



Research Paper

The Relationship between Perceived Teacher Support and Mathematics Performance: The Mediating Roles of Mathematics Internal Motivation, Anxiety and Self-Efficacy

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Abstract

Aim: Several intrapersonal and external factors could affect students' learning and performance in mathematics. This study aimed to explore the relationship between students' perceived teacher support and mathematics performance by considering the mediating roles of mathematics self-efficacy, internal motivation, and anxiety. Multi-stage sampling was used to choose 408 students. The SEM findings suggested that the proposed model had a good fit. Additionally, there was a significant, positive relationship between perceived teacher support and mathematics performance. Moreover, perceived teacher support could explain students' mathematics performance via the mediating roles of mathematics self-efficacy, anxiety, and internal motivation. Furthermore, mathematics self-efficacy affected the other two mediating variables and thereby influenced mathematics performance. The findings implied that mathematics performance could significantly be improved by paying especial attention to different types of teacher support and making educational interventions for increasing teachers' supportive behaviors, which can consequently increase mathematics self-efficacy and motivation and decrease mathematics anxiety.

Keywords: *Mathematics anxiety, Mathematics internal motivation, Mathematics performance, Mathematics self-efficacy, Perceived teacher support*

Introduction

Learning mathematics in school and students' mathematics achievement have received growing theoretical and empirical research attention. However, students still experience failure and different cognitive and academic problems in mathematics. Different learner internal and learner external factors can affect mathematics achievement. Among the external factors, the role of teachers is very crucial since students spend much time and have numerous interactions with them. Perceived teacher support or students' perceptions of being cared, respected, and valued by their teachers is an important factor in student-teacher relationships (Hughes et al., 2012). Teacher support is a meta-construct, i.e., teachers can provide their students with different types of support, which could have unique impact on students' attitudes and behaviours (Tennant et al., 2015) and considerably improve academic achievement (Sakiz, Pape, & Hoy, 2012).

Past research has shown that motivational factors are important learner internal factors which can significantly affect academic achievement. Anxiety is a negative emotion which is experienced by many students in mathematics classes. A growing body of studies have indicated the detrimental effect of negative emotions such as anxiety on students' academic performance and achievement, which might even cause student dropout (Goetz et al., 2013).

Self-efficacy is another important motivational factor which can affect academic achievement. Self-efficacy, or students' beliefs in their abilities to perform academic tasks, is a key motivational factor which could influence mathematics anxiety (Jain & Dowson, 2009). Students with higher levels of self-efficacy are more flexible in their thoughts and perceptions about themselves (Caprara et al., 2008). Consequently, they would hold positive perceptions about their abilities, consider problems as challenges which could be overcome, regulate their negative emotions, and have satisfactory academic performance (Caprara, et al. 2008).

Teacher support can predict learners' internal motivation for doing homework and making efforts as well as their self-concept (Hughes et al., 2012). Students who perceive more teacher support experience less negative and more positive emotions. The results of a study by Dietrich, et al. (2015) showed a direct relationship between perceived teacher support, task internal value, and effort.

The present study examines the relationship between perceived teacher support (as an external factor) and mathematics achievement by considering the mediating roles of internal motivation, mathematics self-efficacy, and math anxiety (as internal factors).

Methodology

This study was quantitative, descriptive, and correlational. The data analyses were performed by SPSS and Amos using Maximum Likelihood Estimation (MLE). A total of 420 students were selected using multi-stage cluster sampling from the statistical population of all male and female students studying in first-round high school (N=11910). Perceived teacher support was measured by three sub-scales. Emotional and instrumental support sub-scales were adopted from Skaalvik and Skaalvik (2013). Additionally, appraisal support was assessed by Wong, Tao, and Konishi (2018). The three sub-scales had acceptable validity and reliability in this study. Internal motivation for mathematics was assessed using six items from Federici and Skaalvik (2014). In addition, mathematics self-efficacy and anxiety were assessed by 15 and 14 items, respectively, adopted from May (2009). Finally, mathematics achievement in this study was considered as the mean of students' scores in their last three exams.

Results

The results indicated that teacher support could directly predict mathematics achievement. In addition, mathematics achievement was indirectly predicted by teacher support through mathematics anxiety, internal motivation, and self-efficacy. Fig. 1 presents standardized path coefficients for the mediation model. It should be noted that 49% of mathematics achievement variance was explained by endogenous and exogenous variables. Additionally, 55, 54, and 26% of mathematics anxiety, internal motivation, and self-efficacy variances were explained by endogenous and exogenous variables. Table 1 shows the fit indices of the structural model proposed in this study.

