Measuring Self-Concept in the NEPS

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Abstract

In educational science, the idea of self-concept is well-known to be substantially correlated with learning behavior, decision making, and academic performance (cf. Shavelson and Bolus 1982; Helmke and van Aken 1995; Bong and Clark 1999; Kaufmann 2008). Therefore, it is a crucial concept in educational research, with importance for different purposes. In the National Educational Panel Study (NEPS), the measurement of self-concept needs to meet the requirements of several stages over the life course: academic self-concept during elementary school and high school, as well as a more general dimension of self-concept after leaving the highly structured context of educational institutions and entering the labor market. This task can be performed due to the hierarchical structuring of self-concept (cf., e. g., Shavelson et al. 1976; Marsh and Shavelson 1985; Marsh 1987; Lichtlein 2000). By distinguishing between two major levels, general self-concept on the one hand and domain-specific self-concept on the other, it is possible to monitor the individual's perception of him- or herself across the complete life course. This article outlines the insertion of self-concept measures used in the NEPS. Information on the theoretical concepts is given, and the chosen measures of investigation are introduced. Subsequently, selected results of students in the 5th and 9th Grade are presented.

1 Introduction

Self-related perceptions play an important role in educational research as well as in research on personality and social psychology (cf. Gecas 1982). The way people view themselves affects their behavior and thus substantially influences their lives (cf. Epstein 1973). As a result of this far-reaching impact, self-perceptions have be-

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come an inherent part of research. Educational scientists, in particular, address a great deal of interest in self-related beliefs, such as self-efficacy and self-concept. For educational research, self-concept is especially interesting in its hierarchical structure (Marsh and Shavelson 1985; Marsh 1987) and its implications regarding development issues. There is a consensual understanding that the self-concept of a person should be described on different levels. On a more abstract level, constructs like general self-esteem or general self-efficacy can be found, while aspects like "academic self-concept" or "school-related self-concept" are seen as being more context-specific. Academic self-concept is well-known to correlate with academic achievement (cf., e. g., Eckert et al. 2006; Köller et al. 2006) even though the nature of this correlation is discussed controversially (cf. Kammermeyer and Martschinke 2006). Beyond this, questions about causality are even harder to answer (Helmke and van Aken 1995). It is not easy to give a precise definition of the term self-concept, especially because of the widespread usage beyond disciplinary boundaries. Rosenberg's definition of self-concept as "the totality of the individual's thoughts and feelings having reference to himself as an object" (Rosenberg 1979, p. 7) is well-known but also very broad.

2 Theoretical and methodological background

In educational research, self-concept is often defined as a person's perception of him- or herself and his or her abilities (cf. Shavelson et al. 1976; Marsh and Shavelson 1985; Watermann et al. 2010). Its main characteristics are multidimensionality on the one hand and a hierarchical structure on the other (cf. Shavelson et al. 1976). At the top level of the hierarchy, there is a general dimension of self-concept, which then unfolds into several distinctive subdimensions, such as social self-concept, emotional self-concept, physical self-concept, and academic self-concept (cf. Shavelson et al. 1976; Shavelson and Bolus 1982). Each of these subdimensions can be further disaggregated into more specific subareas. For example, the academic self-concept can be disassembled into subject-specific components.

The different aspects of self-related perceptions can be used to address a great variety of questions. In his classical approach, Rosenberg (1979) used the general aspect of self-esteem to analyze differences between blacks and whites in the U. S. In addition, Kohn (1981) focused on the connections between more general dimensions of the self-concept and vocational and occupational developments. In educational research, the development of academic self-concept (or subject-specific subdimensions) is typically monitored together with the development of academic performance. Though there is substantial proof for the positive correlation between these two factors, the concrete (causal) mechanism underlying this interdependency is still unclear (cf. Dickhäuser 2006). The causal relation can be formulated in two oppositional approaches. Skill development theorists argue that social and dimensional comparisons of achievement lead to a person's perception of his/her ability, while

self-enhancement theorists consider self-concept to be a cause of performance (cf. e. g., Calsyn and Kenny 1977; Marsh 1990a; van Aken et al. 1997; Dickhäuser 2006; Kammermeyer and Martschinke 2006). Both traditions find support in empirical analyses, and neither appears to be superior.

