capacities for science and higher education. The focus of the second funding phase is on the validation of existing competency models and measures. In KoKoHs II, projects draw on preliminary work, including precise descriptions of the competencies to be assessed as well as well-documented pilot studies evidencing the psychometric properties of the instruments.

In this second funding phase, the remaining conceptual, methodological, and empirical challenges will be addressed. Challenges include systematically designing or adapting tests under time, method, and format constraints, analyzing data with complex methods, confirming psychometric quality criteria, and undertaking comprehensive validation (AERA et al., 2014). Due to specific challenges in higher education, such as reliability issues related to complex models when there is limited testing time, panel mortality in longitudinal studies, and testing based on students’ performance, more complex and innovative methods of analysis need to be considered. These include longitudinal and multilevel analyses in random field-experimental studies, adaptive computer-based testing, and suitable psychometric techniques.
Conclusion and outlook

The effects of assessment on the higher education system itself have not yet been sufficiently examined empirically. With global student mobility and with an increasing share of students enrolling in higher education, we need to give considerably greater importance to scientifically proven findings on the acquisition of competencies in higher education, including their preconditions, effects, and measures for optimization. Considering that science and research are of major importance for the overall economic performance of developed societies, we need to systematically strengthen them at the source, that is, strengthen the performance of the science system and of institutions of higher education through systematic research in this area.

The initiation of the KoKoHs research program can be regarded as a first milestone towards a theoretical and methodological basis for valid and reliable assessment of academic competencies in Germany.

It is essential to link and compare the findings from Germany with findings from other countries and the international state of research. Therefore, the KoKoHs program has established, maintained, and expanded research ties with international cooperation partners from various areas of expertise (including primarily research methodology, teaching methodology, and psychology).

As for example AHELO has shown, international comparative assessments are important and feasible – despite many local and national differences. A recent analysis of the international state of research on assessment of academic competencies can serve as an orientation for future assessment projects (Zlatkin-Troitschanskaia et al. 2015). International comparisons of assessment cultures and practices in higher education can provide interesting insights and promote the discussion not only on university admission, but also on learning conditions in higher education and how they are justified.

At the EAIR annual forum, we will review the current international state of research on competency assessment in higher education and link it to results from the first phase of the KoKoHs research program. Bringing together international researchers, policy-makers, and practitioners in higher education, the EAIR Annual Forum offers an ideal platform for discussing the results of KoKoHs in depth and preparing to take the next step by increasing awareness about long-term assessment perspectives in higher education.

References


