NEPS
National Educational Panel Study

Research Data

Information on Competence Testing

NEPS Starting Cohort 3 — Grade 5

Paths Through Lower Secondary School — Educational Pathways of Students in Grade 5 and Higher

Wave 2: Grade 6

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Information on testing	
Test situation	Group testing, normally taking place in the classroom in the presence of one test instructor and one supervisory teaching staff per test
Test sequence	The tests are administered in one day. The tests are predetermined in two different sequences (random order of the test booklets for the study participants): **Test order test booklet 1 (TB 1A, 2A, 3A)**: ICT literacy + procedural metacognition, science competency + procedural metacognition, declarative metacognition, listening comprehension on word level + procedural metacognition **Test order test booklet 2 (TB 1B. 2B, 3B)**: science competency + procedural metacognition, ICT literacy + procedural metacognition, declarative metacognition, listening comprehension on word level + procedural metacognition
Test duration (net processing time)	135 min
Breaks	35 min

Information on the individual tests

Construct	**Number of Items**	**Allowed Processing Time**	**Survey Mode**
Science Competency	27	29 min	paper-pencil
Listening Comprehension on word level (vocabulary)	77	20 min	paper-pencil
ICT Literacy	30	29 min	paper-pencil
Declarative Metacognition	8	15 min	paper-pencil
Domain-specific procedural metacognition			
Regarding science competency	1	1 min	paper-pencil
Regarding mathematical competence	1	1 min	paper-pencil
Regarding ICT literacy	1	1 min	paper-pencil

Preliminary note

The development of the individual tests is based on framework concepts. They constitute overarching concepts on the basis of which education-relevant competences are to be shown consistently and coherently over the entire personal history. Therefore, the following framework concepts that served as a basis for the development of the test tools to measure the above-mentioned constructs are identical in the different studies.

Science competency

Science competency is the precondition for participating in world affairs marked by science and technology (Prenzel, 2000; Prenzel et al., 2001; Rost et al., 2004) and is viewed as a predictor for an economically, socially and culturally successful life. Many problems and issues we encounter in our daily life require an understanding of natural sciences and technology. Scientific topics and problems affect all people. Therefore, the current discussions of the goals of scientific education focus on the concept of scientific literacy for all people (Osborne & Dillon, 2008). Such literacy is the basis for lifelong learning, serves as a connection for further learning (OECD, 2006; Prenzel et al., 2007) and, thus, also influences professional careers.

Based on this, the NEPS definition of science competency follows the Anglo-Saxon literacy concept (Bybee, 1997; Gräber, Nentwig, Koballa & Evans, 2002; OECD, 2006) that does not regard scientific competence as a simple reproduction but rather as flexible use of acquired knowledge in different situations and contexts of daily life.

In NEPS, science competency is understood as the use of scientific knowledge in the environmental, technological and health contexts. In addition, the concept distinguishes between content-related and process-related elements (see Fig. 1). In selecting its contexts as well as the content-related and process-related elements, NEPS uses the education standards of the Conference of Ministers of Education for the medium-level school-leaving qualification (KMK, 2005) and the *Benchmarks for Scientific Literacy* of the *American Association for the Advancement of Science* (AAAS, 1989, 2009) as a guideline. The selected contexts are of personal, social and global relevance. Considering the current scientific research and the general events of the day, it is assumed that they will remain important across the entire life span.

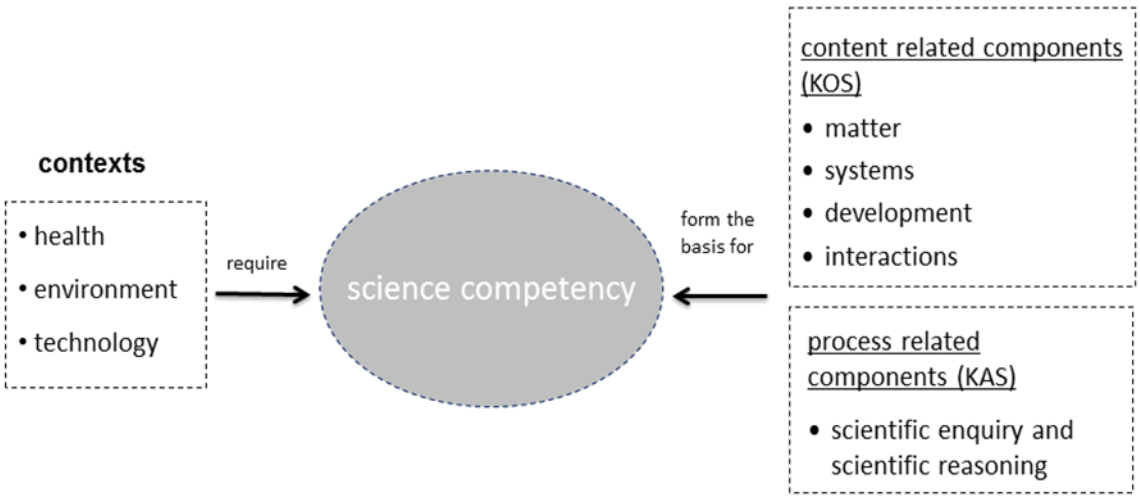

Fig.1: Application contexts as well as content-related and process-related elements of science competency of the NEPS scientific test.

