MEDIATING EFFECT OF TEACHER'S SUPPORT AND STUDENT ENGAGEMENT IN MATHEMATICS AT CHINESE JUNIOR MIDDLE SCHOOL

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SULTAN IDRIS EDUCATION UNIVERSITY

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ABSTRACT

This study aimed to examine the influence of teacher support on student engagement in mathematics. A cross-sectional survey was employed to recruit 632 students from grades 7 to 9 in junior middle schools across China. Participants completed various scales, including a teacher support scale, an academic self-efficacy scale, a student engagement scale, an achievement goal questionnaire, and a passing and failing math scale. Data analysis was conducted using SPSS 20.0, Amos 24.0, and the SPSS macro PROCESS. The results indicated teachers' autonomy support, emotional support, and competence support were positively associated with student engagement. Specifically, teachers' emotional support ($\beta = 0.32$, $p < 0.001$) and competence support ($\beta = 0.36$, $p < 0.001$) had a significant positive impact on student engagement, with competence support making the most significant contribution and autonomy support having the weakest contribution. Additionally, academic self-efficacy mediated the relationship between teachers' autonomy support ($\beta = -0.147$, $p < 0.01$), emotional support ($\beta = 0.243$, $p < 0.001$), competence support ($\beta = 0.348$, $p < 0.001$) and student engagement. The relationship between teachers' autonomy support ($\beta = -0.177$, $p < 0.05$), competence support ($\beta = -0.147$, $p < 0.05$), and academic self-efficacy was moderated by gender. Moreover, passing grades were found to moderate the relationship between teachers' autonomy support ($\beta = 0.146$, $p < 0.05$) and academic self-efficacy. Furthermore, different goal orientations (mastery-approach goal, mastery-avoidance goal, and performance-approach goal) exhibited varying degrees of moderating effects on the mediating relationship between teacher support and student engagement. These findings shed light on the motivational processes through which students perceive the teacher's support's impact on their mathematics engagement. They carry significant implications for mathematics education, emphasizing the need for educators to consider individual differences and implement tailored interventions that enhance academic self-efficacy to improve student engagement.

KESAN PENGANTARAAN SOKONGAN GURU DAN PENGLIBATAN MURID DALAM MATEMATIK DI SEKOLAH MENENGAH RENDAH CINA

ABSTRAK

Kajian ini bertujuan untuk meneliti pengaruh sokongan guru terhadap penglibatan murid dalam matematik. Satu tinjauan keratan rentas telah digunakan untuk mengumpulkan 632 orang murid dari darjah 7 hingga 9 di sekolah menengah rendah di seluruh China. Peserta menjawab pelbagai skala, termasuk skala sokongan guru, skala efikasi kendiri akademik, skala penglibatan murid, soal selidik matlamat pencapaian, dan skala matematik lulus dan gagal. Analisis data dilakukan menggunakan SPSS 20.0, Amos 24.0, dan PROSES makro SPSS. Dapatan menunjukkan sokongan autonomi guru, sokongan emosi, dan sokongan kecekapan berkait secara positif dengan penglibatan murid. Secara lebih khusus, sokongan emosi guru ($\beta = 0.32$, $p < 0.001$) dan sokongan kecekapan ($\beta = 0.36$, $p < 0.001$) mempunyai impak positif yang signifikan terhadap penglibatan murid, dengan sokongan kecekapan memberikan sumbangan paling signifikan dan sokongan autonomi memberikan sumbangan paling lemah. Di samping itu, efikasi kendiri akademik memediasi hubungan antara sokongan autonomi guru ($\beta = -0.147$, $p < 0.01$), sokongan emosi ($\beta = 0.243$, $p < 0.001$), sokongan kecekapan ($\beta = 0.348$, $p < 0.001$) dan penglibatan murid. Hubungan antara sokongan autonomi guru ($\beta = -0.177$, $p < 0.05$), sokongan kecekapan ($\beta = -0.147$, $p < 0.05$), dan efikasi kendiri akademik pula dimoderasi oleh jantina. Selain itu, gred lulus juga didapati memoderasi hubungan antara sokongan autonomi guru ($\beta = 0.146$, $p < 0.05$) dengan efikasi kendiri akademik. Selanjutnya, orientasi matlamat yang berbeza (matlamat pendekatan penguasaan, matlamat pengelakan penguasaan, dan matlamat pendekatan prestasi) menunjukkan tahap moderasi yang berbeza terhadap hubungan pengantaraan antara sokongan guru dengan penglibatan murid. Penemuan ini memberi penerangan tentang proses motivasi dengan cara murid melihat kesan sokongan guru terhadap penglibatan matematik mereka. Ia mempunyai implikasi penting untuk pendidikan matematik, menekankan keperluan bagi pendidik untuk mempertimbangkan perbezaan individu serta melaksanakan intervensi yang sesuai untuk meningkatkan efikasi kendiri akademik dan meningkatkan penglibatan murid.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Student engagement is the engagement behavior that students hold in school learning, and is a positive, lasting and stable psychological state maintained by students during their learning (Zhang, Xue, Zhang, & Sun, 2021; Lam et al., 2014). Existing research mainly explored student engagement from behavioral, psychological, sociocultural and holistic views that integrate these viewpoints. The results showed that the level of student engagement affected the level of academic performance and the level of learning quality (Schnitzler, Holzberger, & Seidel, 2021; Fung, Tan, & Chen, 2018; Lei, Cui, & Zhou, 2018; Estévez, Rodríguez-Llorente, Piñeiro, González-Suárez, & Valle, 2021; Wang, Degol, & Henry, 2019), and affected the healthy growth and long-term development of students (Hong, Liu, Zhen, Jiang, & Jin, 2018; Upadyaya & Salmela-Aro, 2021). Active participation in math classes can not only predict the level

