NEPS
National Educational Panel Study

Research Data

Information on Competence Testing

NEPS Starting Cohort 6 — Adults

Adult Education and Lifelong Learning

Wave 5: 26-69 years

LIfBi
LEIBNIZ INSTITUTE FOR
EDUCATIONAL TRAJECTORIES

Information on testing				
Test situation	Individual interviews, normally held at the participants home			
Test sequence	The test are predetermined in three different sequences and with a varying number of domains: **Test order group 1:** Scientific Literacy + procedural metacognition, ICT Literacy + procedural metacognition **Test order group 2:** ICT Literacy + procedural metacognition, Scientific Literacy + procedural metacognition **Test order group 3:** reading speed, reading competence (B67)+ procedural metacognition Please note: Since group 3 is exclusively comprised of first time participants the instruments of the B67 study were used for the tests reading and reading speed.			
Test duration (net processing time)	Depending on the group membership: **Group 1:** 52 Minuten **Group 2:** 52 Minuten **Group 3:** 33 Minuten			
Breaks	Only short breaks between the individual tests			
Information on the individual tests				
Construct	**Number of Items**	**Allowed Processing Time**	**Survey Mode**	**Next Measurement**
Scientific Literacy	22	25 min	paper-pencil	-
ICT Literacy	29	25 min	paper-pencil	-
Reading-related measures				
Reading speed	51	2 min	paper-pencil	-
Reading competence (B67)	32	28 min	paper-pencil	-
Domain-specific procedural metacognition				
Regarding Scientific Literacy	1	1 min	paper-pencil	-
Regarding ICT Literacy	1	1 min	paper-pencil	-
Regarding reading competence	6	3 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.

Scientific Literacy

NEPS's definition of scientific literacy derives from the Anglo-Saxon concept of literacy (Bybee, 1997; Gräber, Nentwig, Koballa & Evans, 2002; OECD, 2006), viewing scientific competence not sole as the reproduction but rather as the application of knowledge in different situations and contexts of everyday life. Scientific literacy is the prerequisite to participate in a world driven by science and technology (Prenzel, 2000; Prenzel et al., 2001; Rost et al., 2004) and is viewed as a predicator for an economically, socially, and culturally successful life. Scientific literacy is one part of the foundation for lifelong learning (OECD, 2006; Prenzel et al. 2007) thus influencing career choices and career developments.

NEPS defines scientific literacy as the application of science knowledge within the contexts of environment, technology, and health. Additionally the NEPS framework distinguishes between content-related and process-related components (figure 1). It follows the PISA-framework (OECD, 2006), the German Educational Standards for biology, chemistry, and physics at the end of Grade 10 (KMK, 2005a, b ,c), and the Benchmarks for Scientific Literacy of the American Association for the Advancement of Science (AAAS, 2009) thus fulfilling the requirement that the NEPS framework can be linked to international large scale assessments in the field of competence assessment. The chosen contexts of health, environment, and technology are of personal, social, and global significance. New research and the events of the day show that they continue to be relevant throughout a person's life span. The content-related and process-related components cover the central concepts of all of the science disciplines. In the area of knowledge of science this includes matter, development, interactions, and systems. The knowledge about science contains scientific inquiry and reasoning such as to test hypotheses, interpret findings, and the principals of measurement and measurement errors.

The test results of the content-related and process-related components lead to a composite value assessing scientific literacy.

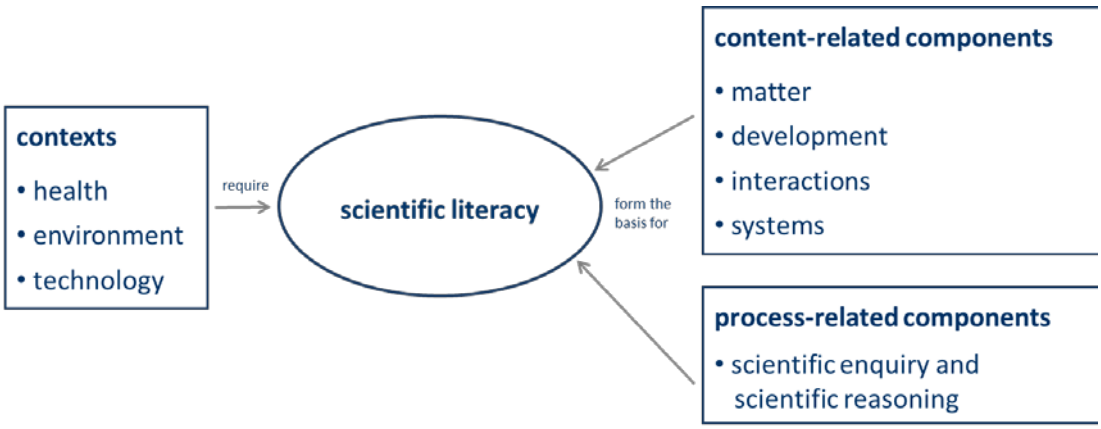

Figure 1: Implementation contexts as well as the content-related and process-related components scientific competence test of the NEPS-science tests

