NEPS
National Educational Panel Study

Research Data

Starting Cohort 4: 9th Grade (SC4) SUF Version 1.0.0 Competencies: Assessment of Declarative Metacognition

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Assessment of Declarative Metacognition

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Bibliographische Angaben:

Lockl, Kathrin (2012): Assessment of declarative metacognition: Starting Cohort 4 – Ninth Grade. Bamberg: Otto-Friedrich-Universität, Nationales Bildungspanel.

Declarative Metacognition (Starting Cohort 4 – Ninth Grade)

A major goal of the National Educational Panel Study (NEPS) is the assessment of competencies that are considered to be of particular importance for educational pathways and participation in society. Longitudinal measurements of reading competence, listening comprehension, mathematical competence and science competency have been and will be carried out coherently across the life span. These measurements are supplemented with regular assessments of metacompetencies such as abilities to handle information technologies (ICT) and metacognition (cf. Weinert, Artelt, Prenzel, Senkbeil, Ehmke, & Carstensen, 2011).

Metacognition is conceptualized as cognition about cognition (Flavell, 1979) and encompasses two components. On the one hand, the declarative knowledge component refers to the knowledge about memory, comprehension, and learning processes that an individual can verbalize. The procedural component, on the other hand, focuses on how the learning process is controlled and regulated through planning, monitoring, and metastrategic activities. The NEPS aims at assessing both, that is, declarative and procedural aspects of metacognition over the life span. In the following, the focus is placed on the assessment of declarative metacognition in starting cohort 4.

1. The design of the study

A description of the design of the study, the sample, as well as the instruments used can be found on the NEPS-website[1]. Overall, 13,933 subjects participated in the test on metacognitive knowledge. The test sequence during the testing session was the same for all subjects. The test on declarative knowledge was the second test and was administered after the reading test. Testing time was 15 minutes.

2. The assessment of declarative metacognition

The declarative aspect of metacognition is measured by scenario-based competence tests focusing primarily on different aspects of strategy knowledge (cf. Artelt, Beinicke, Schlagmüller, & Schneider, 2009; Schlagmüller, & Schneider, 2007). The tests consist of several scenarios describing different school and leisure-time activities. Test scoring is done with reference to experts' judgments of the relative usefulness of the presented alternatives.

More specifically, the test on declarative metacognition in grade nine includes eight different scenarios. Five of the scenarios are related to a school or learning context (two in the domain of reading), whereas the remaining three scenarios are embedded in out-of-school contexts, asking for domain-general strategy knowledge. Cognitive, metacognitive, and resource management strategies are realized, resulting in a knowledge test about solving cognitive tasks like remembering or organizing information, but also about planning and regulating (learning as well as leisure time activities), and about general learning requirements such as using resource management strategies (see Händel, Artelt & Weinert, under revision).

[1] www.neps-data.de

For each scenario, six strategies of differing quality are presented (see example, Figure 1). Subjects are asked to rate the usefulness of each strategy on a four-point scale of usefulness (1 = *not useful at all*, 4 = *very useful*).

Peter has a lot to do this week: He is supposed to go to the swimming club twice, he has been given plenty of homework, and he has to buy a birthday present for his friend.

What should he do in order to manage everything?

Please judge the usefulness of the proposed strategies.

	not useful at all	barely useful	somewhat useful	very useful
He makes a plan for the week and organizes his time for the tasks. He follows his plan very closely.	☐	☐	☐	☐
He combines different tasks and buys the birthday present on his way to the swimming club.	☐	☐	☐	☐
He allows others to help him. He asks his brother to buy the birthday present.	☐	☐	☐	☐
He completes only those pieces of homework which can be done quickly. Then he deals with the other things.	☐	☐	☐	☐
First, he buys the birthday present. If this takes too long, he will skip the homework or the swimming.	☐	☐	☐	☐
He does exactly what he feels like doing at this moment.	☐	☐	☐	☐

Figure 1: Example of a scenario in the domain declarative metacognition.

For the scoring of the test, pair comparisons (option X is more or less useful than option Y) are realized with reference to experts' judgments of the relative usefulness of the presented strategies.

To establish validity for the test on metacognitive knowledge, scientists in the field of educational psychology and learning strategies were asked to provide their judgments on the appropriateness of each strategy. The expert ratings served to develop an objectified scoring procedure for the students' responses. Based on those expert ratings, the relation between all potential pairs of strategies within a scenario was evaluated. For each strategy pair the percentage of expert agreement was computed that one strategy was superior to the other (pair comparison). If for an individual pair-wise comparison at least 75% of the experts agreed that one strategy of the pair was superior to the other strategy of the pair, the pair comparison was considered valid for the assessment of students' metacognitive knowledge. To evaluate students' performance, their responses were recorded into dichotomous response categories based on the expert ratings.