of students' academic performance, but also influence the majors students choose after entering college (Wang & Degol, 2014; Engels, Spilt, Denies, & Verschueren, 2021; Reschly, & Christenson, 2012; Makarova, Aeschlimann, & Herzog, 2019). Research shows a decline in math engagement during the secondary school years (Martin, Way, Bobis, & Anderson, 2015; Li & Lerner, 2011).

The factors affecting student engagement were divided into two categories, one is self-related factors, including gender, grade and previous academic achievement; Another category is environmental factors, including teachers and peers in schools, and parents in the home (Fredricks, Blumenfeld, & Paris, 2004; Ni & Wu, 2011; Xerri, Radford, & Shacklock, 2018). Finn (1993) proposed a participation-identification model based on the perspective of academic completion (Finn,1989), which described the relation between school and student engagement and the relation between social environment and student engagement. The model also indicated that whether students had active learning behavior depended on students' sense of belonging and dependence on school and society (Gillen-O'Neel, 2021; Ni & Wu, 2011); The self-determination theory suggested when the learning demands were satisfied by the social environment or activities, the learner interacted constructively with the learning environment, and then produced high-quality engagement (Zhang & Wang, 2019; Shernoff, Ruzek, & Sinha, 2017). Therefore, when the environment meets the individual's ability, belonging and other needs, the improvement of learning engagement is most likely to occur (Sökmen, 2021). A large number of studies at home and abroad confirmed that the classroom environment was closely related to all aspects of student learning, such as student achievement, motivation and goal achievement (Dufur, Parcel, & McKune, 2008; Liu & Liu, 2012; Luo, Li, Zhao, Wu, & Zhang, 2021). A healthy classroom

environment helps to create a relaxed learning atmosphere, helps students build self-esteem, self-confidence, and increases their engagement and sense of belonging in school (Patrick, Turner, Meyer, & Midgley, 2003). Studies have shown that the classroom environment can affect student engagement (Wang & Hofkens, 2020).

In the school environment, teachers' behavior plays an indispensable role in influencing student engagement (Skinner, Furrer, Marchand, & Kindermann, 2008; Misbah, Gulikers, Maulana, & Mulder, 2015). Studies indicated that teachers and parents generally believed that boys performed better in mathematics than girls (Li, 1999; Tomasetto, Alparone, & Cadinu, 2011; Gunderson, Ramirez, Levine, & Beilock, 2012). The math-gender stereotype is a societal view that female are inferior to male in mathematics (Smetackova, 2015; Cheryan, Master, & Meltzoff, 2015). This view affects male and female differently (Li, Huang, Li, & Si, 2022; Cheryan, Master, & Meltzoff, 2015). Math-gender stereotype not only makes girls less persistent in mathematics learning (Steffens, Jelenec, & Noack, 2010; Eccles, & Wang, 2016), but also leads to lower engagement in mathematics (Miller, Eagly, & Linn, 2015; Eddy & Brownell, 2016), and there are gender differences. Some studies speculated that female faced higher negative mathematics stereotypes, which reduced individual mathematics self-efficacy and mathematics learning motivation, and affected the persistence of mathematics learning (Casad, Hale, & Wachs, 2015; Gurin et al., 2017); while male might benefit from mathematics stereotypes and make learning motivational and persistence improved. Previous research has found that students of different ages perceive teachers' emotional support differently, and it may decline in early adolescence (Wu & Hughes, 2015). In addition to studying teachers' emotional support, this study also studies the effects of teachers' autonomous support and ability support

on student engagement. It is not known which supportive behaviors of teachers are more effective in promoting student engagement. There is a need to research student engagement further in relation to teacher support.

