**On the interplay of motivational characteristics and school grades: the role of Need for Cognition**

**or**

**Changes in Need for Cognition and Ability Self-Concept predict changes in School Grades**

(or

Everything is connected: Need for Cognition, Ability Self-Concept, School Grades and their interplay over time ;-))

Anja Strobel, Alexander Strobel, Franzis Preckel, & Ricarda Steinmayr

**Abstract**

...

**Introduction**

Over the past decades, a large body of research has examined variables predicting performance in school. Comprehensive meta-analytic findings demonstrated intelligence to be the strongest predictor for academic achievement (e.g., Deary, Strand, Smith, & Fernandes, 2007; Kriegbaum, Becker, & Spinath, 2019), but motivational variables have consistently been found to have predictive value for school performance, too (e.g., Kriegbaum et al., 2019; Steinmayr, Weidinger, Schwinger, & Spinath, 2019). In this context, motivational concepts like ability self-concept, hope for success and fear of failure, interest and values are well known and equally established indicators (e.g., Wigfield & Eccles, 2000; Wigfield & Cambria, 2010) that are subsumed under the umbrella term of achievement motivation (Steinmayr et al., 2019).

Over the last years, an additional predictor of academic performance came into the focus of researchers in this field of research: Need for Cognition (NFC), the stable intrinsic motivation of an individual to engage in and enjoy challenging intellectual activity (Cacioppo, Petty, Feinstein & Jarvis, 1996). According to the Investment Theory (Ackerman & Heggestad, 1997), traits such as NFC determine how individuals invest their cognitive resources and how they deal with cognitively challenging material. Studies could show that NFC is related to academic performance in different stages of academic life (e.g., Ginet & Py, 2010; Preckel, 2014; Luong et al., 2017; Grass, Strobel, & Strobel, 2017; for a meta-analytical review see von Stumm & Ackerman, 2013) as well as to behaviour associated with success in learning. As examples, NFC was found to be related to ability self-concept (e.g., Dickhäuser & Reinhard, 2010; Luong et al., 2017), to interest in school (e.g., Preckel, 2014) or to deeper processing while learning (Evans, Kirby & Fabringar, 2003; Luong et al., 2017).

The enjoyment of accomplishing something, the interest in task engagement and the intrinsic value of working on a task, respectively, have been suggested to be relevant to learning and academic achievement and can be found in the respective models (e.g., Wigfield & Eccles, 2000, see also Wigfield & Cumbria, 2010 for a review). Surprisingly, the concept of a more general joy of thinking, that is NFC, has not yet been investigated systematically together with these motivational indicators, especially in longitudinal studies, or integrated into the respective models for the prediction of performance in school.

Only last year, a large longitudinal study examined intelligence, the Big Five, Need for Cognition and a range of different motivational measures together in order to determine their value in predicting school performance (Lavrijsen, Vanstennkiste, Boncquet, & Verschueren, 2021). Their results showed intelligence and NFC to be the strongest predictors of school performance. Academic self-concept was the best predictor within the group of motivational variables. This underscores the importance to consider NFC along with established variables when aiming at a comprehensive picture of the prediction of school grades.

To follow-up on these findings and to provide new insights in the interplay of school performance, NFC and motivational variables, we examined the relevance of NFC, considering well-established motivational constructs as well as prior achievement in the prediction of school grades across different subjects in a longitudinal approach in a sample of secondary school children.

**2. Theoretical background**

**2.1. Achievement Motivation and its relation to school performance**

Achievement motivation is operationalized through various variables and can be seen as an essential predictor of academic achievement (e.g., Hattie, 2009; Steinmayr & Spinath, 2009; Wigfield & Cambria, 2010). Well-established concepts such as the ability self-concept, hope for success and fear of failure, or variables such as interests and values can be found under this umbrella term (Steinmayr et al., 2019). They have found their way into essential models (e.g., Wigfield, & Eccles, 2000; Kriegbaum et al., 2018), which is why they were included in this study as important motivational indicators. They are briefly explained below.