In addition to the ambiguousness of findings on achievement and academic self-concept, the nature of the mechanism is strongly shaped by the characteristics of the investigated school system. As Watermann et al. (2010) pointed out, the findings of American research cannot be transferred to the German situation without restrictions. Kammermeyer and Martschinke (2006) found a shift from skill-development to self-enhancement after the first Grade for the German school system.

Research on the transition to different school types after elementary school often focusses on the transition's impact on academic self-concept (cf. Köller and Baumert 2001). The changing frame of reference (the composition of students changes from heterogeneous achievement groups in elementary school to homogeneous groups after school-type selection) leads to a revaluation of self-concept. Low-performing students' self-concepts benefit from the new reference group in which their own achievement lies closer to or even above the class average, while students demonstrating high performance find themselves in a composition in which their own achievement might not be as outstanding as it was before and they therefore have to deal with losses in self-concept. The described phenomena of the reference group is known as Big-Fish-Little-Pond effect (cp., e. g., Marsh 1990b; Marsh and Hau 2003; Marsh 2005) and can also be found in the German school system (cp. Köller 2004; Köller et al. 2006).

3 Self-Concept Measures in the German National Educational Panel Study

The National Educational Panel Study (NEPS; cf. Blossfeld et al. 2011) provides a great framework for answering questions like the ones outlined above. Its longitudinal design from early childhood to late adulthood provides a unique chance to monitor the development of constructs, such as the self-concept of abilities across a long time period containing important educational transitions, and to embed it in the context of the whole life course.

The above-mentioned hierarchy of self-concept offers the possibility to link academic research with questions on general educational processes. The distinction of a general dimension of self-concept and domain-specific subdimensions can be used to form a coherent measurement fulfilling all the needs of different life stages (cf. Wohlkinger et al. 2011).

3.1 General Self-Concept

General self-concept represents the top level of the self-concept hierarchy. Conceptually, it is not linked to any domain such as school, university, work, or family. Therefore, this measure can be used in an identical manner across all age cohorts. This allows for age-group comparisons and for testing measure stability assumptions across the whole life span.

Among potential instruments appropriate for this purpose, the Rosenberg self-esteem scale (Rosenberg 1965) was selected since self-esteem is assumed to be the base of domain-specific and situational self-evaluations and thus generally forms the key element of self-concept (cf. Ferring and Filipp 1996). Self-esteem has a strong theoretical grounding in social psychology and contains the two dimensions of "self-worth" and a kind of "competence." Self-esteem can be seen as "outcome, motive, and buffer" and is, in this sense, an important aspect for developing processes over the whole life course (Cast and Burke 2002). Robins and Trzesniewski (2005) showed that there is a kind of normal trajectory of self-esteem across the life-span and that the existing discontinuities are connected with important life experiences at different ages. Von Collani and Herzberg (2003a; 2003b) presented a short 10-item German version of Rosenberg's self-esteem scale that combines good psychometric characteristic (reliability, validity) and includes positive as well as negative item wording. The instrument is used with students starting from Grade 5 up to the adult stage (Roth et al. 2008).

3.2 Domain-Specific Self-Concept

Following the hierarchy of the self-concept, domain-specific measures are necessary to obtain a better-defined look on the different aspects of person's view of him- or herself. The stage structure of the NEPS provides a quite convenient way to implement domain-specific instruments. At the school and higher-education stages, there is a focus on academic self-concept, whereas the adult stage concentrates on the spheres of work life and family.

To contribute to the needs of the academic self-concept research tradition, the domain-specific self-concept at the school stages is further disaggregated. A general dimension of academic self-concept was implemented to provide a measure for overall self-rating of school performance. Additionally, along with the NEPS emphasis on the subjects of German and mathematics, both these subjects were incorporated separately. In PISA 2000, a similar conception lead to the development of a very economical instrument consisting of three short scales on verbal, mathematical, and overall academic self-concept (Kunter et al. 2002). These scales were applied for students of Grade 5 and Grade 9, enabling comparisons with the cross-sectional data acquisition of PISA within the framework of a longitudinal study.

In addition to the positive facet of self-rating, we measure learned helplessness. The conception of learned helplessness was introduced by Abramson and colleagues (Abramson et al. 1978) and is understood as counterpart of the positive self-concept. The instrument used in the NEPS was originally utilized in KOALA-S (cf. Ditton, 2007), a longitudinal study in elementary schools that thereby also provided experiences with young students. For the NEPS, we adjusted this instrument to the domain-specific level and now use it to gather helplessness in the subjects of German and mathematics separately.