The selected content-related and process-related elements cover central concepts of all scientific disciplines. The scientific knowledge domain comprises the content-related matter, *systems*, *development* and *interactions*. The knowledge of natural sciences includes *inquiry*

and scientific reasoning that deal, among other things, with checking hypotheses, interpreting findings as well as measuring principles and measuring error control.

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Listening comprehension at word level as indicator of linguistic competence in German

The importance of linguistic competence for learning in school as well as for explaining social disparities during school careers is largely undisputed.

In NEPS, the linguistic competences in German are measured through listening comprehension at word, sentence and text/discourse level on the one hand, and – from 2nd grade elementary school – through reading ability indicators (reading competence, reading speed) on the other where, however, not all indicators are measured at each survey. In nursery school, for the start cohort on the 1st measuring date at the age of about 4 years, listening comprehension is measured at word and sentence level.

Listening comprehension at word level: receptive vocabulary

Measures of the receptive vocabulary represent a favorable, internationally compatible indicator for the acquired language abilities and skills of children and adults. In numerous, comprehensive international, panel studies such as the Head Start Family and Child Experiences Survey – FACES (USA)[1], the National Longitudinal Survey of Children and Youth – NLCSY (Kanada; u.a. Lipps & Yiptong-Avila, 1999)[2], the British Cohort Study – BCS70 (z.B. Bynner, 2004) or the European Child Care and Education (ECCE) Study carried out in Germany, Austria, Spain and Portugal (e.g. European Child Care and Education (ECCE) Study Group, 1997), the receptive vocabulary is measured as a central and sometimes even sole indicator of the cumulatively acquired linguistic-cognitive abilities against the background of individual basic skills (e.g. working memory capacity, speed variables) and Environmental stimulation.

The internationally most used instrument for measuring the receptive vocabulary certainly is the ***Peabody Picture Vocabulary Test (PPVT***; Dunn, 1959; Dunn & Dunn, 1981, 1997, 2007) which is now available in different versions. Basically, the PPVT can be used over a wide age spectrum and is also easy to carry out and evaluate.

As a published German version of the PPVT is available only for older children from an age of 13 years (Dunn & Dunn, 2004), a procedure analogous to PPVT was prepared for NEPS which is based on data of the ECCE and BiKS studies. Within the framework of the BiKS study, in the longitudinal BiKS-3-10 analysis, a German research version of PPVT (Roßbach u.a., 2005) is used which is based on the data of the ECCE study (European Child Care and Education (ECCE) Study Group, 1997). Based on the BiKS data of 504 children between 3;10 and 5.7 years (M= 4.6; SD=0.37), 77 items were selected via IRT analyses that are particularly selective for this age range and arranged in one test instrument by complexity.

The task of the children is to select the correct picture for each predetermined individual word from a set of four pictures. The test is carried out at pre-school age in a playfully arranged individual test situation. In order to avoid overstraining of the children in case of poor performance, the test is stopped after six consecutive wrong answers.

[1] http://www.acf.hhs.gov/programs/opre/hs/faces/
[2] http://www.statcan.ca/english/sdds/4450.htm

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ICT Literacy

New conceptions for computer literacy increasingly emphasize aspects of information literacy in addition to technological literacy (basic declarative and procedural functional knowledge about hardware and software applications). Computer literacy is the ability to create, access, manage, integrate, and evaluate information using digital media. It can thus be seen as a combination of technological and information literacy. Therefore, explicit technological and informational tasks in specific contexts are represented in the tests. Different process components and content areas are taken into account for a content valid test construction. The process components were either allocated to technological literacy (e.g. create) or information literacy (e.g. evaluate) (see Fig. 1). Various software applications (e.g. operating system, internet search engines) were included for the content areas. All test items were constructed in such a way that they could be allocated to either of the two subscales as well as to a process component and a field of content.