To assess the scientific competence of first-graders independent from their reading skills the test is administered by reading the questions and answer options to the students out loud. The answer options in the test material are given as pictures which will have to be checked. The test material is one-sided print containing one test question per page as to not overwhelm the children with too much content. For better child appropriate navigation throughout the test material each page is marked with images (animals, plants, etc.) instead of page numbers.

Literatur

American Association for the Advancement of Science. (AAAS). (2009). *Benchmarks for science literacy*. *Project 206.* Retrieved from http://www.project2061.org/publications/bsl/online/index.php

Bybee, R. W. (1997). Towards an understanding of scientific literacy. In W. Gräber & C. Bolte (Eds.), *Scientific literacy – An international symposium* (pp. 37–68). Kiel: Institut für die Pädagogik der Naturwissenschaften (IPN).

Gräber, W., Nentwig, P., Koballa, T. & Evans, R. (Eds.). (2002). *Scientific Literacy. Der Beitrag der Naturwissenschaften zur Allgemeinen Bildung.* Opladen: Leske + Budrich.

KMK (2005a). *Beschlüsse der Kultusministerkonferenz: Bildungsstandards im Fach Biologie für den Mittleren Schulabschluss.* Beschluss vom 16.12.2004. München: Luchterhand.

KMK (2005b). *Beschlüsse der Kultusministerkonferenz: Bildungsstandards im Fach Chemie für den Mittleren Schulabschluss.* Beschluss vom 16.12.2004. München: Luchterhand.

KMK (2005c). *Beschlüsse der Kultusministerkonferenz: Bildungsstandards im Fach Physik für den Mittleren Schulabschluss.* Beschluss vom 16.12.2004. München: Luchterhand.

OECD (2006). *Assessing scientific, reading and mathematical literacy: A framework for PISA 2006.* Paris: OECD.

Prenzel, M. (2000). Lernen über die Lebensspanne aus einer domänenspezifischen Perspektive: Naturwissenschaften als Beispiel. In F. Achtenhagen & W. Lempert (Eds.), *Lebenslanges Lernen im Beruf - seine Grundlegung im Kindes- und Jugendalter. Band IV. Formen und Inhalte von Lernprozessen* (pp. 175-192). Opladen: Leske + Budrich.

Prenzel, M. (2001). Voraussetzungen und Beispiel zu PUS. In M.-D. Weitze (Ed.), *Public Understanding of Science: Theorie und Praxis. Public Understanding of Science im deutschsprachigen Raum. Die Rolle der Museen* (pp. 49–61).

Rost, J. (2004). *Lehrbuch Testtheorie – Testkonstruktion*. Bern: Verlag Hans Huber.

Prenzel, M., Schöps, K., Rönnebeck, S., Senkbeil, M., Walter, O., Carstensen, C. & Hammann, M. (2007). Naturwissenschaftliche Kompetenz im internationalen Vergleich. In M. Prenzel, C. Artelt, J. Baumert, W. Blum, M. Hammann, E. Klieme & R. Pekrun (Eds.), *PISA 2006. Die Ergebnisse der dritten internationalen Vergleichsstudie* (pp. 63-105). Münster: Waxmann.

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.