Altogether, five different self-concept measures are being used at the school stages that cover different levels of the self-concept hierarchy and ensure that a great variety of questions are answered with the NEPS data.

At the stage of higher education, the school-related dimensions of German and mathematics don't play a major role for students of most subjects. For this reason, the distinction of these domains within the school context is not very applicable for other domains and was thus removed for non-school stages. Still, we differentiate between positive and negative aspects. The positive facet is covered by taking the absolute academic self-concept from Dickhäuser et al. (2002), while the student helplessness instrument is based on Jerusalem and Schwarzer (2006).

At the adult stage, not only is the differentiation between the school-typical dimensions of German and mathematics no longer appropriate, but the higher level dimension of academic self-concept also doesn't apply to the respondent's reality anymore. Therefore, only the universal dimension of self-concept, namely the Rosenberg self-esteem scale, is surveyed.

Altogether, the self-concept framework provided in the NEPS takes advantage of the structural characteristics of self-concept. The hierarchical formation, in particular, as well as the separation into positive and negative facets, is used to fulfill the peculiar needs of each life stage. With this framework, different disciplines are able to address a great variety of questions connected with the self-concept to the NEPS data.

4 First Results

To get an impression of the self-concept measures used in the NEPS, we hereby present an overview of the positive domain-specific self-concept measures and their correlation with grades for students in both Grade 5 and Grade 9.[1]

1 This paper uses data from the National Educational Panel Study (NEPS): Starting Cohort Grade 5, doi: 10.5157/NEPS:SC3:1.0.0 and Starting Cohort Grade 9, doi:10.5157/NEPS:SC4:1.0.0. From 2008 to 2013, NEPS data were collected as part of the Framework Programme for the Promotion of Empirical Educational Research funded by the German Federal Ministry of Education and Research (BMBF). As of 2014, the NEPS survey is carried out by the Leibniz Institute for Educational Trajectories (LIfBi) at the University of Bamberg in cooperation with a nationwide network.

Altogether, the Grade 5 and Grade 9 sample consisted of 6,085 and 16,425 cases, respectively. Among the self-concept scales presented here, complete information is available for more than 80 % of the cases.

Since a major strength of the NEPS is its large sample size, we distinguish different school types: Hauptschule (*HS;* school for basic secondary education), Realschule (*RS;* intermediate secondary school), Gymnasium (*GY;* type of school leading to upper secondary education and Abitur), and Förderschule (*FöS;* school establishment for students whose development cannot be adequately assisted in mainstream schools on account of disability). For readability purposes and to reduce complexity for the following demonstration of analysis potential, other types of schools, such as schools with mixed student populations, were excluded.

Intercorrelations of self-concept measures

Theoretically, according to the hierarchical structure of self-concept, both dimensions of subject-specific self-concept are considered to be partially included in the general dimension of academic self-concept. This assumption turns out to be correct for both age cohorts, as Figure 1 shows. In Grade 5, the correlation between the general *academic self-concept (ASC)* and the *verbal self-concept (VSC)* is r = .513, while the correlation with the *mathematical self-concept (MSC)* is r = .384. For Grade 9, the pattern is very similar, even though the coefficients show slightly lower values.

Moreover, for both cohorts, we find a correlation close to zero between the two lower-level self-concept measures VSC and MSC. This indicates that the instruments are able to clearly distinguish between the two domains of verbal and mathematical skills.

Almost the same relations found independently of school type appear when distinguishing the results. Table 1 outlines the intercorrelations of the self-concept measures for each school type separately. For Grade 5, there are small differences between the school types. While neither HS nor RS nor GY shows a correlation between verbal and mathematical dimensions of self-concept, there is a correlation of r = .247 for FöS

Figure 1 General intercorrelations (Pearson) of self-concept measures in Grade 5 and Grade 9

