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Mathematics achievement and self-efficacy: Relations with motivation for mathematics

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ABSTRACT

In this study we analyzed if teacher support and student self-efficacy mediated the relations between students' grades in mathematics and different measures of mathematics motivation. Participants in the study were 823 Norwegian middle school students. Indicators of motivation were intrinsic motivation, effort, persistence, and help-seeking behavior. Data were analyzed by means of multiple regression and SEM analysis. The relations between students' grades and motivation were partly mediated through emotional support and self-efficacy.

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1. Introduction

A common belief among educators is that students' self-perceived abilities play an important role in their academic motivation. A central construct related to self-perceived abilities is self-efficacy. Bandura (1977) originally proposed that self-efficacy would affect peoples' choice of activities, effort and persistence. In accordance with these expectations numerous studies have shown that students' motivation for schoolwork is related to their academic self-efficacy. For instance, self-efficacy beliefs have been found to relate positively to intrinsic motivation, choice of tasks, task values, and persistence (see, Bong & Skaalvik, 2003). Both researchers and educators have also been concerned with the quality of the student–teacher relationship and recent studies have also documented that students' motivation for schoolwork is positively related to their perception of the teachers as emotionally supportive (e.g., Federici & Skaalvik, 2014a,b; Furrer & Skinner, 2003). The present study tested if mathematics self-efficacy and the perception of mathematics teachers as emotionally supportive predicted motivation and if these constructs mediated the relation between students' achievement (grades) and their motivation for schoolwork.

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2. Theoretical perspectives

2.1. Self-efficacy beliefs

In social cognitive theory self-efficacy is conceptualized as peoples' expectations of being capable of conducting specified tasks. For instance, Bandura (1977, p. 3) defined self-efficacy as "... beliefs in one's capabilities to organize and execute the courses of action required to produce given attainments." Thus, students' self-efficacy refers to beliefs about what they are capable of accomplishing, rather than what skills and abilities they think they possess (Bandura, 1986; Zimmerman & Cleary, 2006). As pointed out by Skaalvik (1997) self-efficacy addresses questions like "Can I do it?" as opposed to self-concept, which addresses questions like "Am I good at it?"

Bandura (1986) considers self-efficacy as a unique human capability that affects motivation, for instance the choices people make, the effort that they expend on different activities, and how long they will persevere when confronting challenges. Previous research confirms that students' self-efficacy beliefs are related to different measures of motivation. Students' academic self-efficacy has been shown to be positively related to intrinsic motivation (Fan & Williams, 2010; Skaalvik & Skaalvik, 2004; Zimmerman & Cleary, 2006), choice of activities (Bandura & Schunk, 1981; Pajares & Miller, 1995), career selection (Betz & Hackett, 1983), persistence (Multon, Brown, & Lent, 1991; Schunk, 1981), and task-value (Bong, 2001). Also, Klassen and his associates found that self-efficacy for self-regulation predicted lower levels of procrastination for both university students (Klassen, Krawchuk, & Rajani, 2008) and secondary school students (Klassen et al., 2009). Because past performance affects both self-efficacy and motivation (Bandura, 1997), an important question is if self-efficacy predicts motivation over and above the prediction that can be made from students' previous achievements. In this study we also tested if students self-efficacy beliefs in mathematics mediated the effect of past math achievement on students' motivation for mathematics.

2.2. Teacher emotional support

Recent educational research shows a growing interest in the quality of the teacher–student relationship. Relationships between teachers and students reflect the potential of classroom interactions to foster student development. Several studies reveal that positive relations between teachers and students are positively associated with student motivation, engagement, and well-being (Furrer & Skinner, 2003; Marchand & Skinner, 2007; Niehaus, Rudasill, & Rakes, 2012; Sakiz, Pape, & Hoy, 2012).

In most research the teacher–student relationship is measured by asking the students about their relationship with their teachers. Such measures cannot be clearly distinguished from measures of the students' perceptions of the teachers as emotionally supportive. Emotional support is often defined in terms warmth, friendliness, respect, empathy and care (Patrick, Kaplan, & Ryan, 2011). Research reveals that students' perceptions of the teachers as emotionally supportive are associated with a range of motivational measures such as intrinsic motivation (Skaalvik & Skaalvik, 2012a,b; Wentzel, 1994), engagement (Patrick et al., 2011), academic initiative (Danielsen, Wiium, Wilhelmsen, & Wold, 2010), effort (Goodenow & Grady, 1993; Wentzel, 1994), and help-seeking behavior (Newman, 2000; Newman & Schwager, 1993).

Students' perceptions of the teachers as emotionally supportive are also positively related to the students' level of academic achievement (Federici & Skaalvik, 2014b). In the present study we therefore also tested if perception of the teachers as emotionally supportive mediated the relation between students' past mathematics achievement and their motivation for mathematics.

2.3. Mathematics motivation

In this study we used four measures of motivation for mathematics: intrinsic motivation, effort, persistence, and help-seeking behavior. Intrinsic motivation was conceptualized as interest and the inherent satisfaction of working with mathematics (Deci & Ryan, 2000; Ryan & Deci, 2000). Intrinsic motivation has in previous research been shown to be positively related to behavioral measures of motivation, for instance effort and help-seeking behavior (Skaalvik & Skaalvik, 2004, 2005).

Effort, persistence, and help-seeking behavior are behavioral indicators of motivation. Effort and persistence when encountering difficulties are assumed to be positively related to self-efficacy (Bandura, 1997; Schunk & Pajares, 2009). Help-seeking behavior is a self-regulatory strategy but also a behavioral indicator of motivation for mastering the task in question. If students are given optimal challenge at school they are also likely to encounter difficulties and need help and guidance (Karabenick, 2004; Karabenick & Sharma, 1994). As an indicator of motivation or motivated behavior help-seeking differs from effort and persistence in that it requires social interaction and the admittance of needing help. Compared to effort and persistence it may therefore be more dependent on the perception of the teachers as emotionally supportive. We assume that all the behavioral measures of motivation are influenced by the students' interest in mathematics or their intrinsic motivation for mathematics.

3. The present study

Understanding the factors that influence the relationship between past achievement and current motivation is especially important to explore in mathematics, because these factors may lead to interventions that move students away from a

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