Research Data

Assessment of declarative metacognition:
Starting Cohort 2 - Grade 3

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Declarative Metacognition (Starting Cohort 2 – Third 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 scientific literacy 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 2.

1. The Design of the Study

The description of the design of the study, the sample, as well as the instruments used can be found on the NEPS website[1]. The tests were administered in two days and the test sequence was identical for all study participants. The test on metacognitive knowledge was administered on the second day. It was placed on the second position after the test on listening comprehension on word level. Overall, 5,610 children participated in the test on metacognitive knowledge. Testing time was 15 min.

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.

The test on declarative metacognition in Grade 3 is based on the same general rationale as the tests that are used in Grade 1 (see Lockl, Händel, Haberkorn, & Weinert, 2016) and secondary schools within the NEPS (Starting Cohorts 3 and 4, see Händel, Artelt & Weinert, 2013). It includes ten different scenarios. The scenarios focus on conditional metacognitive knowledge, that is, knowledge about the appropriateness of different strategies in varying situations, and include cognitive, metacognitive, and resource management strategies. Accordingly, the test assesses knowledge about solving cognitive tasks like remembering or organizing information, but also about planning and regulating, and about general learning requirements. Six of the scenarios are related to a school or learning context, whereas the

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[1] www.neps-data.de

remaining four scenarios are embedded in out-of-school contexts, asking for domain-general strategy knowledge (see Table 1).

Table 1

Content of the Scenarios in the Domain of Declarative Metacognition

Scenario	Context	Strategies concerning
1	school context	grouping and rehearsing information
2	out-of-school context	remembering information
3	school context	rehearsing and control
4	school context	elaboration
5	out-of-school context	grouping information
6	school context	elaboration
7	out-of-school context	prospective memory
8	school context	remembering information
9	out-of-school context	time management
10	school context	reading a text

For each scenario, three strategies of differing quality are presented (see example, Figure 1). Children have to rate each strategy on a three-point Likert scale, labeled by a different amount of stars (1, 2, or 3) indicating the usefulness of the strategy.

As in Grade 1, the scenarios and proposed strategies are presented orally accompanied by pictures. However, in contrast to Grade 1, the task-related text is additionally provided in the test booklets. That is, the experimenter reads aloud the scenarios and the corresponding strategies and the children can follow each approach by reading the task-related text and by looking at the pictures. A pilot study has shown that this mode of test administration increases the validity of testing in the age group of third graders (Lockl, Händel & Artelt, submitted).

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

In order 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 favoring one strategy as superior over another (pair comparison). If for an individual pair-wise comparison at least 75% of the experts agreed that one strategy was superior to the other strategy within the same 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.
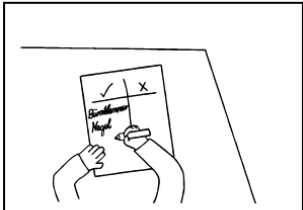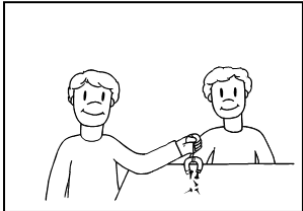

Figure 1: Example of a scenario in the domain declarative metacognition. Please note that this scenario was not included in the main study in Grade 3.

3. Data in the Scientific Use File

The data set contains 20 valid pair comparisons. These pair comparisons are 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	g3	01	12	_c
declarative metacognition	grade 3	scenario 1	pair comparison of the strategies 1 and 2	scored variable

Table 2 shows the mean scores, standard deviation, and item-total correlations for the 20 pair comparisons. Please note that the Scenarios 2, 4 and 7 were identical to those administered in Grade 1.

As can be seen in Table 2, the internal consistency (Cronbach's α) of the test instrument is .67 (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). Please note that the mean score is only provided if a participant has at least 3 valid (i.e., non-missing) pair comparisons.

The mean test score is 0.59 (SD = 0.17) for the investigated sample. The mean scores for the ten single scenarios range from M = 0.44 (SD = 0.43) to M = 0.84 (SD = 0.32).

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 3-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.

Table 2

Descriptive Statistics of Pair Comparisons in the Domain of Declarative Metacognition

Scenario	Pair Comparison	Variable	m	SD	r_{it}
1	scenario 1: pair comparison 1	mdg30112_c	0.84	0.37	0.21
	scenario 1: pair comparison 2	mdg30123_c	0.68	0.47	0.21
2	scenario 2: pair comparison 1	mdg10212_sc2g3_c	0.39	0.49	0.21
	scenario 2: pair comparison 2	mdg10223_sc2g3_c	0.82	0.38	0.31
3	scenario 3: pair comparison 1	mdg30313_c	0.64	0.48	0.25
	scenario 3: pair comparison 2	mdg30323_c	0.51	0.50	0.21
4	scenario 4: pair comparison 1	mdg10413_sc2g3_c	0.49	0.50	0.27
	scenario 4: pair comparison 2	mdg10423_sc2g3_c	0.39	0.49	0.29
5	scenario 5: pair comparison 1	mdg30513_c	0.49	0.50	0.18
	scenario 5: pair comparison 2	mdg30523_c	0.60	0.49	0.21
6	scenario 6: pair comparison 1	mdg30613_c	0.46	0.50	0.25
	scenario 6: pair comparison 2	mdg30623_c	0.41	0.49	0.17
7	scenario 7: pair comparison 1	mdg10713_sc2g3_c	0.86	0.34	0.32
	scenario 7: pair comparison 2	mdg10723_sc2g3_c	0.82	0.39	0.28

8	scenario 8: pair comparison 1	mdg30812_c	0.48	0.50	0.23
	scenario 8: pair comparison 2	mdg30823_c	0.39	0.49	0.30
9	scenario 9: pair comparison 1	mdg30912_c	0.81	0.39	0.30
	scenario 9: pair comparison 2	mdg30913_c	0.81	0.39	0.25
10	scenario 10: pair comparison 1	mdg31012_c	0.41	0.49	0.26
	scenario 10: pair comparison 2	mdg31013_c	0.47	0.50	0.27
Scale	Cronbach's α = .67 N = 5,259				

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, 93.7% of the participants show no missing response in the pair comparisons.

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