3. Data in the Scientific Use File

The data set contains 69 valid pair comparisons scored as dichotomous variables with 1 indicating a correct response (judgment on a strategy pair in line with the experts' ratings) and 0 indicating an incorrect response (judgment on a strategy pair contrary to the expert ratings or the two strategies of a pair were considered as equal).

The following example demonstrates the composition of the variable names for the pair comparisons:

md	g9	01	12	_c
declarative metacognition	grade 9	scenario 1	pair comparison of the strategies 1 and 2	scored variable

Table 1 shows the mean scores, standard deviation, and item-total correlations for the 69 pair comparisons.

Table 1: Descriptive statistics of the pair comparisons in the domain declarative metacognition

Scenario	Pair Comparison	Variable	m	SD	r_{it}
1	scenario 1: pair comparison 1	mdg90112_c	0.69	0.46	0.40
	scenario 1: pair comparison 2	mdg90113_c	0.39	0.49	0.18
	scenario 1: pair comparison 3	mdg90115_c	0.60	0.49	0.36
	scenario 1: pair comparison 4	mdg90116_c	0.90	0.29	0.45
	scenario 1: pair comparison 5	mdg90123_c	0.59	0.49	0.17
	scenario 1: pair comparison 6	mdg90124_c	0.44	0.50	0.27
	scenario 1: pair comparison 7	mdg90126_c	0.85	0.36	0.25
	scenario 1: pair comparison 8	mdg90136_c	0.91	0.29	0.42
	scenario 1: pair comparison 9	mdg90145_c	0.40	0.49	0.26
	scenario 1: pair comparison 10	mdg90146_c	0.79	0.41	0.38
	scenario 1: pair comparison 11	mdg90156_c	0.88	0.33	0.26
2	scenario 2: pair comparison 1	mdg90213_c	0.91	0.29	0.30
	scenario 2: pair comparison 2	mdg90215_c	0.52	0.50	0.15
	scenario 2: pair comparison 3	mdg90216_c	0.87	0.34	0.29
	scenario 2: pair comparison 4	mdg90223_c	0.94	0.24	0.32
	scenario 2: pair comparison 5	mdg90226_c	0.91	0.29	0.34
	scenario 2: pair comparison 6	mdg90234_c	0.92	0.27	0.31
	scenario 2: pair comparison 7	mdg90235_c	0.94	0.23	0.39
	scenario 2: pair comparison 8	mdg90256_c	0.93	0.25	0.42
3	scenario 3: pair comparison 1	mdg90313_c	0.82	0.38	0.30
	scenario 3: pair comparison 2	mdg90314_c	0.97	0.18	0.48
	scenario 3: pair comparison 3	mdg90315_c	0.96	0.19	0.46
	scenario 3: pair comparison 4	mdg90323_c	0.72	0.45	0.31
	scenario 3: pair comparison 5	mdg90324_c	0.94	0.23	0.48
	scenario 3: pair comparison 6	mdg90325_c	0.92	0.27	0.43
	scenario 3: pair comparison 7	mdg90334_c	0.74	0.44	0.13
4	scenario 4: pair comparison 1	mdg90413_c	0.78	0.42	0.38
	scenario 4: pair comparison 2	mdg90414_c	0.84	0.37	0.34

