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## 2.1 International and national frameworks and initiatives defining learning outcomes in higher education

On a global scale, attempts to specify conceptually academic learning outcomes have been made mostly in OECD countries. Definitions of learning outcomes can be used not only as an orientation for accrediting degree courses and universities; in some countries, they are used also as a basis for the development of assessment methods. The following will provide an overview of various key approaches and projects in this field.

The most extensive initiative that has defined learning outcomes in higher education internationally over the course of the past decade is the Tuning Educational Structures project (see, e.g., Adelman 2009; Lokhoff et al. 2010). In Europe, it was initiated mainly as a result of the Bologna reform in 2000. To date, over 120 countries around the world have been involved in and have implemented Tuning projects.<sup>2</sup> Further projects have been initiated on this basis to develop assessments to measure academic competencies acquired in national higher education systems, including competencies required on the job market (e.g., Tuning Educational Structures in Europe 2014).

In the Tuning initiative, the participating countries mutually agreed upon definitions of academically taught generic and discipline-specific competencies to be

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2 For more information on the Tuning projects, see <http://www.unideusto.org/tuningeu/home.html>.

acquired in seven (initially nine) fields of study at both bachelor and master levels. These definitions were developed on the basis of comprehensive surveys of students, graduates, employers, and university teachers regarding the role of generic and discipline-specific competencies. One of the main results of the national Tuning projects was that generic competencies were recognized as fundamental learning outcomes of ever-increasing importance (see, e.g., Tuning Educational Structures in Europe 2009; 2011).

The Tuning Academy's current project *Measuring and Comparing Achievements of Learning Outcomes in Higher Education in Europe (CALOHEE)* is especially notable. The purpose of the project is to develop multi-dimensional tests for five fields of study using similar methodology but tailoring them to the characteristics of the fields, thereby making it possible to compare students' performance in a Europe-wide context. To give the academic community a central position in the further implementation of the process of modernization of higher education in Europe, a bottom-up approach is taken. The aims of the CALOHEE project are to create a multi-dimensional instrument to measure and compare levels of learning, do justice to the different missions and profiles of higher education institutions, and develop transnational conceptual frameworks and assessment frameworks for five academic domains and five related disciplines (civil engineering, nursing, history, education, and physics). Additional aims are to develop test blue prints and work plans for creating and implementing assessments, and to furnish white papers explaining costs and benefits of various designs for transnational comparative assessment (Wagenaar 2016).<sup>3</sup>

This trend has become evident in other initiatives such as the *Valid Assessment of Learning in Undergraduate Education (VALUE)* program, launched by the Association of American Colleges and Universities (AAC&U) (see also section 2.2.1). While national Tuning projects have focused mainly on competencies in specific domains (e.g., business administration, educational sciences, physics, chemistry, and social sciences), the VALUE program develops mostly assessments of generic competencies based on meta-rubrics (Rhodes & Finley 2013). The VALUE program was established to develop and implement innovative assessment instruments and practices. The main outcome of the VALUE program is 16 meta-rubrics defining "essential learning outcomes" (Rhodes 2010, p. 17) which can be summarized in categories such as intellectual and practical skills, personal and social responsibilities, and integrative learning. The individual rubrics and assessments used in educational institutions differ from each other, but can be

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3 For more information on the CALOHEE project, see <http://www.eurashe.eu/projects/caloehe/>.

traced back to the fundamental VALUE rubrics; yet the program does not have an objective and standardized method of determining academic competencies (Finley 2012). The VALUE program therefore can be described as “a first step, a proof of concept” (Rhodes n.d., p. 24) and acts more as a starting point for assessing learning outcomes (Rhodes 2010).

The American Association of State Colleges and Universities (AASCU) sponsors the VALUE program as well as a research initiative examining whether bachelor graduates are prepared for the demands that await them in their professional careers. In cooperation with the Council for Higher Education Accreditation (CHEA), the AASCU has created a catalogue of guidelines designed to support performance-based assessments in higher education (New Leadership Alliance for Student Learning and Accountability 2012).

