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THE GERMAN NATIONAL EDUCATIONAL PANEL STUDY (NEPS)

Assessing Competencies Over the Life Course and in Higher Education

INTRODUCTION

The German National Educational Panel Study (NEPS) is an exceptional and unique research endeavor which aims to gain new insights into the acquisition of competencies across the entire life span, to describe crucial educational transitions, to study educational careers, to identify the determinants of competence development and educational decisions and to analyze the impact of education and competencies on the life course. This article gives a brief overview of the conception and structure of the NEPS. It then describes in more detail the general approach to modeling and measuring competencies used by the NEPS, as well as the way of addressing the issue of subject-specific competencies in higher education.

RESEARCH QUESTIONS, RESEARCH DESIGN AND ORGANIZATION OF THE NEPS

Overview

The NEPS, funded by the Federal Ministry of Education and Research, is an instrument for studying education over the life course and addresses a wide range of questions, including:

- How do competencies develop over the life course?
- What are the central factors in the process of competence acquisition and educational decision-making? What role do educational institutions, non-formal and informal learning environments play? How important are social characteristics, the cultural context and economic living conditions?
- What does the relationship between competencies and educational credentials look like? To what extent do certificates (grades) reflect levels of competence?
- Which competencies are decisive for educational and labor market success? To what extent do labor market outcomes depend on acquired competencies, credentials, social origins, social and cultural capital and personality traits?
- What are returns to education and competencies in terms of income, occupational career, subjective well-being, social, political and cultural participation and health?

S. Blömeke, O. Zlatkin-Troitschanskaia, C. Kuhn & J. Fege (Eds.), Modeling and Measuring Competencies in Higher Education: Tasks and Challenges, 147–158.

– Which factors favor participation in continuing education in later life? What conditions are unfavorable for lifelong learning?

The preeminent theoretical orientation of the NEPS is the life course perspective, meaning that the study aims to investigate the process of education, learning and competence development over the entire life span. In order to provide relevant data quickly, the NEPS uses a specific methodological approach (see Figure 1). We decided not to observe a single birth cohort over several decades, but to start with different cohorts at the same time and to follow them over a longer period of time. The cohorts are either age-based (newborns, adults) or defined by a specific point in their educational career (e.g., entry into higher education). Each of these cohorts focuses on one or two stages of education. In accordance with the structure of the German education system, the NEPS distinguishes between eight educational stages, e.g., stage 1 "From birth to early child care"; stage 5 "From upper secondary school to higher education, vocational training and the labor market"; and stage 7 "From higher education to the labor market" (see Figure 2).

