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Research Data

The NEPS ICT Literacy Framework and Item Examples

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The NEPS ICT Literacy Framework

In our modern knowledge and information society, the ability to search for information and to handle information and communication technologies (ICT) competently is indispensable for coping with a host of demands in various life domains. The ability to comprehend, use, and communicate information conveyed by electronic media is not just important for coping with professional tasks in many areas of work. With the growing encroachment of ICT into all walks of life, these abilities get a major status in everyday life. Therefore, mastery of ICT can be viewed as a general cultural technique whose acquisition is an essential precondition for successful participation in society and for the fulfillment of personal and career-related goals (cf. Weinert, Artelt, Prenzel, Senkbeil, Ehmke & Carstensen, 2010).

In the context of NEPS, *Information and Communication Technology (ICT) Literacy* is conceptualized as a unidimensional construct comprising the facets of technological and information literacy. In line with the literacy concepts of international large-scale assessments, we define ICT literacy from a functional perspective. That is, functional literacy is understood to include the knowledge and skills that people need for successful participation in society. This leads to an assessment framework that relies heavily on everyday problems, which are more or less distant from school curricula. As a basis for constructing the instrument assessing computer literacy in NEPS, we use a framework that identifies four process components of computer literacy representing the knowledge and skills needed for a problem-oriented use of modern information and communication technology. They are defined as follows:

1) *Access*: knowledge of basic operations used to retrieve information (e.g., entering a search term in an internet browser, opening and saving a document);
2) *Create*: the ability to create and edit documents and files (e.g., setting up tables, creating formulas);
3) *Manage*: the ability to find information within a program (e.g., retrieving information from tables, processing the hits returned by a search engine);
4) *Evaluate*: the ability to assess information and to use it as the basis for informed decisions (e.g., assessing the credibility of the information retrieved);

The first two process components (a*ccess*, *create*) refer to the facet of technological literacy, whereas the other two process components (*manage*, *evaluate*) refer to the facet of information literacy (Figure 1). Apart from the process components, the construction of the NEPS tests for ICT Literacy is guided by a categorization of software applications that are used to locate, process, present, and communicate information (cf. Senkbeil, Ihme, & Wittwer, 2013):

1) word processing and operating systems
2) spreadsheet
3) presentation and graphics software
4) e-mail and other communication applications
5) internet/search engines

Each item in the tests refers to one process component and one software application. With the exception of a few items addressing factual knowledge (e.g., computer terminology), the items ask students to accomplish computer-based tasks. To do so, students were presented with realistic problems embedded in a range of authentic situations. Most items use screenshots—for example, an internet browser, an electronic database, or a spreadsheet—as prompts.

This framework can be applied to constructing ICT literacy tests for all age cohorts tested (i.e., students attending Grades 3, 6, 9, and 12; students in the vocational track; university students; and adults). It is also applicable to computer-based simulation tasks that will be used in NEPS for testing ICT literacy in 2017 for the first time.
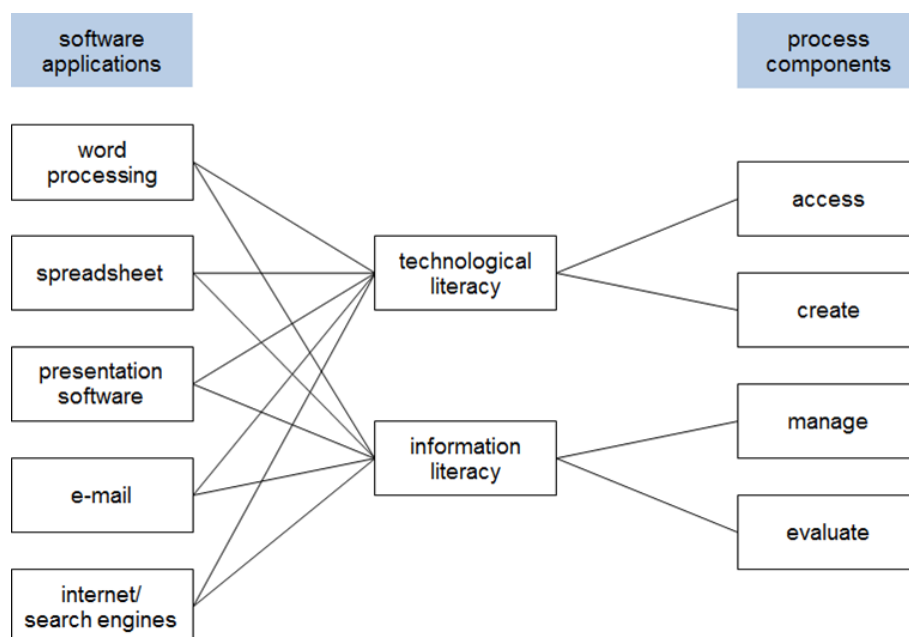