There is increasing interest in establishing national and international academic performance standards – with regard to both general educational and qualification goals of higher education (e.g., Tuning initiative) and learning in specific domains. In some countries such, mostly formal, descriptions of learning outcomes objectives serve as a basis for certifications (e.g., in accreditation) as well as a means to model and measure academically taught competencies. In this regard, there are a number of nationally initiated and funded research programs such as the Voluntary System of Accountability (VSA) program in the United States (see section 3.2.1). The standardization trend goes hand in hand with the development and implementation of core curriculum content standards and valid test instruments to assess them.

Meanwhile, various higher education associations and networks such as the Association of Public and Land-grant Universities (APLU) or the AASCU refer to the Assessments of the VSA program in accordance with recommendations by the American Commission on the Future of Higher Education (VSA 2013). The Degree Qualifications Profile (DQP) is one of the most internationally renowned initiatives (see, e.g., Ewell 2013). Further examples of these types of initiatives include national qualification frameworks and study program profiles in various OECD countries, such as the Australian Qualifications Framework (AQF) (AQF 2013) and the Canadian Degree Qualifications Framework (CDQF) (see, e.g., Lennon & Frank 2014). Frameworks of reference also can exist at the regional and institutional levels (see, e.g., the Ontario Qualifications Framework (OQF)) and may be a centerpiece of national learning outcomes assessment programs (see, e.g., the Higher Education Quality Council of Ontario 2012) or serve as an orientation in other countries. For instance, American and international frameworks of reference are followed by Canadian accreditation agencies (Lennon & Frank 2014). Due to decentralized responsibilities in the field of higher education in Canada, development of models

and measuring instruments for national use is considered extremely difficult (Poole & Simmons 2013). Guidelines are laid out in the CDQF, but are not binding and are adapted by higher education institutions to their needs. These institutions have differing expectations with regard to learning outcomes. The guidelines provide general descriptions of generic competencies but generally do not include specific approaches to guide operationalization or learning outcomes assessment. On the whole, this leads to fragmented practice in assuring educational quality and evaluating the achievement of learning outcomes objectives, as well as limitations for cross-institutional comparisons, as is the case in Canada. Nevertheless, there are systematic approaches to embedding assessments in accreditation programs (Lennon & Frank 2014). Pioneer programs in competency-oriented practice in higher education include in particular the professionally oriented programs in the fields of engineering, medicine, and economics. In these fields, external requirements to deliver evidence of learning success, for example, for accreditation purposes, drive progress and innovation in assessment.

The American DQP refers directly to the stages of higher education and is designed to enable comparison of degree program profiles across institutions (Ewell 2013). In the second edition of the American DQP, the Lumina Degree Qualification Profile, broad definitions of expected learning outcomes are offered for various stages of academic qualification (bachelor, master). However, domain-specific competencies are not explicitly targeted (Lumina Foundation 2014) as was – to a certain extent – the case in the national Tuning projects. The AQF (see, e.g., Wheelahan 2011) also defines learning outcomes objectives for all types and levels of qualification within post-secondary education and is used for accrediting higher education institutions.

Throughout the Asia-Pacific region (e.g., Hong Kong), there is growing interest in standardized assessments of students' learning outcomes. Thus, there are various national initiatives in which university representatives work together, for example, to develop a common framework of learning outcome-oriented methods for specific disciplines (e.g., Cheng 2011; Prosser 2013). In Hong Kong, quality of higher education is assured with systematic, learner-centered, outcome-oriented approaches (see Deneen, Brown, Bond & Shroff 2013). Various government-funded activities are implemented to help measure university graduates' academic performance through external program evaluation systems (Prosser 2013). In Taiwan, higher education institutions are starting to use external accreditation frameworks to develop internal competency-oriented criteria and performance indicators in order to assess their achievement of learning outcomes (see Lee, Wie & Wang 2013). In this regard, results include descriptions of learning outcomes specific to study programs or institutions (e.g., Yung-chi 2010). So far, the focus of external accred-

itation has been evaluations that refer to verifiable evidence-based information on learning outcomes, such as students' portfolios (see Lee et al. 2013).