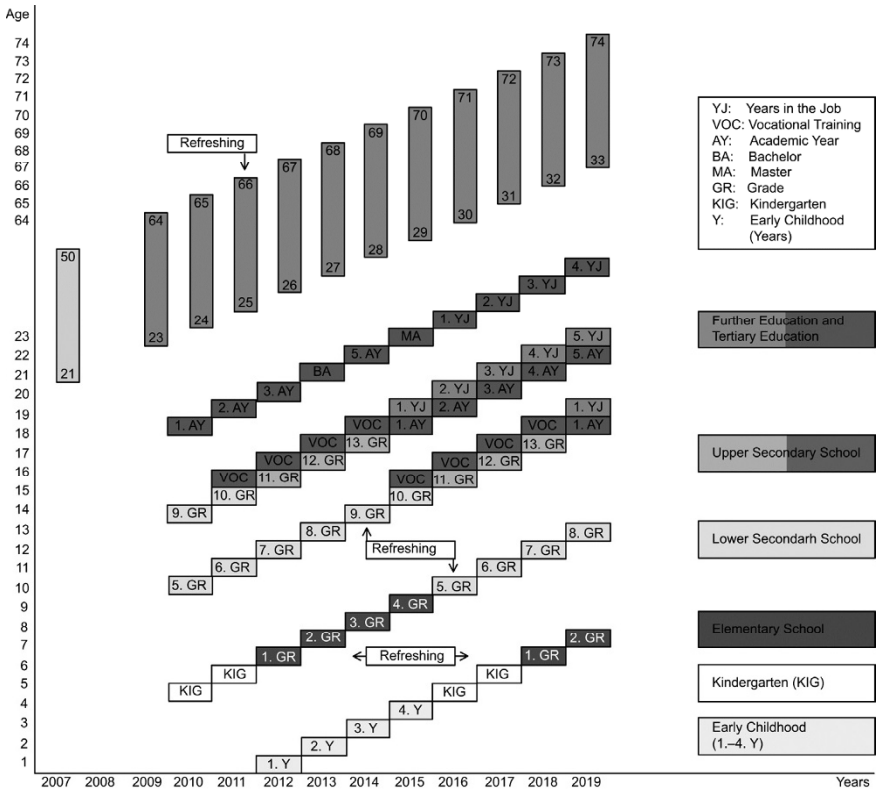

Figure 1. The multi-cohort sequence design of the NEPS.

As the life course perspective is central to the NEPS, a coherent conceptual framework is necessary that covers the entire life course and integrates the study of different stages of education and cohorts. This integration is ensured by a theoretical orientation towards five major dimensions, which are called "pillars" (see Figure 2): Pillar 1 is concerned with competencies and has the task of modeling competence development over the life span and constructing corresponding tests (for details, see Weinert et al., 2011). Pillar 2 focuses on the conceptualization of different learning environments and the operationalization of central contextual characteristics that are expected to have an impact on competence acquisition and educational decisions (for details, see Bäumer et al., 2011). Pillar 3 addresses social and gender inequalities and the question of how inequalities are reproduced and transformed by educational decisions (for details, see Stocké et al., 2011). As the individual migration history and an individuals' ethnic or cultural origin have an effect on competence development and educational decisions that goes beyond the mechanism of social inequality, pillar 4 addresses the acquisition of education across the life course of migrants and their descendants (for details, see Kristen et al., 2011). The central issue of pillar 5 is returns to education, both in monetary and non-monetary terms (e.g., income, risk of unemployment, subjective well-being, social, cultural and political participation, health; for details, see Gross et al., 2011).

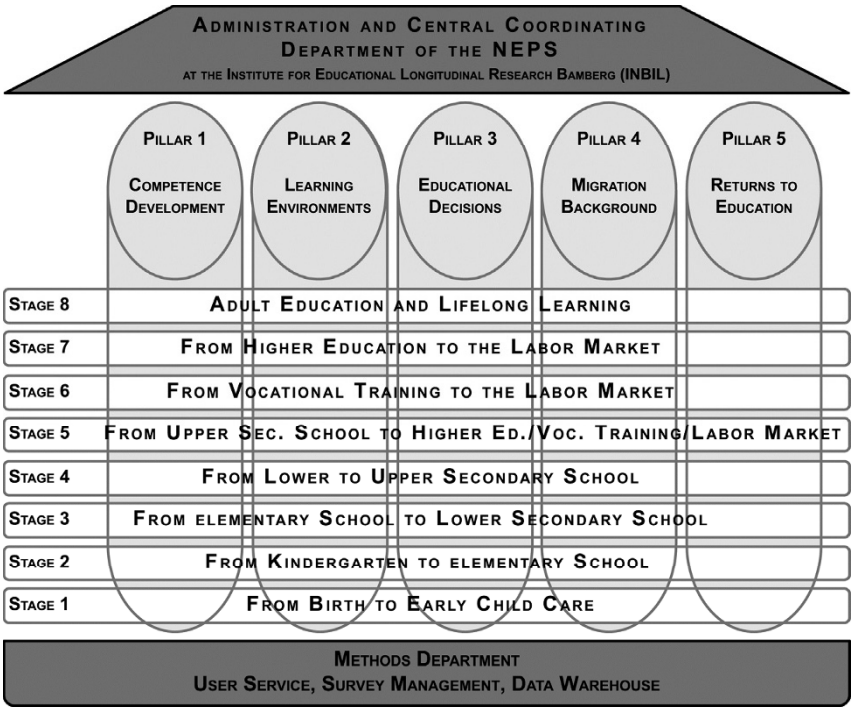

Figure 2. The five basic pillars and eight stages of the NEPS.