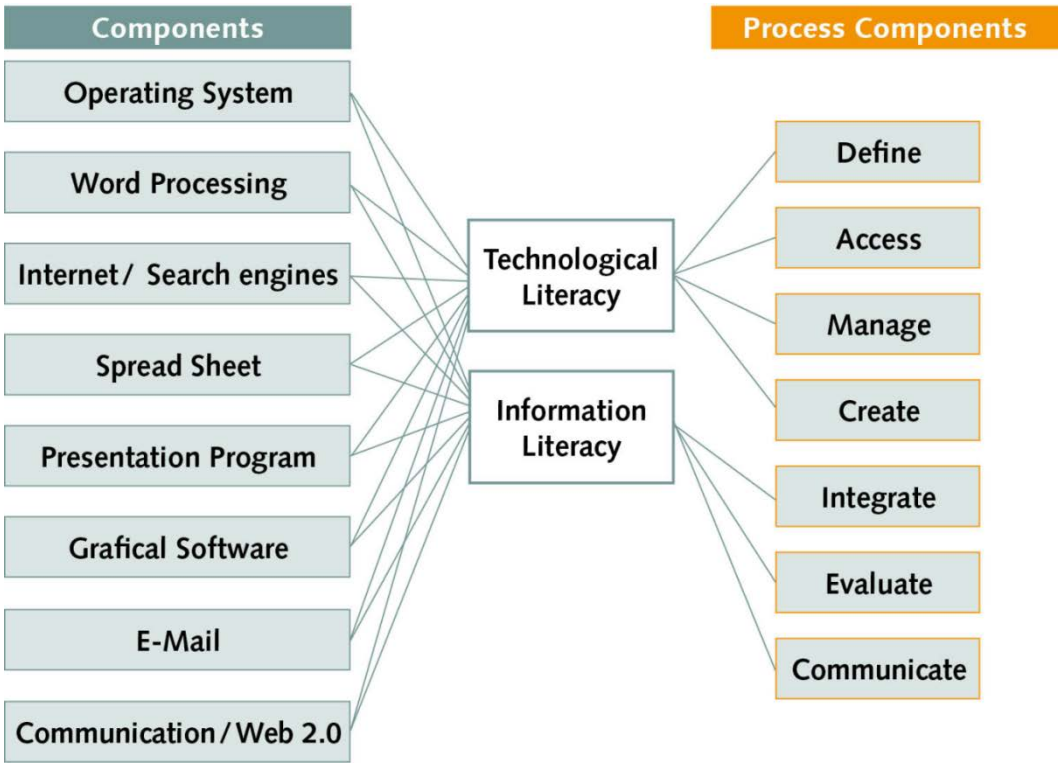

Fig. 1: ICT Literacy Outline Concept in NEPS

Metacognition

Metacognition is the knowledge and control of the own cognitive system. According to Flavell (1979) und Brown (1987), declarative and procedural aspects of metacognition are differentiated which are both covered in the National Education Panel.

Declarative metacognition

Declarative metacognition refers to knowledge about person, task and strategy variables that an individual can verbalize (Flavell, 1979). This includes, for example, knowledge about the strengths and weaknesses of one's own memory and learning, knowledge about cognitive requirements of tasks (i.e., their difficulty), as well as knowledge about strategies of attaining cognitive learning and achievement goals. It is assumed that the declarative aspect of metacognition constitutes a necessary prerequisite for strategic learning. Knowledge about different kinds of strategies can again be divided into declarative, procedural, and conditional strategy knowledge. Declarative strategy knowledge is the awareness of strategies, that is, the awareness that a certain strategy exists. Procedural knowledge describes how a strategy works effectively and conditional knowledge helps to understand which strategies are more useful for solving a certain task than others (Borkowski, Milstead, & Hale, 1988; Paris, Lipson, & Wixson, 1983).

In the National Educational Panel Study (NEPS), the declarative aspect of metacognition is measured by scenario-based knowledge tests. The construction of the tests is based on existing test instruments that refer to domain-specific knowledge (mostly in the domain of reading, e.g., the test on knowledge about reading strategies, Schlagmüller & Schneider, 2007) or to domain-general knowledge (Neuenhaus, Artelt, Lingel, & Schneider, 2011). These test instruments have been proven to be reliable and economic in use, they refer to concrete learning situations, and are interpretable against a clear benchmark.

The tests on declarative metacognition that are administered in the NEPS include several scenarios describing different school and leisure-time activities. For each scenario, a list of approaches of differing strategic quality is presented and participants are asked to rate the usefulness of each alternative. In order to be appropriate for the different age groups some characteristics of the tests (e.g., the number of the presented alternatives or the context in which the scenarios are embedded) are modified.

Test scoring is done with reference to the relative usefulness of the presented alternatives. Thus, the test instrument can be characterized as a test assessing conditional and relational knowledge about strategies (cf. Händel, Artelt & Weinert, 2013). The evaluation of the relative usefulness of the strategies is based on the ratings of experts who are scientists in the field of educational psychology and learning strategies. Accordingly, a pair comparison is scored as correct if the judgment on a strategy pair concurs with the expert ratings, and as incorrect if the judgment on a strategy pair contradicts the expert ratings.

Procedural metacognition

Procedural metacognition includes the regulation of the learning process through activities of planning, monitoring and controlling. Within the framework of NEPS in combination with the competence tests of the individual domains, the procedural aspect of metacognition is

not assessed as a direct measure of such planning, monitoring and controlling activities but as a metacognitive judgement that refers to the control of the learning performance during (and/or shortly after) the learning phase (also see Nelson & Narens, 1990). After the study participants have taken their competence tests, they are requested to rate their own performance. They are asked to state the portion of questions presumably answered correctly.

Usually, one question is asked per domain. For competence domains that can be divided into coherent individual parts (e.g. reading competence referring to different texts), the inquiry of procedural metacognition is referred to these parts as well, which, of course, leads to a longer processing time.

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