After China and the United States, India has the third-largest higher education system in the world (Gupta, Hammer & Redish 2010; Gandhi 2013). The University Grant Commission (UGC) is in charge of reviewing the standards of teaching and research in the higher education system in India (Gandhi 2013; Gupta et al. 2010). In order to accredit Indian universities, the UGC has founded 12 autonomous organizations, including the National Assessment and Accreditation Council (NAAC) (Gupta et al. 2010; Kumar Sarkar 2012). In 2007, NAAC introduced a two-stage system to accredit universities in India, comprising an internal evaluation of the university and an external assessment conducted by NAAC (Gandhi 2013; Kumar Sarkar 2012). This approach is similar to the methodology of other quality assurance agencies worldwide (Shukla & Trivedi 2008). NAAC has accredited 104 universities and 744 colleges (Gandhi 2013).

In Latin America in 2008, the interuniversity center for development (Centro Interuniversitario de Desarrollo, CINDA) in Chile together with the América Latina – Formación Académica (ALFA) (a program financed by the European Union) implemented a project focusing on the effectiveness and relevance of quality assurance mechanisms. Institutional quality was the main focus of research so as to provide information for creating evidence-based policies (Lemaitre, Torre, Zapata & Zenteno 2013). As a result of the project, the Ibero-American network was established to improve the quality of higher education. More effective communication of results of self-assessments and of external evaluations was recommended in order to enhance the quality of teaching and management at participating institutions (Land & Gordon 2013). Few countries such as Brazil and Mexico have well-developed systems for assessing student learning outcomes in higher education on a national scale, which have also been adopted in other countries in the region, such as Colombia (see Shavelson Domingue, Mariño, Molina-Mantilla, Morales & Wiley 2016).

In higher education in Egypt, Kuwait, and the United Arab Emirates (UAE), emphasis on students' skills and learning outcomes is evident. The first reforms in this area took place in Egypt as part of the Quality Assurance and Accreditation Project (QAAP). QAAP was established to contribute to training and familiarizing scientific personnel with learning outcomes assessment. The Middle States Commission on Higher Education (MSCHE) accreditation program also pursued a more stringent focus on learning outcomes (see Wald & Gomma 2014). The situation is similar for accreditation endeavors in Kuwait (see, e.g., Accreditation Board for Engineering and Technology (ABET) 2015). In 2010 in the UAE, the National Qualification Authority was founded and was able to make further progress thanks to the development of the Qualifications Framework Emirates (QFE) (see

Wald & Gomma 2014). The QFE defines learning outcomes in terms of university graduates' abilities and characteristics for various levels and types of educational qualifications including secondary education, vocational training, and higher education. It follows international frameworks such as the European qualifications framework and the Bologna framework (see Ministry of Science, Technology and Innovation 2005; Wald & Gomma 2014).

In South Africa, the Higher Education Quality Committee (HEQC) was established in 2001 to assume a central role in transforming the tertiary education system. However, to date, the measures taken, including standardized guidelines for expected learning outcomes, external assessments, published reports, and recommendations, have not resulted in significant positive effects on teaching-and-learning methods (Lockett 2010). During the second phase of the HEQC focus was on improving teaching in the higher education system (HEQC 2011).

In Europe, there are numerous initiatives. For example, in the United Kingdom, there are Subject Benchmark Statements, which are incorporated in the Quality Code for Higher Education (The Quality Assurance Agency for Higher Education (QAA) 2008; 2015). They are based on the findings of the Tuning initiative as well as the meta-rubrics from the VALUE project and were established to provide domain-specific descriptions of learning outcomes at various stages for over 58 areas of study to assure quality higher education (e.g., approximately 18 areas in medical training). They are intended as an orientation for external accreditations and internal assessments at universities in the United Kingdom.