It goes without saying that such an ambitious and interdisciplinary project as the NEPS which approaches the research questions from different theoretical and disciplinary angles, cannot be carried out by a small research group. Therefore, experts and expert groups from all over Germany collaborated in order to form an effective network of excellence. This consortium links researchers from various disciplines (e.g., psychology, educational science, sociology, economics, demography, migration studies, statistics and survey methods) and major research institutions and is headed by the principal investigator Hans-Peter Blossfeld. The central coordination and administration facility of the NEPS is located at the Institute for Longitudinal Educational Research at the University of Bamberg (INBIL). The HIS-Institute for Research on Higher Education, based in Hanover, is responsible for stage 7: "From higher education to the labor market".

More detailed information on the objectives, design and structure of the NEPS is given by Blossfeld, von Maurice, & Schneider (2011).

The Sub-study: "From Higher Education to the Labor Market"

Within the conceptual framework of the NEPS, the longitudinal sub-study entitled "From higher education to the labor market" (stage 7) follows a cohort of approximately 16,500 randomly selected new entrants to higher education through their student days and beyond (for further information on this sub-study, see Aschinger et al., 2011). Of course, the key research areas for the higher education stage center on the overall questions of the NEPS, but focus to an extent on specific aspects. With regard to educational decisions, for example, stage 7 of the NEPS pays special attention to dropping out, entering a master's program, starting a dissertation and entering employment. As regards competencies, we will not only examine the domains that are assessed in all stages of education covered by the NEPS and, therefore, constitute a common core of competence assessment (see below), but we will also collect data on stage-specific competencies in particular fields of study ("subject-specific competencies of higher education students/graduates").

The higher education stage of the NEPS also pays special attention to particular groups of students who have previously been neglected in higher education research or are of special interest to education policy. For example, teacher training students are oversampled in order to provide detailed large-scale data on what is considered to be a key profession for the quality of school education. In addition, we tried to include the entire population of first-year students without a school-leaving certificate qualifying them for higher education (so-called "nontraditional students"; Schuetze & Wolter, 2003).

Data is being collected using several modes, e.g., self-administered questionnaires, computer-assisted telephone interviewing, online surveys and group tests in classroom settings. As regards the frequency and timing of the panel waves, up to three (but usually two) short surveys or tests will take place every year. Data collection started in autumn 2010.

MODELING AND MEASURING COMPETENCIES WITHIN THE NEPS

The General Approach

According to a well-established definition which often forms the basis of competence research in Germany, competencies are "context-specific cognitive dispositions that are acquired and needed to successfully cope with certain situations or tasks in specific domains" (Koeppen et al., 2008, p. 62). In other conceptualizations however, the term "competence" is not restricted to the cognitive dimension, but also includes motivation, volition, affection and attitudes. Weinert (2001, p. 2433), for example, refers to competencies as "combinations of those cognitive, motivational, moral, and social skills available to (or potentially learnable by) a person [...] that underlie the successful mastery through appropriate understanding and actions of a range of demands, tasks, problems, and goals".

The NEPS takes a broad view on competencies, but has decided to distinguish systematically between cognitive and non-cognitive components and to assess them separately (for detailed information on the selection, rationale and conceptualization of competencies within the NEPS, see Weinert et al., 2011). This decision was made for several reasons: From an analytical point of view, the advantage of modeling and assessing different competence dimensions separately lies in the possibility of analyzing the interplay and relationships between them. From the perspective of a longitudinal reconstruction of competence development, the limitations and challenges of modeling and measuring competencies in a coherent way across the entire life span have to be taken into account. While the internal dynamics of development and change of some competencies can and will be reconstructed over the life course, the longitudinal reconstruction of other competencies is difficult and does not lie at the heart of the NEPS.

The definition of competencies as context-bound and domain- as well as demand-specific implies that competencies are the result of learning processes and that they can be acquired. Therefore, they must be distinguished from generalized, context-free cognitive dispositions (such as intelligence) which are learnable only to a limited extent (cf. Koeppen et al., 2008). Nonetheless, the NEPS includes these domain-general abilities in order to analyze their impact on the acquisition of domain-specific competencies (cf. Weinert et al., 2011).