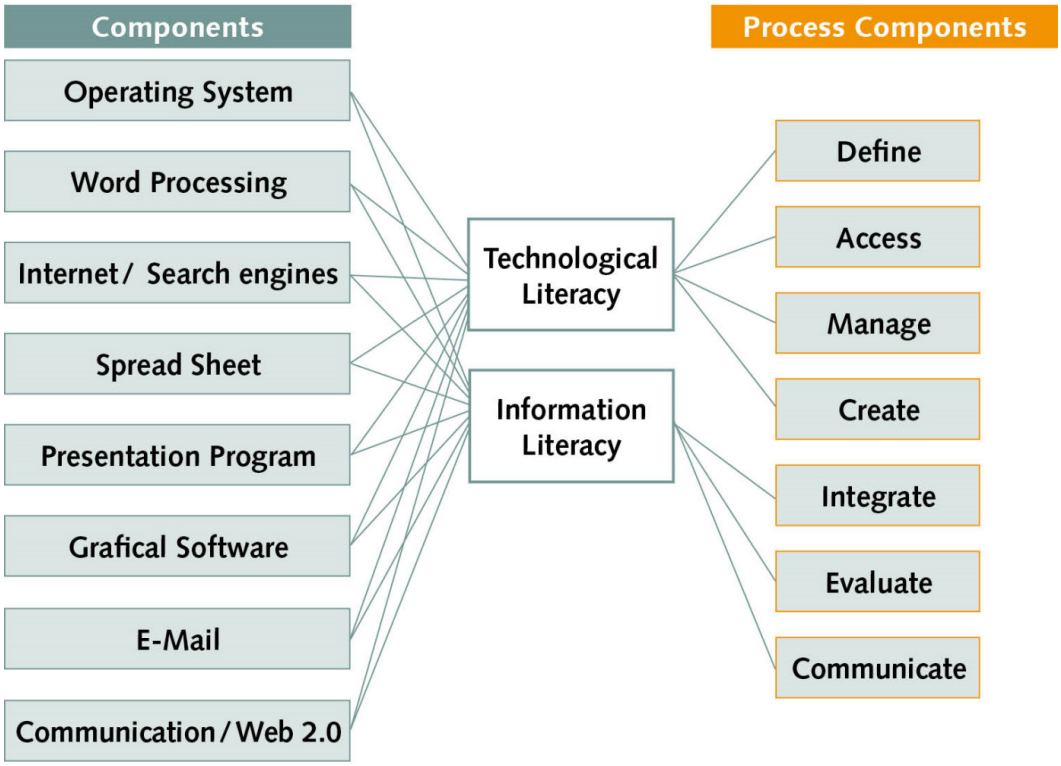

Fig. 1: ICT Literacy Outline Concept in NEPS

Reading speed

In addition to the reading competence test which focuses on reading comprehension, an indicator of the reading speed is collected where primarily basal reading processes and/or their automation are given priority. The test which is processed by the study participants within two minutes is based on the test design principles of the two Salzburg reading screenings (e.g. Auer, Gruber, Mayringer & Wimmer, 2005). The test material, however, was newly designed for use by the National Education Panel. The study participants are given a total of 51 sentences which can normally be answered with the aid of general world knowledge, in other words no specific content-related previous knowledge is required (e.g. ”mice can fly”). After each sentence, the participant has to check whether the sentence is correct in terms of content (“true“) or not (”false“). When taking the test, participants mainly differ from each other by the number of sentences they are able to process within the given time limit. As a result of the less demanding material in terms of content, differences between participants with proportionately falsely processed sentences are to be neglected. The measure of the reading speed is determined by the number of sentences correctly judged during the two-minute processing limit.

Bibliography

Auer, M., Gruber, G., Mayringer, H. & Wimmer, H. (2005). Salzburger Lesescreening für die Klassenstufen 5-8. Göttingen: Hogrefe.

Reading competence

The ability to understand and use written texts is an important precondition for further developing personal knowledge and personal skills, and a prerequisite for participating in cultural and social life. Manifold areas of knowledge and life are made accessible through reading. The range of reading occasions is very wide, and reading fulfills many different functions (cf. Groeben & Hurrelmann, 2004). They range from reading for expanding knowledge which is crucial to further education and lifelong learning to literary-esthetic reading. Not only do texts convey information and facts, but they also transport ideas, moral concepts and cultural contents. Accordingly, the concept of reading competence in the National Education Panel takes functional understanding as a basis for reading competence, as is also reflected in the Anglo-Saxon *Literacy* Concept (also see OECD, 2009), with the focus on competent handling of texts in different typical everyday situations.