Figure 1: Assessment framework for computer literacy (process components and software applications)

Item format

The majority of the NEPS ICT literacy items are constructed as simple multiple choice (MC) items. These kinds of items display an item stem giving the test persons background information on the item topic. Most items contain a screenshot with given relations between text and screenshot. The test question is followed by four to six different answer options. One of the response options is correct, whereas the other response options function as distractors. NEPS ICT literacy tests also use the multiple true false (MTF) format. Structurally similar to the MC format, they also feature an item stem containing background information and often a screenshot, a test question, and four to seven answers. Unlike the MC items, the test person here must decide whether each MTF answer is either true or false.

Assessment conditions

The final NEPS ICT literacy tests of the main studies takes 29 min, leaving 1 min of half an hour to the metacognition question where test persons are asked to judge how many items they answered correctly. In NEPS, ICT literacy is tested in school students attending Grades 3, 6, 9, and 12; in young adults in the vocational track; in university students; and in adults. In school, the tests are applied in a group context. It is only in Grade 3 that all questions and response options are read out. Adults are tested at home in a one-on-one setting.

Computer-based testing

From 2017, the ICT literacy tests will be partly conducted in a computer-based setting. These tests will contain MC and MTF tasks as described above and simulation-based items, in which software environments are simulated and test takers often have to solve multi-step problems.
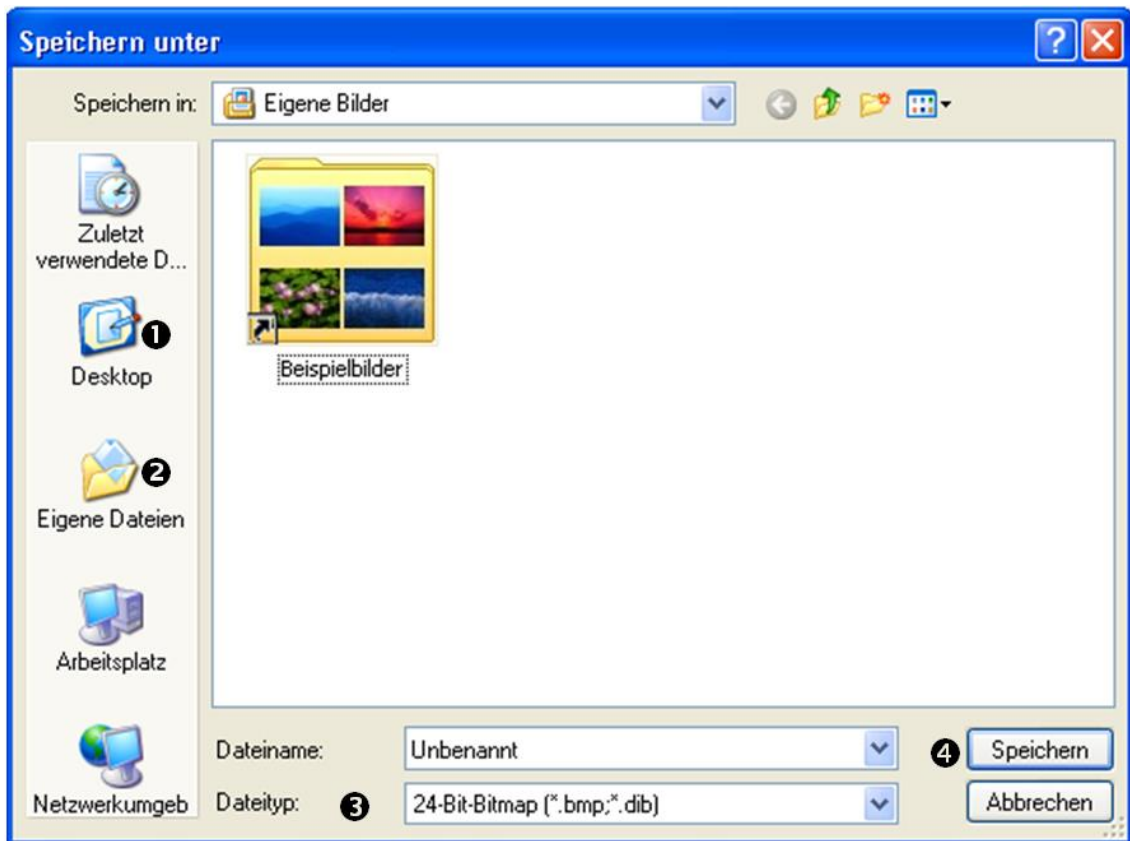
The NEPS ICT Literacy Test – Item Examples