The dissertation topic is exploring how teacher's support impacts student engagement using student reports. The effect of teacher's support on student engagement of middle school is positive (Jin & Wang, 2019; Strati, Schmidt, & Maier, 2017; Tao, Meng, Gao, & Yang, 2022). When teachers are good at detecting the psychological needs of students, and adopt supportive behaviors such as encouragement and concern, they can help students reduce distractions and deviant behaviors (Wang & Eccles, 2012; Lu, Xie, & Liu, 2022), to make students work harder and more confident in their studies, and actively engage in the learning process. Many studies took adolescents as research objects and used self-determination theory (Deci & Ryan, 2000) as the theoretical basis to explore the impact of teacher's support on students' academic motivation and engagement (Allen, Pianta, Gregory, Mikami, & Lun, 2011; Danielsen, Wiium, Wilhelmsen, & Wold, 2010; Wang & Eccles, 2013; Yu & Singh, 2018). The theory of self-determination motivation holds that the social environment supports three basic psychological needs of students: the psychological needs of autonomy, the psychological needs of relevance, and the psychological needs of competence, which can promote students' self-regulated learning behaviors and learning outcomes (Wang, Tian, & Huebner, 2019). Corresponding to students' basic psychological needs (Campbell, Soenens, Beyers, & Vansteenkiste, 2018), teacher support is embodied in autonomous support, emotional support and competence support. The higher the level of teacher support in these three categories, the higher the level of student engagement in learning (Wang & Eccles, 2013; Ahmed, Umrani,

Qureshi, & Samad, 2018). Future research should investigate the correlation between teacher support and student engagement and how teacher support affects student engagement in mathematics classrooms.

1.2 Background of the Study

There were many empirical studies of teacher's support and student engagement in the past, which showed that teachers' classroom teaching behaviors were important to students **(**Chen, 2005; Ahmed, Umrani, Qureshi, & Samad, 2018). Teachers have a strong influence on students' learning process, and this influence continues to have an effect on students (Hill, Charalambous, & Chin, 2019; Lazarides, Gaspard, & Dicke, 2019; Blazar & Kraft, 2017). However, most studies only explore the association between teachers' autonomy support and student engagement or teacher's emotional support and student engagement, confirming that autonomous support or emotional support positively predicts student engagement **(**Liu et al., 2018; Hospel & Galand, 2016**)**. The theory of self-determination suggested the psychological needs of students are divided into autonomy needs, emotional needs and competency needs (Wang, Liu, Kee, & Chian, 2019). This study proposed teacher's autonomy support corresponding to students' autonomous needs, teachers' emotional support for students' emotional needs, and teacher's competence support for students' competence needs. Skinner and Belmont (1993) proposed an impact model of student engagement which explored the relationship between context, self, action, and outcome. The model believed that if students' basic psychological needs were met, student engagement was directly improved (Molinari & Mameli, 2018; Benlahcene, Kaur, & Awang-Hashim, 2020).

Teachers need to provide corresponding support based on the three basic psychological needs of students in order to benefit students' academic development. Which teacher support dimensions are related to student engagement is a question worthy of discussion. This study explored the relation between teacher's autonomy support (AS), emotional support (ES), and competence support (CS) and student engagement, and further examined how these three types of teacher's support affected student engagement in mathematics.

Song (2015) used the revised Sherman Mathematical Attitude Scale and the Implicit Associative Intelligence Test to analyze the current situation of domestic adolescents' stereotypes from two aspects, explicit and implicit. The results showed that there were no explicit math gender stereotypes among middle school students. But there is currently debate as to whether the gender difference that exists in mathematics has narrowed (Ganley et al., 2013). Some scholars conducted an experimental study on college students in Sichuan Province using the intelligence association test, and obtained different results. College students in most areas of the province believed that boys should choose science and engineering, and girls should choose literature and history, and found gender differences in implicit gender stereotypes. Compared with boys, girls hold stronger stereotypes (Li, 2016; Ewing & Taylor, 2009). Studies in adolescents reached the same conclusion. In a recent study, a survey of high school students using the Mathematics Gender Stereotype Scale found that there were significant gender stereotypes among high school students, and among high school students, they believed that boys are more capable of mathematics learning (Wang, Yang, & Si, 2018; Hamre & Pianta, 2001; Spilt, Hughes, Wu, & Kwok, 2012). Therefore, whether there is a gender difference in the relationship between teacher's

support dimensions and student engagement is also an issue that we will further explore.