With regard to program profiles, there are transnational European initiatives such as the Chemistry Eurobachelor. In this case, a conceptualization of fundamental competencies in the domain was developed as a basis for all chemistry degree programs in Europe. Overall, 58 bachelor programs, 34 master programs, and 2 doctoral programs in Europe have been accredited accordingly at over 50 universities in 22 countries and are referred to as the Chemistry Eurobachelor and Euromaster (see Turunen & Byers 2012). The Dublin Descriptors also provide definitions of qualification-oriented learning outcomes of higher education in Europe for instance with regard to domain-related knowledge and application of knowledge, judgment, and communication skills (see Gudeva Dimova, Daskalovska & Trajkova 2012). Another example of a transnational initiative involving nine countries in Europe is the CoRe Project (I and II) (Lokhoff et al. 2010). In this project the results of the Tuning projects in Europe were evaluated (mostly positively). During the second phase of the project, the main goal was to publish detailed, evidence-based information on academically taught competencies (Lokhoff et al. 2010).

On the whole, existing initiatives can be differentiated into those focusing on (1) qualification stages of higher education, that is, degrees (e.g., the DQP), (2) the

description of rather general learning outcomes of higher education (e.g., VALUE), or (3) the definition of learning outcomes in specific disciplines (such as the Tuning projects). These types of definition frameworks differ significantly in how relevant and binding they are. This has far-reaching implications for their use as a basis for assessing academic competencies at national, institutional, and program levels (see section 2.2).

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## 2.2 Assessing competencies in higher education

Overall, the importance of assessments of students' competencies in higher education is continuously increasing thanks to their potential to fulfill multiple functions and provide multi-perspective evidence-based information (see section 1). Their *formative function*, that is, individual diagnoses geared towards improving ongoing teaching-and-learning processes, is to provide students and teachers with timely feedback on the level and development of competencies over the course of studies. Their *summative function* is to provide information on competency levels reached upon completion of a degree program, and thus to serve for overall evaluations (see section 4) of whether the competency standards and teaching-and-learning objectives defined have been met (see section 3.1). Assessment practices at national, institutional, and program levels vary greatly within and across geographical regions and range from external accreditation to internal competency assessment using standardized tests. In the following, central assessment practices are presented and discussed for different levels of education and various geographical areas.

### 2.2.1 Assessment practices in various countries

At the national level, objective and standardized assessments of competency levels and competency acquisition in higher education – enabling generalizable performance assessment – are still scarce in Europe. A notable exception is the standardized European Chemistry Test (EChem Test), an assessment of chemistry graduates acquiring the certificate of the European Chemistry Thematic Network Association (ECTNA), which is implemented internationally in Europe (see Turunen & Byers 2012; ECTN 2013). However, so far, in most initiatives in Europe assessments of individual degree programs have been developed (see section 2.2.3).

In Brazil and Mexico, a long-standing tradition exists in conducting external assessments using standardized tests in higher education. Brazil is one of very

few countries worldwide which has introduced compulsory national tests to assess domain-specific knowledge in 24 disciplines as well as generic abilities and skills for all students (Fundação Cesgranrio 2014; Fundação Cesgranrio & Cespe 2014: Brazil's 'Prova', Exame Nacional de Cursos (ENC) test until 2003; Exame Nacional de Desempenho dos Estudantes (ENADE) since 2004). In Mexico, tests on specialized domain-specific knowledge such as the Examen General para el Egreso de la Licenciatura (EGEL), developed at the Centro Nacional de Evaluación para la Educación Superior (CENEVAL) for 40 academic disciplines (CENEVAL 2015) are not obligatory by law. However, most universities and students have been taking part in such tests over the past several years as results on them have become increasingly important to prospective employers (Vidal 2013). In Colombia and Chile many projects are being conducted to develop and implement such standardized assessments in higher education. In Columbia, for example, a standardized test has been introduced which measures students' generic competencies at the beginning and end of their bachelor degree program (Shavelson et al. 2016).