In sum, the NEPS addresses the following competence domains and generalized abilities (for details, see Weinert et al., 2011):

A) Domain-general cognitive abilities (e.g., "fluid intelligence", "cognitive mechanics") which are assessed using perceptual speed and figural reasoning as relatively culture-fair and language-free indicators;

B) Domain-specific cognitive competencies, e.g., mathematical literacy, which are subject-bound during school age and become basic, cross-curricular competencies in later life. Three of these competencies, i.e., German language competencies, mathematical literacy and scientific literacy, will be assessed consistently and coherently across all stages of education throughout the life course. In addition, indicators of foreign language competencies will be measured;

C) Meta-competencies and social competencies: While the competence areas mentioned above focus on cognitive, educationally relevant competencies in a narrow sense, the third category refers to metacognitive and non-cognitive competencies. Featuring metacognition, self-regulation, ICT literacy and social competencies, this category includes those competencies that are often labeled "key competencies" (cf. Rychen, 2003).
D) Stage-specific (curriculum- or job-related) attainments, skills and outcome measures.

While all of the competencies or abilities in areas A to C are addressed in every educational stage and cohort of the NEPS – either directly using tests or indirectly through the collection of self-report data – the fourth competence area (stage-specific (curriculum- or job-related) attainments, skills and outcome measures) will be included only for selected stages of education. In the higher education stage of the NEPS, for example, we will carry out a test of subject-specific competencies in selected subject areas.

In addition to these competencies and general abilities, the NEPS collects data on stable personality dimensions (e.g., the Big Five, self-esteem) and on motivation (e.g., achievement motivation, personal goals, general interest orientation and topic-related interests; a complete overview is given by Wohlkinger et al., 2011).

Subject-specific Competencies in Higher Education

For the higher education stage, the NEPS uses two approaches to measure subject-specific competencies, that is, competencies that refer to a particular field of study. On the one hand, we are using self-report instruments that are applicable to the entire sample of higher education students; these self-report measures will be collected several times (for details, see Aschinger et al., 2011). On the other hand, we are also employing tests of subject-specific competencies in selected fields of study.

Several reasons led to the decision to gather self-report data: First, whereas tests of the subject-specific competencies of higher education students hardly exist in Germany and are yet to be developed, self-assessment questionnaires are more common. Second, self-report instruments are relatively economical in terms of administration, time and money, and they can be administered to a large sample at low cost. Third, although self-assessments are criticized for being unreliable and invalid, several studies have found a systematic correlation between self-rated competencies and alternative measures of the same construct (for an overview and references, see Braun et al., 2008). Fourth, when self-report data on competencies and data from achievement tests are collected simultaneously, it is possible to test the validity of the self-assessment instrument.

As regards subject-specific competence tests, the NEPS will start with business administration and teacher education and will include additional subject areas in future cohorts of the panel. The reason for selecting teacher education lies in the fact that the quality of schools, the competencies of teachers and teacher education continue to be central issues in educational research and education policy. The

choice of business administration for measuring disciplinary competencies is justified by the quantitative importance of this field of study. In addition, curricula and intended learning outcomes are relatively comparable across higher education institutions and even across countries.

The tests for both subject areas will be administered at the end of the study program. Therefore, they will not allow us to analyze the dynamics of competence development, but they will measure learning outcomes after the students have passed the degree course. While we will use or perhaps adapt existing tests for the subject-specific competencies of future teachers, the test for business administration students is yet to be developed.

The competence model we will use as a basis for test selection and construction is informed by well-known and elaborate conceptualizations that were primarily developed in research on the professional competencies of teachers. For example, the COACTIV study[1] (cf. Baumert & Kunter, 2006; Kunter et al., 2007), the PaLea study[2] (cf. Bauer et al., 2010) and the TEDS-M study[3] (cf. Blömeke, Kaiser, & Lehmann, 2010a, 2010b; Schmidt, Blömeke, & Tatto, 2011) proposed a competence model that is hierarchically structured and adopts a broad, multidimensional concept of teachers' professional competencies, including both cognitive and noncognitive dimensions.