In order to represent the concept of reading competence over the entire life span as coherent as possible, three characteristic features were specified in the framework concepts for the NEPS reading competence test. They are considered in the following age and stage-specific test forms:

1. Text functions, text types respectively,
2. Comprehension requirements,
3. Task formats.

1. Text functions/text types

NEPS distinguishes between five text functions and associated text types which are represented in each version of the test: a) factual texts, b) commenting texts, c) literary texts, d) instructions and e) advertising texts. This selection is based on the assumption that these five text functions are of practical relevance to the study participants of various ages. The text functions and/or text types can be characterized as follows:

Texts conveying factual information represent basic texts for learning, fundamental acquisition of knowledge and extraction of information; examples are: articles, reports, reportages and announcements. Texts with a commenting function are texts in which a stand is taken or a controversial question is discussed and in which a reflecting level is integrated. This is where, for the study and adult cohorts, for example, ingenious essays or humorous comments are found; and where, in the student cohorts, the blessing and curse of smoking could be discussed. The literary-esthetic function of texts was included in the third category; here short stories and extracts from novels or stories can be found. As a result of their specific reception that is presumably strongly dependent on educational track and curriculum, specific literary text types such as stage plays, satires or poems were excluded. The fourth category comprises text types conveying product inserts such as engineering and operating instructions, package inserts for medication, work instructions, cooking recipes etc. The fifth category (appeals, advertising) includes text types such as job advertisements, recreation programs etc. The five selected text functions and, thus, associated text types are realized as a longitudinal concept in each test booklet over the life

span, which means that each test/each test booklet, for measuring the reading competence, contains a total of five texts corresponding to the five text functions.

Unlike the PISA studies, NEPS does not include discontinuous texts such as graphics, tables, road maps etc. Discontinuous texts are not contained in the NEPS concept as they pose high demands on readers and, in addition, are not significant for every age group for which reading competence is tested in NEPS.

Age-specific selection (text complexity, topic selection/task requirements):

For each age cohort, texts were and are selected according to thematic orientation and lexical, semantic and grammatical properties that have to be appropriate for the respective group of readers. By increasing text complexity (larger vocabulary, longer words, foreign words), increased complexity of the sentence structures) as well as the basic length of texts, the test design takes into account the increasing reading competence from childhood to early adulthood. In addition, texts are selected in order to ensure that topics correspond to the environment of the respective age group. This covers a wide spectrum of topics ranging from animals (for children) to social and philosophical questions relating to the meaning of life for adults. Additionally, the test material is adjusted to the respective age group through age-adapted phrasing of the questions, answering options and the comprehension requirements of the tasks.

2. Comprehension requirements / task types

From the literature on reading competence and text comprehension (e.g. Kintsch, 1998; Richter & Christmann, 2002), it is possible to derive different types of comprehension requirements reflected in the NEPS concept in three specific requirement types of the tasks (task types). The variants are called *types* as there is no explicit assumption that tasks of one type are necessarily more difficult or easier than tasks of another type.

For tasks of the first type (“finding information in the text“), detailed information must be identified at sentence level, in other words deciphering and recognizing statements or propositions. For tasks on this requirement cluster, the information needed to solve the respective tasks is, in terms of the wording, either contained in the text and identical with the task itself, or phrasing varies slightly.

In the case of the second task type (“drawing text-related conclusions“), conclusions have to be drawn from several sentences to be related to each other in order to extract local or global coherence. In some cases, this takes place between sentences located closely together, in others several sentences are spread over entire sections. In another form of this type, the task is to understand the thoughts expressed in the entire text, which requires the comprehension and integration of larger and more complex text portions.

For the third type, the requirements of “reflecting and assessing“ are in the foreground, which in the literature is often linked to the mental representation of the text in the form of a situation model. In one version of this task type, the task is to understand the central idea, the main events or the core message of text, whereas in another version, the purpose and intention of a text has to be recognized and the readers are asked to assess the credibility of a text.

The different comprehension requirements occur in all text functions and are considered in the respective test versions in a well-proportioned ratio. (cf. Fig. 1.).