*Ability Self-concept.* Ability self-concepts can be described as generalized or subject-specific ability perceptions that students acquire on the basis of competence experiences in the course of their academic life (Möller & Köller, 2004). They thus reflect cognitive representations of their level of ability (Marsh, 1990). Such ability perceptions of students affect their academic performance (e.g., Wigfield & Eccles, 2000). A meta-analysis found moderate correlations with academic achievement (r = .34; Huang, 2011), whereas the association was lower (around r = .20) when controlled for prior achievement (e.g., Marsh & Martin, 2011). Steinmayr et al. (2019) demonstrated that among several motivational indicators, domain-specific ability self-concept was the strongest predictor of school performance. Moreover, ability self-concept and school performance influence each other and can thus mutually contribute to their strengthening or weakening (e.g., Guay et al., 2003).

*Hope for Success/Fear of Failure*. Murray (1938) considered the Need for Achievement as one of the basic human needs and as a relatively stable personality trait. His concept was extended by McClelland, Atkinson, Clark, and Lowell (1953), who differentiated the achievement motives hope for success (the experience of positive emotions and the belief of being able to succeed) and fear of failure (the experience of negative emotions and worry about failing in achievement situations). Such affective tendencies in the context of achievement motivation are reflected, for instance, in the choice of task difficulty, affinity for risk, and quality of task completion (Diseth & Martinsen, 2003). Hope for success may facilitate knowledge acquisition, whereas fear of failure may impede it (Diseth & Martinsen, 2003). A meta-analysis found achievement motivation in the sense of hope for success weakly to moderately positively related to academic achievement (r = .26; Robbins et al., 2004). For the association of fear of failure and academic achievement findings from individual studies suggest a relationship of similar magnitude but in a different direction (e.g., r = -.26; Dickhäuser et al., 2016).

*Task values - Interest*. Another important motivational indicator that was also included in the influential model of Wigfield and Eccles (2000), describes task values. Such task values focus on importance, perceived utility, and interest in a task (cf. Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002). Specifically on the domain of interest, a number of papers are available on the relationship with school performance, with correlations being in a low to moderate range (for an overview, see Steinmayr et al., 2019). A meta-analysis on the relationship between interest and achievement found moderate, positive correlations between these two variables (Schiefele, Krapp, & Winteler, 1992).

**2.2 Need for Cognition and academic performance**

Need for Cognition (NFC) describes the stable intrinsic motivation of an individual to engage in and enjoy challenging intellectual activity (Cacioppo, Petty, Feinstein & Jarvis, 1996). While individuals with lower NFC scores tend to rely more on other people, cognitive heuristics or social comparisons, individuals with higher NFC scores show a tendency to seek, acquire and reflect on information (Cacioppo et al., 1996). NFC has been shown to be rather modestly related to intelligence and its fluid (Fleischhauer et al., 2010) and crystallised (von Stumm & Ackerman, 2013) components, mirroring the typical cognitive performance of a person.

Concerning academic performance, across different stages of school and university, correlations with NFC can be found: For example, low to medium correlations were found for NFC and average grades at the university (for meta-analytical reviews see Richardson, Abraham & Bond, 2012; von Stumm & Ackerman, 2013). A similar picture emerges for the correlation of NFC and university entrance tests (Cacioppo & Petty, 1982; Olson, Camp, & Fuller, 1984; Tolentino, Curry, & Leak, 1990). In terms of school performance, Preckel (2014) reports a weak positive correlation primarily for the subject of maths in secondary school. Ginet and Py (2000) found a mean correlation of r = .33 of NFC when looking at school performance across all school years studied, with lower correlations in earlier and higher in later school years, a pattern that can also be found in Luong et al. (2017). Colling et al. (2021) reports differences in the strength of the correlations with school performance, too, here depending on the type of school, with the correlations between NFC and performance being strongest in the highest and weakest in the lowest track of school.