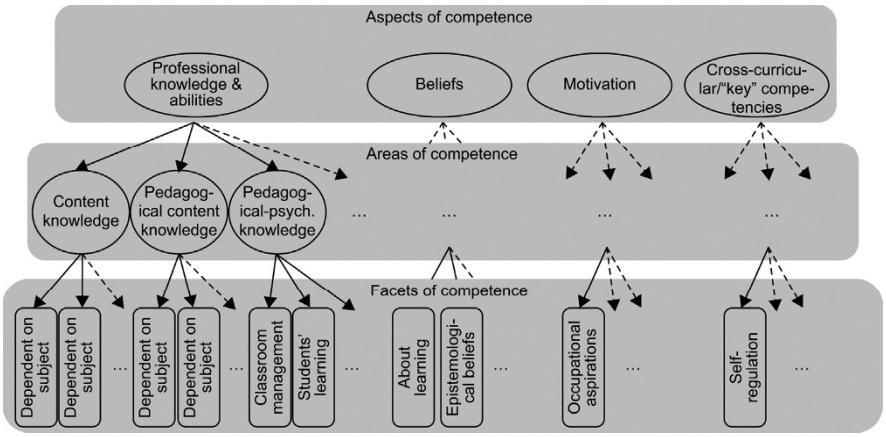

Figure 3. Professional competence of teachers (adapted from Bauer et al., 2010; Baumert & Kunter, 2006).

On the highest level of abstraction, non-cognitive prerequisites of professional competence – such as value commitments and beliefs, motivation and cross-curricular/"key" competencies – are distinguished from cognitive subject-specific competencies (see Figure 3). As research in the field of cognitive psychology has shown that experts and novices differ first and foremost in their declarative, procedural and strategic knowledge and that generic abilities play a less important role (Weinert, 1998), knowledge is central to professional competence and should

form the focus of competence assessment. Research on teachers' competencies differentiates between several areas of professional knowledge, for example – and most importantly – content knowledge, pedagogical content knowledge and general pedagogical-psychological knowledge (see the second level of Figure 3). Both content knowledge and pedagogical content knowledge refer to specific subjects taught in school, either in terms of subject matter knowledge, i.e., the teacher's understanding of the structures of the domain, or knowledge on how best to present the subject to students (for details on the concepts of content knowledge and pedagogical content knowledge, see, for example, Krauss et al., 2008). Their conceptualization and assessment are, therefore, domain-specific. As the NEPS includes (future) teachers of all subjects and because, at present, the final size of the net sample is unknown, it is uncertain whether we will be able to test content knowledge and pedagogical content knowledge. Nevertheless, it will be possible to address selected facets of general pedagogical knowledge, for example, teachers' knowledge of classroom management and student learning in general.

It will also be possible to collect data on facets of value commitment and beliefs (e.g., epistemological beliefs, subjective theories on learning and instruction), motivation (e.g., occupational aspirations), "key" competencies and personality (e.g., self-regulation, self-efficacy, social competencies). Some of these facets belong to the "core" survey program of the NEPS and will definitely be addressed (e.g., occupational aspirations, interests, social competencies, the "Big Five" personality traits, general self-concept). Whether or not we will be able to include additional aspects that are particularly relevant to the professional competence of teachers is not yet known.

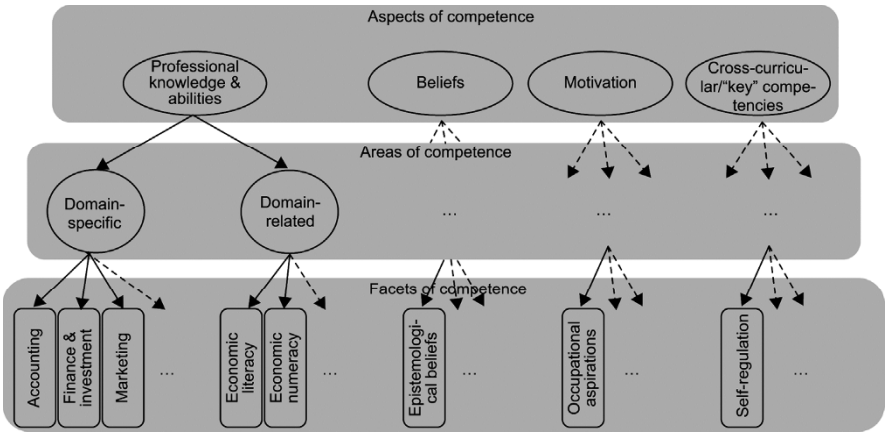

Figure 4. Professional competence of higher education graduates in business administration (adapted from Bauer et al., 2010; Baumert & Kunter, 2006; Winther, 2010).