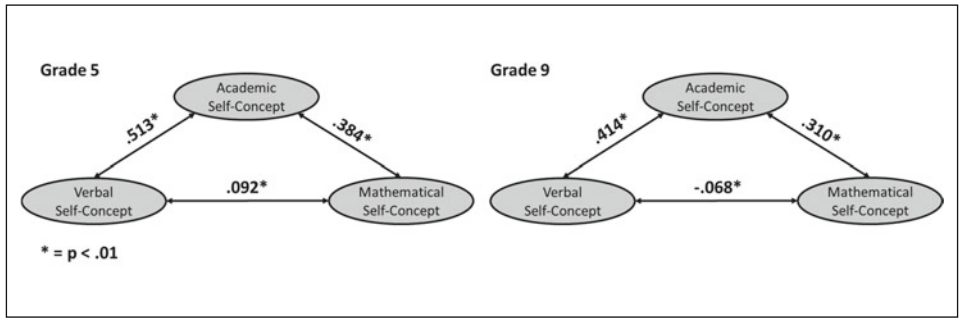

Table 1 Intercorrelations of Self-Concept Measures by School Type

School Type	Grade 5				Grade 9			
	FöS	HS	RS	GY	FöS	HS	RS	GY
VSC * MSC	.247*	n. s.	n. s.	n. s.	.112*	–.110*	–.114*	–.057*
VSC * ASC	.494*	.467*	.477*	.514*	.447*	.405*	.358*	.417*
MSC * ASC	.499*	.429*	.278*	.360*	.418*	.238*	.283*	.368*

Note. FöS = Förderschule (school establishment for students whose development cannot be adequately assisted at mainstream schools on account of disability); HS = Hauptschule (school for basic secondary education); RS = Realschule (intermediate secondary school); GY = Gymnasium (type of school leading to upper secondary education and Abitur); ASC = academic self-concept; VSC = verbal self-concept; MSC = mathematical self-concept; * = $p < .01$.

students. The relationship between the two lower-level self-concepts and the general academic dimension shows little variety across school types. The most outstanding value is the connectivity between MSC and ASC for students from RS, which is somewhat lower than for students from other school types.

The measures show slightly more variation for Grade 9. Although still close to zero, a remarkable difference between the school types can be found in the correlation between VSC and MSC: For FöS students, there is a positive correlation, whereas the other school types show a negative correlation.

When comparing Grade 5 with Grade 9, it appears that almost all correlations show lower values in the older age group. This finding will be even more interesting when the younger cohort reaches Grade 9 in a few years and longitudinal comparisons become feasible.

Mean comparison across school types

After the first impression of the intercorrelations of the self-concept measures, a look at the means seems appropriate. Table 2 displays the means for each instrument, differentiated by school type.

Within Grade 5, there is basically a slight increase of the means of all three self-concept scales across the school types, and only FöS students fall a bit outside of this pattern. In Grade 9, the picture changes: Compared with the Grade 5 means, only the VSC maintains its level. Both the ASC and (especially) the MSC are remarkably lower across all school types. Additionally, the means show less variation across the school types and now lie closer to each other. The differences presented in Table 2 were further examined with T-Tests. With few exceptions, almost all differences between the means of Grade 5 students are significant. In Grade 9, some significant coefficients can still be found, but in general, the differences are lower than the Grade 5 mean differences. Concretely, the differences between GY and the other school types remain significant, while the distance between HS and RS and the distance between

Table 2 Means of Self-Concept Measures for each School Type

School Type	Grade 5				Grade 9			
	FöS	HS	RS	GY	FöS	HS	RS	GY
Verbal Self-Concept (VSC)	3.00	2.81	2.93	3.12	2.94	2.88	2.88	3.01
Mathematical Self-Concept (MSC)	3.04	2.75	2.89	3.04	2.58	2.52	2.49	2.55
Academic Self-Concept (ASC)	3.11	3.03	3.10	3.26	2.84	2.87	2.85	2.92
N	437+	569+	993+	2150+	966+	3446+	2997+	4970+

Note. FöS = Förderschule (school establishment for students whose development cannot be adequately assisted at mainstream schools on account of disability); HS = Hauptschule (school for basic secondary education); RS = Realschule (intermediate secondary school); GY = Gymnasium (type of school leading to upper secondary education and Abitur); the "+" after each number in column N indicates that this is the **minimum** number of cases available for each scale.

HS and FöS decrease. This finding is consistent with the Big-Fish-Little-Pond effect: Until Grade 4, all students also compare themselves to students who are later separated to different school types. From Grade 5 on, their frame of reference changes, which leads to an adaptation of the self-rating after being separated into homogeneous achievement groups.

Correlations of self-concept measures with grades

The examination of the means begs the question of whether these patterns can also be detected when including grades. Table 3 shows the correlations between the three self-concept scales and academic achievement. To reflect the dimensionality of the scales, grades for the school subjects of German and mathematics were included separately and additionally averaged to take account of the hierarchy level.