	scenario 4: pair comparison 3	mdg90415_c	0.80	0.40	0.39
	scenario 4: pair comparison 4	mdg90423_c	0.92	0.27	0.38
	scenario 4: pair comparison 5	mdg90424_c	0.93	0.25	0.37
	scenario 4: pair comparison 6	mdg90425_c	0.92	0.28	0.39
	scenario 4: pair comparison 7	mdg90436_c	0.65	0.48	0.29
	scenario 4: pair comparison 8	mdg90446_c	0.75	0.43	0.29
	scenario 4: pair comparison 9	mdg90456_c	0.75	0.43	0.36
5	scenario 5: pair comparison 1	mdg90512_c	0.97	0.18	0.41
	scenario 5: pair comparison 2	mdg90515_c	0.91	0.28	0.43
	scenario 5: pair comparison 3	mdg90516_c	0.60	0.49	0.30
	scenario 5: pair comparison 4	mdg90523_c	0.96	0.20	0.35
	scenario 5: pair comparison 5	mdg90524_c	0.93	0.25	0.34
	scenario 5: pair comparison 6	mdg90526_c	0.90	0.30	0.18
	scenario 5: pair comparison 7	mdg90535_c	0.87	0.34	0.39
	scenario 5: pair comparison 8	mdg90545_c	0.87	0.34	0.37
	scenario 5: pair comparison 9	mdg90546_c	0.49	0.50	0.23
	scenario 5: pair comparison 10	mdg90556_c	0.81	0.39	0.19
6	scenario 6: pair comparison 1	mdg90613_c	0.57	0.50	0.32
	scenario 6: pair comparison 2	mdg90616_c	0.88	0.32	0.25
	scenario 6: pair comparison 3	mdg90623_c	0.43	0.50	0.21
	scenario 6: pair comparison 4	mdg90624_c	0.66	0.47	0.23
	scenario 6: pair comparison 5	mdg90634_c	0.73	0.44	0.42
	scenario 6: pair comparison 6	mdg90635_c	0.91	0.28	0.45
	scenario 6: pair comparison 7	mdg90636_c	0.92	0.28	0.41
7	scenario 7: pair comparison 1	mdg90713_c	0.88	0.33	0.46
	scenario 7: pair comparison 2	mdg90714_c	0.60	0.49	0.28
	scenario 7: pair comparison 3	mdg90716_c	0.79	0.41	0.30
	scenario 7: pair comparison 4	mdg90723_c	0.93	0.26	0.39
	scenario 7: pair comparison 5	mdg90734_c	0.78	0.41	0.19
	scenario 7: pair comparison 6	mdg90735_c	0.94	0.24	0.44
	scenario 7: pair comparison 7	mdg90745_c	0.74	0.44	0.26
	scenario 7: pair comparison 8	mdg90756_c	0.85	0.36	0.24
8	scenario 8: pair comparison 1	mdg90812_c	0.94	0.24	0.40
	scenario 8: pair comparison 2	mdg90813_c	0.86	0.35	0.39
	scenario 8: pair comparison 3	mdg90816_c	0.91	0.28	0.37
	scenario 8: pair comparison 4	mdg90824_c	0.88	0.32	0.46
	scenario 8: pair comparison 5	mdg90825_c	0.93	0.26	0.46
	scenario 8: pair comparison 6	mdg90834_c	0.80	0.40	0.38
	scenario 8: pair comparison 7	mdg90835_c	0.88	0.32	0.44
	scenario 8: pair comparison 8	mdg90846_c	0.87	0.34	0.40
	scenario 8: pair comparison 9	mdg90856_c	0.93	0.25	0.43
Scale	Cronbach's α = .89 N = 12655				

As can be seen in Table 1, the internal consistency (Cronbach's α) of the test instrument is .89 (cases with missing pair comparisons were excluded for this analysis).

In addition to the pair comparisons, an overall mean test score is reported, including all pair comparisons with equal weight. The values of the mean test score range from 0 (no pair comparisons solved correctly) to 1 (all pair comparisons solved correctly).

The mean test score is 0.80 (*SD* = 0.14) for the investigated sample. The mean scores for the eight single scenarios range from *M* = 0.67 (*SD* = 0.23) to *M* = 0.88 (*SD* = 0.21).

There are different kinds of missing responses in the data set. These are a) nonvalid responses (for example, due to ticking two response categories on the four-point scale), missing responses b) due to omitted items, c) due to items that are not reached, d) due to items that are not administered, and e) missing responses that are not determinable.

The coding of the missing responses in the pair comparisons is as follows: If just one kind of missing response in a pair comparison occurred, the corresponding pair comparison was labeled according to the missing response that occurred in the ratings of the single strategies. If different kinds of missing responses occurred in a pair comparison, the response was labeled as not determinable missing response. Overall, 90.9% of the participants show no missing response in the pair comparisons.

References

Artelt, C., Beinicke, A., Schlagmüller, M. & Schneider, W. (2009). Diagnose von Strategiewissen beim Textverstehen. *Zeitschrift für Entwicklungspsychologie und Pädagogische Psychologie*, *41*(2), 96–103.

Flavell, J. H. (1979). Metacognition and cognitive monitoring: A new area of cognitive-developmental inquiry. *American Psychologist*, *34*(10), 906–911.

Händel, M., Artelt, C. & Weinert, S. (under revision). Assessing metacognitive knowledge: Development and evaluation of a test instrument. *Journal for Educational Research Online.*

Schlagmüller, M. & Schneider, W. (2007). *WLST 7-12. Würzburger Lesestrategie-Wissenstest für die Klassen 7 bis 12*. Göttingen: Hogrefe.

Weinert, S., Artelt, C., Prenzel, M., Senkbeil, M., Ehmke, T. & Carstensen C.H. (2011) Development of competencies across the life span. In H. P. Blossfeld, H. G. Roßbach & J. v. Maurice & (Eds.). *Education as a lifelong process: The German National Educational Panel Study (NEPS). (Zeitschrift für Erziehungswissenschaft, Sonderheft 14 .* Wiesbaden: VS Verlag für Sozialwissenschaften.