A similar competence model is used to conceptualize the professional competencies of higher education graduates in business administration (see Figure 4). While in the

competence model for business administration the highest level of abstraction is identical to the competence model for the teaching profession, the lower levels had to be modified in order to be applicable to the particular subject area.

As regards professional knowledge and abilities, we distinguish between a domain-specific area of competence that refers to business administration in a narrow sense and domain-related fields. In differentiating between domain-specific and domain-linked competencies, we follow Winther and Achtenhagen (2008) and Winther (2010). While domain-specific competence relates to the accomplishment of tasks within the domain, domain-related competence may facilitate coping with domain-specific requirements. In the NEPS however, domain-related competencies such as economic literacy and economic numeracy are not assessed directly, but approximated by measuring literacy and mathematical competencies in general.

As regards the domain-specific knowledge of business administration students, the NEPS is unable to cover all of the sub-domains. Due to the restricted testing time, we had to select the most important ones. In order to identify those sub-domains that should and could be addressed, we chose a curriculum-oriented approach, analyzed module descriptions of 26 bachelor degree courses at universities and universities of applied sciences and categorized the curricular information according to the classification of business administration into six functional areas proposed by Haunerdinger and Probst (2006) (cf. Aschinger et al., 2011). This analysis led to the result that the major sub-domains of the core curriculum for business administration, i.e., compulsory courses, are accounting, management and organization, finance and investment and marketing. Due to the quantitative significance of accounting, we decided to include this sub-domain in the test. In addition, we prefer to include the areas of finance and investment and marketing in the test. The sub-domain of management and organization makes up a slightly larger proportion of the compulsory study program than finance and investment, but it is relatively heterogeneous with regard to the topics addressed. The reason for opting for marketing lies in the fact that this sub-domain is preferred by women. Whether the proposed structural model of domain-specific competencies in business administration holds true is an open question that has to be empirically examined.

CONCLUSION: POTENTIAL AND LIMITATIONS OF THE NEPS FOR MEASURING COMPETENCIES IN HIGHER EDUCATION

One major advantage of the NEPS is that a broad range of different competencies are measured. The NEPS therefore can address a variety of important research questions which have not yet been answered satisfactorily. The NEPS, for example, is the first study that will shed light on how basic domain-specific competencies, such as German language competencies and mathematical literacy, develop over the entire life course – from the first years of school and adolescence to adulthood and retirement – and why they develop differently. As the longitudinal and lifelong measurement of basic domain-specific competencies is a central issue for the NEPS, these competence areas are assessed in the higher

education stage as well. The inclusion of basic domain-specific competencies in the higher education stage also opens up a unique opportunity to answer the question: In what way do these competencies contribute to the acquisition of competencies which are specific to tertiary education? In a similar vein, measuring domain-general cognitive functions makes it possible to analyze the relationship between these generalized abilities on the one hand and the acquisition of basic domain-specific competencies or subject-specific competencies in higher education on the other.

With a few exceptions, the issue of competence assessment in German higher education has thus far been neglected. It was not until recently that new initiatives began to advance the construction and implementation of instruments which are suitable for competence measurement in higher education (see, for example, the funding initiative entitled "Modeling and Measurement of Competencies in Higher Education" by the German Federal Ministry for Education and Research). As a consequence, valid and reliable instruments are rare or have yet to be developed. As the test construction process is time-consuming, the NEPS decided to restrict the measurement of subject-specific competencies in higher education in the first step of the research project to two fields of study – namely teacher education where some tests already exist, and business administration – and to focus on a single measurement at the end of the study program. It is, however, the aim to include additional subject areas such as engineering and medicine in future funding periods of the NEPS.

NOTES

[1] COACTIV: Professionswissen von Lehrkräften, kognitiv aktivierender Mathematikunterricht und die Entwicklung mathematischer Kompetenz [Professional Competence of Teachers, Cognitively Activating Instruction, and Development of Students' Mathematical Literacy].

[2] PaLea: Panel zum Lehramtsstudium [Panel for Teacher Certification Courses].

[3] TEDS-M: Teacher Education and Development Study in Mathematics.

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