In the United States, particular mention is deserved by the VSA, which includes three standardized tests for measuring critical thinking and written communication skills (VSA 2013). Particularly in the United States, but also in other countries such as Australia, numerous research projects are dedicated to developing or enhancing assessments, typically aiming to ensure the validity and reliability of new and existing assessments in higher education. Many assessments were developed by testing institutes like the Educational Testing Service (ETS) (see, e.g., Liu, Mao, Frankel & Xu 2016) and the Council for Aid to Education (CAE) (see, e.g., Zahner 2013). The national VALUE initiative in the United States (see section 3.1) is an important program in the area of learning outcomes assessments, given its aim to develop and establish new assessment practices. The rubrics developed in VALUE are being implemented at an increasing number of universities. The AAC&U has worked together with more than 100 higher education institutions, faculties, and teams of assessment research experts (Rhodes 2010).

Singapore has its own long-standing tradition of focusing on international benchmarking and drawing comparisons with, for example, partner universities in the United Kingdom and the United States (also with regard to learning outcomes) (see, e.g., Marginson 2011). However, these developments currently are limited to ranking systems, some of which are based on multiple objective competency indicators. Over the past few years, research in Japan, where bachelor education traditionally has been input-oriented, also has placed greater emphasis on learning outcomes assessment (see Yamada 2014). Traditionally, graduates' performance is determined by the status and reputation of their university. Over the past few years, however, research projects have launched initiatives that have, for example,

adapted standardized tests from other countries (such as the United States) to the higher education system in Japan and have implemented them at the national level to assess objectively learning outcomes in specific domains (such as economics) (see, e.g., Yamaoka & Asano 2015).

In Australia, students from all higher education institutions can take part in national surveys such as the Graduate Skills Assessment (GSA), which is conducted twice a year. The GSA assesses generic competencies at both the beginning and the end of studies (see Graduate Careers Australia (GCA) 2015).

In addition to assessing competency using standardized tests, there are many initiatives around the world in which students' learning outcomes are based on self-assessments, for instance, of students' satisfaction (Coates & McCormick 2014). Some examples include the American Cooperative Institutional Research Program (CIRP) (HERI 2015) and the National Survey of Student Engagement (NSSE), which also is conducted in Canada, the Course Experience Questionnaire (CEQ) (Australia, GCA 2015) (see National Center for Higher Education Management Systems (NCHEMS) 2014) and, in Japan, the Japanese Cooperative Institutional Research Program (JCIPR), which was based on the CIRP approach (Yamada 2009). In these surveys, students estimate the extent to which the courses they have completed have contributed to their learning in terms of perceived increase in competency levels over the course of their studies. These surveys do not provide direct evidence of, but rather proximal information on, academic learning outcomes. The same applies to other surveys focusing in particular on learning outcomes relevant to the labor market such as the survey on Destinations of Leavers from Higher Education (DLHE) in the United Kingdom (Higher Education Statistics Agency (HESA) 2015) or the Graduate Destination Survey (GDS) in Australia (Graduate Careers Australia (GCA) 2015).

Many of the newly developed assessments and standardized tests of competencies taught and acquired in higher education are not implemented directly in higher education, but rather in adjacent sectors of education and work. Examples include the assessment initiatives of technical colleges (which are comparable to vocational education in Germany) or the indirect assessment of workplace competencies, for example, based on the Jobs Requirement Approach (JRA) modules, which assess the level and application of a number of generic competencies, such as communication, presentation skills, or teamwork skills in professional life (see, e.g., Korres et al. 2013). The JRA modules focus on specific professional requirements (also termed job skills) and the application of generic competencies in realistic, situational contexts (see, e.g., Achieve Inc. 2010). Such job skills are differentiated from a person's competencies, because they do not refer to personal characteristics, but rather to specific professions (OECD 2013a). They can provide useful insights for

developing tests that are valid with regard to professions and comprise realistic complex test items. This also applies to graduate surveys such as the Australian GDS, the Canadian Youth in Transition Survey (YITS) and the British DLHE, which gather important information on transition phases such as the transition into a profession or into other educational sectors and ask graduates to evaluate the role academically acquired competencies are playing in their professional careers.