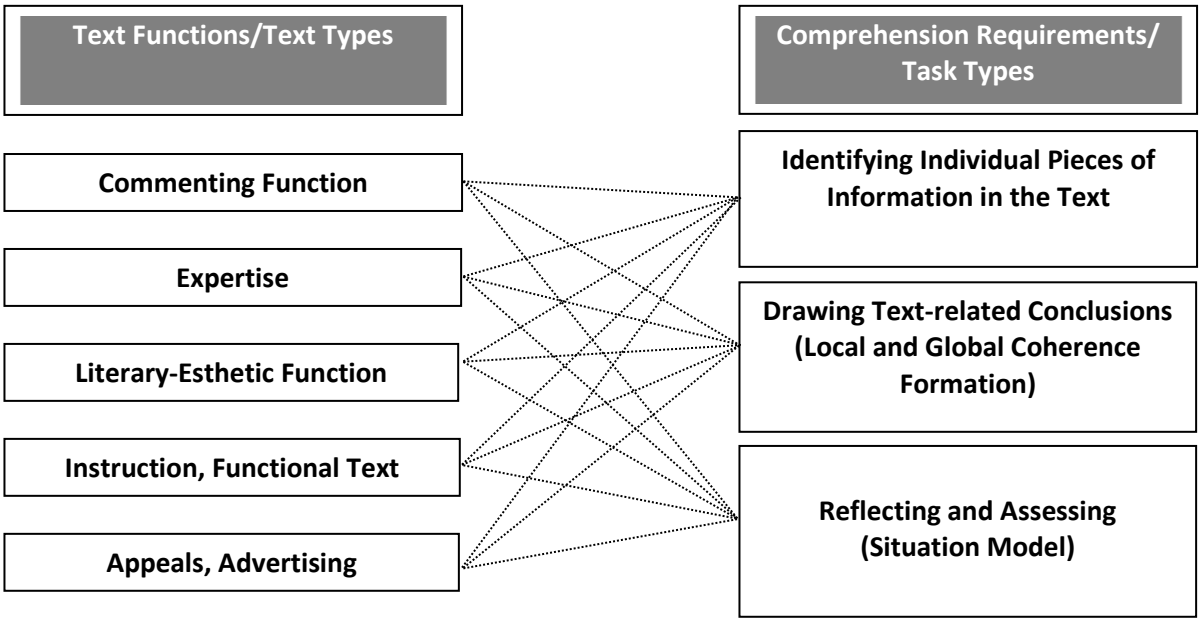

Fig. 1: Text functions and comprehension requirements

3. Task formats

The majority of tasks match the multiple choice format. Tasks of this type consist of a question/assignment on a text for which four different answers are offered, one of which is the correct answer. As another task format, decision-making tasks are used where individual statements have to be judged on whether they are right or wrong according to the text. The so-called correlation tasks represent a third format where, for example, a partial title must be chosen and assigned to different sections of a text. For tasks of the second and third type, summaries are made, if necessary, thus creating answers with partly correct solutions (partial credit items).

By systematically considering different text functions, which are implemented in different age groups in realistic and age-related texts, text themes and different comprehension requirements of the related tasks, it is possible to operationalize reading competence as a comprehensive ability construct.

Bibliography

Groeben, N. & Hurrelmann, B. (Hrsg.) (2004). Lesesozialisation in der Mediengesellschaft: Ein Forschungsüberblick. Weinheim: Juventa.

Kintsch, W. (1998). Comprehension. A paradigm for cognition. Cambridge: University Press.

OECD (2009). PISA 2009 assessment framework – Key competencies in reading, mathematics, and science. Paris: OECD

Richter, T. & Christmann, U. (2002). Lesekompetenz: Prozessebenen und interindividuelle Unterschiede. In N. Groeben, B. Hurrelmann (Hrsg.), Lesekompetenz: Bedingungen, Dimensionen, Funktionen (S. 25-58). Weinheim: Juventa.

Metacognition

Metacognition is the knowledge about and control of the own cognitive system. According to Flavell (1979) und Brown (1987), the NEPS distinguishes declarative and procedural aspects of metacognition.

Procedural metacognition

Procedural metacognition includes the regulation of the learning process through activities of planning, monitoring and control. Within NEPS the procedural aspect of metacognition is not assessed as a direct measure of such planning, monitoring and control activities but as a metacognitive judgement along with the domain-specific competence tests (judgment of performance during/shortly after the learning phase; see also Nelson & Narens, 1990). After the participants have completed all items of the respective competence tests, they are asked to estimate their own performance in the domain-specific competence test.

In general, one judgment about the portion of correctly given answers is inquired per competence domain. For competence domains divided into coherent individual parts (e.g. reading competence assessed by providing items referring to several texts), the assessment of procedural metacognition is referred to these parts as well, resulting in a longer assessment time.

Bibliography

Brown, A. L. (1987). Metacognition, executive control, self-regulation, and other more mysterious mechanisms. In F. E. Weinert and R. H. Kluwe (Eds.), *Metacognition, motivation, and understanding* (pp. 65-116). Hillsdale, New Jersey: Lawrence Erlbaum Associates.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist, 34*, 906-911.

Nelson, T.O. & Narens, L. (1990). Metamemory: A theoretical framework and new findings. In G.H. Bower (Hrsg.), *The psychology of learning and motivation* (pp. 125-141). New York: Academic Press.