Table 1: Model fit indices of the structural model

2χ	DF	GFI	CFI	RMSEA	IFI	NFI	TLI	PCFI
841.28	365	.92	.95	.05	.95	.91	.94	.85

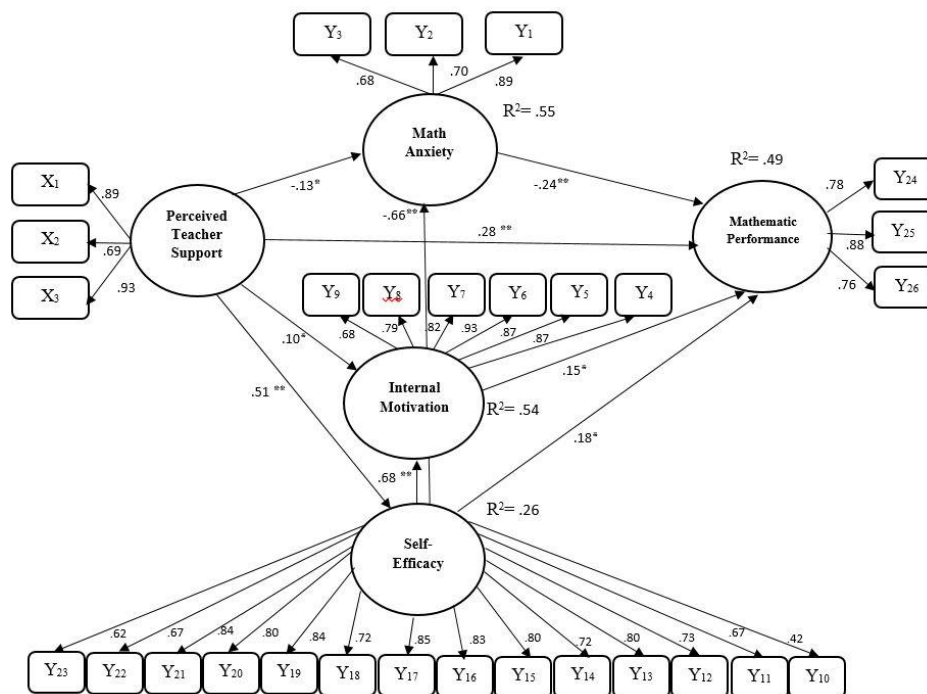


Fig. 1: Standardized path coefficients for the mediation model

Discussion and conclusion

The findings indicated that there was a significant and positive relationship between teacher support and mathematics achievement, which is consistent with previous studies (e.g., Dietrich, et al., 2015; Wong, Tao, & Konishi, 2018). Teachers can enhance their learners' mathematics achievement by providing them with different types of support such as emotional, appraisal, and instrumental. When students feel their teacher's care and support, they would display higher levels of commitment and fewer problematic behaviors. In addition, students would be more persistent in doing their homework and cooperative in classroom activities.

Furthermore, the SEM results showed that teacher support can reduce mathematics anxiety, which could increase mathematics achievement. When students receive adequate teacher support, they may have a better relationship with their teacher and feel loved, respected, and supported. Therefore, they would experience less anxiety, which can help them better focus on learning materials and improve their achievement. Further, perceived teacher support could enhance learners' internal motivation and, in turn, mathematics achievement. In fact, perceived teacher support is related to students'

perceptions of utility and intrinsic value of mathematics. In other words, students who perceive higher levels of teacher support tend to consider mathematics as useful and enjoy learning it.

In addition, both mathematics self-efficacy and internal motivation mediated the relationship between teacher support and mathematics achievement. Mathematics self-efficacy also affected anxiety and motivation, which in turn improved mathematics achievement. More specifically, perceived teacher support promoted self-efficacy and motivation and reduced anxiety, which consequently enhanced students' mathematics achievement. In fact, students who receive higher levels of teacher support have higher self-efficacy, can identify their strengths and weaknesses, and consider failures and mistakes as opportunities for their future achievements. Therefore, they would be more internally motivated and be able to adopt learning goals, rather than performance goals, which can consequently promote their mathematics achievement.

It is suggested that significant measures be taken to increase teacher support. For example, practical interventions could be made to train teachers for improving their relationships with students so that they can provide students with a wide range of support in mathematics classes, which can help promote self-efficacy and motivation and reduce anxiety.

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