### **2.2.2 Assessment practices in higher education institutions**

The number of assessments measuring academically taught competencies at the local level, that is, mainly at individual institutions, is clearly on the rise in various countries.

In the United States, this has been illustrated by the National Institute for Learning Outcomes Assessment (NILOA) surveys of chief academic officers, which also indicated the use of learning outcomes assessments at higher education institutions in the United States (Kuh, Jankowski, Ikenberry & Kinzie 2014). In 2009 and 2013, NILOA surveyed higher education rectors throughout the United States (N=2,809 and N=2,781) from regionally accredited institutions granting bachelor degrees, asking about established assessment practices at their higher education institutions and about the use of assessment results in teaching and management practices. These are some of the main results:

1. Descriptions of the main learning outcomes objectives were available at most higher education institutions.
2. At most institutions assessments at both an institutional level and a degree program level had been conducted.
3. Data provided by the assessments were important (quality) indicators – in particular when it came to accreditation.
4. Types and methods of assessment as well as the way in which assessment results were used varied significantly among the surveyed higher education institutions.
5. Approximately 80 percent of the universities had staff members directly responsible for assessing learning outcomes. In 65 percent of the cases, there were just one or two people in such positions. Most of the rectors of the surveyed universities wanted to increase their staff members' expertise and institutions' resources and obtain more instruments and items necessary for conducting assessments. Despite financial difficulties, most rectors intended to increase assessment activities at their institutions.

6. The rectors often stressed the need to have access to extensive objective information on examination and measurement methods as well as to higher education rankings.

With regard to the use of learning outcomes assessments, such as national standardized assessments of generic abilities and knowledge (e.g., the Collegiate Learning Assessment (CLA), Collegiate Assessment of Academic Proficiency (CAAP), Educational Testing Service's Proficiency Profile ETS-PP, and WorkKeys) as well as regional or local assessments and surveys of students, graduates, employers, and other stakeholders, results of the NILOA survey 2013 of chief academic officers indicated the following: Most of the institutions surveyed (92 percent) made use of at least one method of assessment on a representative sample of students from the institution; two thirds made use of three or more assessment methods. Most of the institutions (90 percent) made use of at least one institution-level and one program-level assessment; 77 percent made use of two such assessments, and 58 percent made use of three or more. The NILOA survey 2013 showed that, compared to 2009, there had been a significant increase in the use of various types of assessment. Most commonly, institutions participated in national tests, as confirmed by 76 percent of the institutions surveyed. Standardized assessments such as the CLA, CAAP, ETS-PP, and WorkKeys were used systematically by 39 percent of the institutions in order to determine generic knowledge and abilities of students. However, standardized tests assessing domain-specific knowledge were used at 8 percent of the universities only.

In the United States in particular, many assessments and standardized tests of higher education learning outcomes have been developed over the past decade. These include the Proficiency Profile (ETS 2010), CAAP (ACT 2012, 2015), and College Basic Academic Subjects Examination (College BASE) (ARC 2014), all of which are established and used at many higher education institutions. In some states in America all students enrolled at state-run higher education institutions are tested before they are allowed to progress to the next stage of their degree program (using, e.g., the Area Concentration Achievement Test (ACAT), College BASE, or ETS-PP). Some of these tests are designed to assess students' competency in specific subjects; most of them, however, are designed to assess their generic competencies. In higher education in some Latin American countries (e.g., Brazil), participation in standardized tests is obligatory.<sup>4</sup>

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4 However, there are no studies available documenting the uses like the NILOA survey for the United States.