All correlations are negative since lower grades indicate better achievement in the German school system. As expected, the correlations between the self-concepts and their corresponding grades show the highest connection, while the oppositional correlations between VSC and grades in mathematics and between MSC and grades in German in general is low or zero. Furthermore, all correlations between ASC and grades are lower than the correlations of subject-specific self-concepts and the grades of the corresponding subjects. Both findings can be regarded as indicators for the good separation between the different self-concept constructs. The ASC can be used when examining academic performance independent of concrete subjects, while VSC and MSC can be used for subject-specific questions.

For Grade 5, there is an erratic correlation pattern across the different school types. Students with special educational needs (FöS) mostly show the lowest correlations between self-ratings and achievements. Generally, the correlations are at a

Table 3 Correlations (Pearson) of Self-Concept Measures with Grades for each School Type

School Type	Grade 5				Grade 9			
	FöS	HS	RS	GY	FöS	HS	RS	GY
VSC * grade_G	–.274*	–.416*	–.447*	–.386*	–.470*	–.498*	–.534*	–.608*
VSC * grade_M	n. s.	n. s.	n. s.	–.098*	–.175*	n. s.	n. s.	–.100*
MSC * grade_M	–.337*	–.539*	–.534*	–.445*	–.509*	–.612*	–.638*	–.703*
MSC * grade_G	n. s.	n. s.	n. s.	n. s.	n. s.	n. s.	n. s.	–.109*
ASC * grade_G	–.163*	–.233*	–.278*	–.257*	–.262*	–.328*	–.348*	–.485*
ASC * grade_M	–.154*	–.167*	–.211*	–.200*	–.213*	–.247*	–.329*	–.455*
ASC * grade_GM	–.174*	–.248*	–.296*	–.270*	–.281*	–.342*	–.413*	–.560*

Note. FöS = Förderschule (school establishment for students whose development cannot be adequately assisted at mainstream schools on account of disability); HS = Hauptschule (school for basic secondary education); RS = Realschule (intermediate secondary school); GY = Gymnasium (type of school leading to upper secondary education and Abitur); ASC = academic self-concept; VSC = verbal self-concept; MSC = mathematical self-concept; grade_G = grade in German; grade_M = grade in mathematics; grade_GM = average grade German and mathematics; * = $p < .01$.

moderate level, and the highest correlation can be found between the mathematical self-concept and grades in math. The results for GY lie a bit underneath those of RS, partially even under the level of HS.

In Grade 9, the correlation between academic performance and self-concept is generally much stronger. Again, FöS students show lower correlations than the other school types. As before, the correlation between the MSC and grades in math is the highest. Contrary to the situation in Grade 5, the GY correlations here obtain the highest results. This finding can again be connected to the Big-Fish-Little-Pond effect: After being separated into the different school types, students with lower achievements, in particular, benefit from the new reference group, while students with higher achievements have to deal with higher competition in their new environment. After having spent four years in their new reference group, the relationship between self-concept and grades is realigned.

5 Conclusion

The self-concept measures provided by NEPS contain a great potential for many questions that have not yet been able to be answered by other datasets. As the results presented above show, the NEPS design, with its large-scale sample, can be used to distinguish different school types and still remain large enough for complex analyses. This characteristic particularly helps in deepening research on school-type-related

subgroup analyses, for example, by examining well-known phenomena such as the Big-Fish-Little-Pond effect.

On the one hand, both the instruments measuring academic self-concept as well as the timing of their usage allow for comparisons with other studies such as PISA, and on the other hand, they also allow for longitudinal comparisons that monitor self-concept development processes. The distinction between different hierarchical levels enables research located in a more general area as well as examinations of concrete subject-specific questions.

The results presented here only focus on the dimension of positive academic self-concept; however, there is greater potential within the negative dimension of self-perception and the non-academic measures. The unique structure of the NEPS, with its focus on the complete life course, enables questions focusing on the whole life-course, especially when addressing questions on educational mechanisms after leaving the homogeneous context of school.

Furthermore, the offering of other self-related concepts, such as motivation, goal attainment, and personality measured in a similar hierarchical structuring (cf. Wohlkinger et al. 2011), will also contribute to obtaining a better understanding of the interdependency of education, competence development, and self-perceptions.

The results indicate that there has to be some further analyses regarding students with special educational needs and their negative relationship between the two subject-specific self-concepts. Furthermore, there are indications that gender makes some difference, as Schilling et al. (2006) have examined. These and other topics need to be explored in further analyses.

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