Concerning the interplay of intelligence und NFC, Strobel, Behnke, Gärtner, and Strobel (2019) found that intelligence and NFC each significantly predicted higher GPA. NFC moderated the relation between intelligence and GPA in a way that at higher NFC scores, the relation of reasoning ability to GPA was diminished. Though this is only one study, this could point to a potentially compensating effect of NFC.

**2.3 NFC and motivational aspects of learning**

The increased willingness to invest mental effort and attention in task and information processing that is typical for individuals with higher NFC is also associated with positive correlations to various traits, behaviours and indicators relevant to learning. Evans, Kirby, and Fabringar (2003) found associations of NFC with deeper processing while learning. Dickhäuser and Reinhard (2010) report strong associations of NFC with general and small with specific ability self-concept, and Luong et al. (2017) report moderate to high correlations of NFC with aspects of the ability self-concept, with learning orientation, processing depth and the desire to learn from mistakes. Preckel (2014) found correlations at a medium level with learning goals as well as interest in various school subjects, the correlation with academic interest is also reported by Keller et al. (2016). Furthermore, Elias and Loomis (2002) found NFC and efficacy beliefs to be moderately correlated. Their results suggested that the relationship between NFC and grade point average was mediated by efficacy beliefs, in a way that higher NFC scorer were associated with a higher efficacy belief, which in turn had a positive effect on academic performance. Diseth and Martinsen (2003) examined another indicator of performance motivation: In a student sample, they found a high positive correlation between NFC and hope for success and a medium negative relationship between NFC and fear of failure. Comparable findings are also reported by Bless, Wänke, Bohner, Fellhauer, and Schwarz (1994). In a large sample of 7th grade students, Lavrijsen et al. (2021) found a strong correlation with performance motivation and no relation of NFC to fear of failure.

Some studies examined NFC along with other motivational variables and could show NFC to explain variance in academic performance beyond established motivational characteristics such as learning orientation or academic self-concept (Keller et al., 2016; Luong et al., 2017). Meier, Vogl, and Preckel (2014) examined variables that could explain the attendance of a gifted class. They found that NFC, compared to other motivational constructs like academic interests and goal orientations, predicted the attendance of a gifted class while controlling for cognitive ability and other factors like parental education level or academic self-concept. Lavrijsen et al. (2021) examined the value of intelligence, personality (Big Five and NFC) and different motivational constructs in the prediction of school performance. Intelligence, NFC and academic self-concept were found to be the most strongest predictors of math grades and performance in standardized math tests.

**2.4 The present study**

All in all, NFC proved to be a very promising construct in the prediction of school performance and to be worthwhile to consider together with other motivational constructs. Studies conducted so far have limitations in that they often are cross-sectional, that motivational constructs and NFC are not investigated together in a systematic way or that only a few school subjects were considered, respectively. Furthermore, up to now prior achievement was not integrated as performance predictor in studies examining NFC. This is a limitation insofar as besides students’ cognitive abilities their prior achievement could be shown to be a relevant predictor of academic performance (e.g., Hailikari et al., 2007, Steinmayr et al., 2019).

At this background we want to add to the existing body of research by examining NFC, motivational indicators (ability self-concept, hope for success and fear of failure, interests, each of them general and domain specific) and Grades (GPA, Math, German, Chemistry and Physics) at two points of time. By applying latent change score modelling we will be able to determine the influence of our different predictors in the change of school performance over time. At the same time, mutual influences of changes in school performance, NFC and motivational constructs can be detected. We examine the following hypotheses and research questions:

1. What is the role of Need for Cognition in the prediction of school performance considering different motivational constructs and prior achievement in school?
2. Is Need for Cognition able to predict changes in school achievement over time?
3. Are changes in motivational variables, Need for Cognition and school performance related over time?