Overall, in assessments, emphasis is placed on the acquisition of various types of generic competencies (also termed soft skills or cross-sectional competencies) such as self-regulated learning. Exchange with testing institutes such as the ETS also indicates that tests to assess generic competencies, such as literacy constructs, are more widespread (see, e.g., Liu, Frankel & Roohr 2014). Assessments of domain-specific competencies are most often developed for the field of teacher education as well as for the sciences (mathematics, physics, chemistry, biology); however, such assessments in the sciences also examine mainly soft skills rather than domain-specific constructs. In the field of economics, financial competency and entrepreneurship competency are emerging areas of assessment (see, e.g., Breuer, Zlatkin-Troitschanskaia & O'Neil 2014; Weber 2012), albeit with only few related studies so far (see Zlatkin-Troitschanskaia et al. 2016b).

### **2.2.3 International assessments**

In very few studies have objective, standardized assessments been conducted of academic competencies at the international level, allowing for generalizable or comparative interpretations of students' performance. A pioneering study from the field of teacher education was the Teacher Education and Development Study – Learning to Teach Mathematics (TEDS-M), which provided internationally comparative findings on the effectiveness of teacher education programs (Blömeke, Kaiser & Lehmann 2010a, 2010b). TEDS-M was initiated by the International Association for the Evaluation of Educational Achievement (IEA) and assessed a representative sample of pre-service primary and secondary school teachers from 17 countries. This study was the first to focus on learning outcomes in teacher education for mathematics and compare teacher education programs across nations based on graduates' content knowledge and pedagogical content knowledge of mathematics (Tatto, Schwille, Senk, Ingvarson, Peck & Rowley 2012). The tests used in TEDS-M were based on a competency model of professional action in teaching mathematics following Shulman (1986) and Weinert (2001). The study provided ample data on institutional conditions and participants' individual characteristics, enabling in-depth analyses (Laschke & Blömeke 2014). Even though TEDS-M focused on a small content area of teachers' knowledge only, it is considered to have paved the way for further international comparative studies assessing competencies in higher education.

Further international comparative research has been conducted in the fields of engineering and economics. In one study students' performance in the United States, China, and Russia was compared using ETS tests. Critical thinking and

academic ability in mathematics, languages, and domain-specific content areas of engineering students were assessed (Loyalka et al. 2016). In economics, international comparative studies have been conducted based on the Test of Understanding in College Economics (TUCE) developed by the Council for Economic Education (Walstad, Watts & Rebeck 2007; see Yamaoka Walstad, Watts, Asano & Abe 2010; Brückner et al. 2015b; Förster et al. 2015b; Zlatkin-Troitschanskaia, Schmidt, Brückner, Förster, Yamaoka & Asano 2016d).

A study with a broader scope was the OECD's international Assessment of Higher Education Learning Outcomes (AHELO) feasibility study. AHELO was the first attempt to assess domain-specific and generic learning outcomes of higher education across national, linguistic, and cultural barriers and different higher education systems (OECD 2012). Based on recommendations by the TUNING project (see section 3.1), AHELO assessed generic competencies using the CLA, developed in the United States (CAE 2015, see also section 3.3.3.1) as well as knowledge of economics and engineering using newly developed standardized knowledge tests in 17 countries<sup>5</sup> (OECD 2013a). AHELO was conducted to develop an approach for assessing students' generic and domain-specific competencies and comparing them internationally and to test its feasibility (OECD 2013a).

Overall, there are only a few international assessments based on standardized tests (the TEDS-M, see IEA 2011, and the AHELO, see OECD 2013a), and in most countries, assessment practices have been established only recently.

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5 The generic competencies assessment in AHELO was used in Colombia, Egypt, Finland, Korea, Kuwait, Mexico, Norway, Slovakia, and the American federal states; the engineering knowledge test was used in Abu Dhabi, Australia, Canada, Colombia, Egypt, Japan, and Mexico; the economic knowledge test was used in Belgium, Egypt, Italy, Mexico, the Netherlands, Russia, and Slovakia.



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