The ICT literacy items aim to measure the ability to handle specific tasks and problems. To construct realistic tasks, most of the items contain screenshots—for example, of an internet browser, an electronic database, or a spreadsheet. Realistic answer alternatives, which were taken from the screenshots (e.g., menu buttons), usually serve as distractors in the tasks for technological literacy. In the items for information literacy—for example, authentic search masks—were used to construct distractors.

Figure 2 contains an example item for *technological literacy*, process component *access*, within *word processing/operating systems*. The item in Figure 3 is an example of an *information literacy* item, process component *manage*, software application *internet/search engines*. The item in Figure 4 is another example of a technological literacy item with the process component *create*, software application *spread sheet*.

Question 1:

Peter wants to save a picture in this image processing application in the TIFF format. How does he do that?

Please check the right answer! Please check one box only!

a	❶ He clicks on "Desktop".
a	❷ He clicks on "My Documents" ("Eigene Dateien").
a	❸ He searches the list "file-type" ("Dateityp").
a	❹ He clicks on "Save" ("Speichern").

Figure 2. Example item for Technological Literacy.

Question 2:

To find information about the American president, you entered the search term "Barack Obama". Which drop-down menu would you use to get this information in German from Germany?

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Please check the right answer in every line!

		true	false
❶ beliebige Sprache ("any language")		a	a
❷ alle Regionen ("any region")		a	a
❸ irgendein Format ("any format")		a	a
❹ ohne Zeitbegrenzung ("without time limit")		a	a
❺ irgendwo auf der Seite ("somewhere on the page")		a	a

Figure 3. Example item for Information Literacy.

Question 3:

This table shows the number of tickets that have been sold for a school play. Which formula is needed in the table to calculate the total number of tickets issued on Thursday?

	A	B	C	D	E	F
1			Drama Club Play			
2			Tickets			
3		Tickets sold	Tickets issued free of charge	Total no. of tickets	Total attendance	
4	Monday	28	0	28	26	
5	Tuesday	29	24	53	53	
6	Wednesday	65	16	81	80	
7	Thursday	58	8		64	
8	Total	180	48	228		
9						
10						

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Please check the right answer! Please check one box only!

a	=B7+C7
a	=D5:D7
a	=E8-B8
a	=B8-C8

Figure 4. Example item for Technological Literacy.

References

Senkbeil, M., Ihme, J. M., & Wittwer, J. (2013). The Test of Technological and Information Literacy (TILT) in the National Educational Panel Study: Development, Empirical Testing, and Evidence for Validity. *Journal for Educational Research Online, 5*, 131-169.

Weinert, S., Artelt, C., Prenzel, M., Senkbeil, M., Ehmke, T. & Carstensen, C. H. (2010). Development of competencies across the life span. *Zeitschrift für Erziehungswissenschaft, 14 (suppl. 2)*, 67-86.