References

Dickhäuser, O., Dinger, F. C., Janke, S., Spinath, B., & Steinmayr, R. (2016). A prospective correlational analysis of achievement goals as mediating constructs linking distal motivational dispositions to intrinsic motivation and academic achievement. Learning and Individual Differences,

50, 30–41. 10.1016/j.lindif.2016.06.020

Diseth, Å., & Martinsen, Ø. (2003). Approaches to learning, cognitive style, and motives as predictors of academic achievement. *Educational psychology*, *23*(2), 195-207. doi: <https://doi.org/10.1080/01443410303225>

Guay, F., Marsh, H. W., & Boivin, M. (2003). Academic self-concept and academic achievement: Developmental perspectives on their causal ordering. Journal of Educational Psychology, 95, 124−136.

Hailikari, T., Nevgi, A., and Komulainen, E. (2007). Academic self-beliefs and prior knowledge as predictors of student achievement in mathematics: a structural model. Educ. Psychol. 28, 59–71. doi: 10.1080/01443410701413753

Hattie, J. A. C. (2009). Visible Learning: A Synthesis of 800 + Meta-Analyses on Achievement. Oxford: Routledge.

Huang, C. (2011). Self-concept and academic achievement: a meta-analysis of longitudinal relations. J. School Psychol. 49, 505–528. doi: 10.1016/j.jsp.2011. 07.001

Kriegbaum, K., Becker, N., & Spinath, B. (2018). The relative importance of intelligence and motivation as predictors of school achievement: A meta-analysis. Educational Research Review, 25, 120–148. 10.1016/j.edurev.2018.10.001

Marsh, H. W. (1990). Causal ordering of academic self-concept and academic achievement: a multiwave, longitudinal panel analysis. J. Educ. Psychol. 82, 646–656. doi: 10.1037/0022-0663.82.4.646

Marsh, H. W., & Martin, A. J. (2011). Academic self-concept and academic achievement: Relations and causal ordering. The British Journal of Educational Psychology, 81(Pt. 1), 59–77. 10.1348/000709910X503501

McClelland, D. C., Atkinson, J., Clark, R., and Lowell, E. (1953). The Achievement Motive. New York, NY: Appleton-Century-Crofts.

Möller, J., & Köller, O. (2004). Die Genese akademischer Selbstkonzepte: Effekte dimensionaler und sozialer Vergleiche. Psychologische Rundschau, 55(1), 19–27. doi:10.1026/0033-3042.55.1.19

Robbins, S. B., Lauver, K., Le, H., Davis, D., Langley, R., & Carlstrom, A. (2004). Do psychosocial and study skill factors predict college outcomes? A meta-analysis. Psychological Bulletin, 130(2), 261–288. 10.1037/0033-2909.130.2.261

Schiefele, U., Krapp, A., and Winteler, A. (1992). “Interest as a predictor of academic achievement: a meta-analysis of research,” in The Role of Interest in Learning and Development, eds K. A. Renninger, S. Hidi, and A. Krapp (Hillsdale, NJ: Lawrence Erlbaum Associates, Inc), 183–212.

Steinmayr, R., and Spinath, B. (2009). The importance of motivation as a predictor of school achievement. Learn. Individ. Differ. 19, 80–90. doi: 10.1016/j.lindif.2008.05.004

Steinmayr, R., Weidinger, A. F., Schwinger, M., & Spinath, B. (2019). The importance of students’ motivation for their academic achievement— Replicating and extending previous findings. Frontiers in Psychology, 10,

1730. 10.3389/fpsyg.2019.01730

Wigfield, A., & Eccles, J. S. (2000). Expectancy–value theory of achievement motivation. Contemporary Educational Psychology, 25(1), 68–81. 10.1006/ceps.1999.1015

Wigfield, A., and Cambria, J. (2010). Students’ achievement values, goal orientations, and interest: definitions, development, and relations to achievement outcomes. Dev. Rev. 30, 1–35. doi: 10.1016/j.dr.2009.12.001