The encouragement and respect of emotionally supportive teachers can enhance students' self-efficacy, learning interest, and academic self-confidence (Galugu & Samsinar, 2019). As a result, student engagement will also be enhanced (Davis, 2006; Gregory, Hafen, Ruzek, Mikami, & Pianta, 2016). But studies have found that teachers' emotional support may vary at different ages and stages of student development(Wu & Hughes, 2015). Students in the fifth and sixth grades of primary school are faced with the dual changes and development of body and mind. In addition, the increase of learning tasks and the increase of learning difficulty can easily lead to negative learning emotions and reduce the level of learning engagement. Some studies found that the learning burnout level of the senior primary school students was significantly higher than that of the middle grade students, and they showed obvious negative tendencies in Chinese learning efficacy expectations and learning behaviors (Zong & Cheng, 2019). Some studies found that primary school students had higher learning engagement than junior middle school students, and junior middle school students had higher learning engagement than high school students, which meant that students' learning engagement gradually decreased from primary school to high school (Skinner, Furrer, Marchand, & Kindermann, 2008; Eccles et al., 1996). However, teachers' teaching support behavior in high school and junior middle school had a stronger impact on students' learning engagement than in primary school (Yang, Bear, & May, 2018). Based on this, this study further explored the moderating role of grade in the relationship between teacher's support and student engagement in maths. Research showed that higher-achieving students are more engaged in learning (Moreira et al., 2018). This study will examine whether teacher's support has a different effect on math engagement for

students who pass and fail math exams.

Bandura's self-efficacy theory stated that the support of important others, such as emotional support and material help, can effectively improve the level of personal self-efficacy (Ferla, Valcke, & Cai, 2009). Self-determination theory also proposed that teacher's emotional support satisfied students' relation needs and made students feel loved psychologically, a sense of belonging arose spontaneously, and they felt that they were competent for many learning tasks (Ryan & Deci, 2000; Jin & Wang, 2019; Froiland, Worrell, & Oh, 2019). Students' self-efficacy will also be enhanced. Students who felt capable of completing the learning tasks given by their teachers involved more time and energy, and they were still able to persevere in the face of challenging learning tasks. Relevant empirical results also supported this view that The effect of academic self-efficacy on student engagement was significant (Jiang, Liu, Zhen, Hu, & Jin, 2019; Lin, Liu, & Peng, 2020; Goetz, Keltner, & Simon-Thomas, 2010; Olivier, Archambault, De Clercq, & Galand, 2019; Maricuțoiu & Sulea, 2019). How teacher's support affect student engagement will be studied, and academic self-efficacy can be explored as an intermediary variable.

Achievement goal orientation is the individual's cognition of the cause and purpose of a certain task, as well as the belief in completing the task. It reflects a general orientation of the individual in the achievement task, with behavioral, cognitive, emotional characteristics (Elliot & Murayama, 2008). Achievement goal orientation is based on achievement motivation theory (Elliot & McGregor, 2001; Meece, Anderman, & Anderman, 2006). Some achievement goals had a significant influence on students' learning motivation, learning engagement and academic achievement (Karlen, Suter,

Hirt, & Merki, 2019), other achievement goals negatively predicted learning outcomes (Elliot & McGregor, 2001; Schunk, Pintrich, & Meece, 2008; Alhadabi & Karpinski, 2020). In the hierarchical model of achievement motivation (Elliot, 1999, 2005; Elliot & Church, 1997), achievement goals were significantly predicted by individual and environmental variables (Elliot, 1999; Alhadabi & Karpinski, 2020). Based on this, this study will explore the moderating effect of achievement goal orientation between teacher's support and student engagement in maths.

1.3 Problem Statement

Mathematics is an important subject with strict structure and logic. In order to achieve ideal academic achievement, Chinese junior middle school students invest a lot of time and energy in mathematics learning. However, under the condition of equal intelligence and consistent learning environment, students' mathematical learning performance still varies significantly (Wang, She, & Song, 2014). In the process of learning mathematics, Chinese junior middle school students have passive behavior and non-engagement (Yan, 2021). This 'non-engagement' phenomenon is not only manifested as passive behavior, but also has problems such as lack of emotional communication and cognitive thinking deviation, which cannot meet the requirements of curriculum standards (Cheng, 2021). Studies indicated that student engagement in mathematics tends to decline from primary school to middle school (Martin, Way, Bobis, & Anderson, 2015). Therefore, it is of great practical significance to systematically investigate the influencing factors of student engagement in mathematics in Junior middle schools.

First of all, teacher-student interaction affects student engagement and academic achievement (Thornberg, Forsberg, Chiriac, & Bjereld, 2020). Junior middle school students in China have the pressure to compete to enter high school, and teachers also have the pressure of teaching in the classroom. Teachers in the classroom show more controlled teaching behaviors. Many teachers who hold behaviorist teaching principles believe that when students are passive and uncooperative, the controlled motivational style can quickly intervene and enable students to participate in learning activities (Reeve, 2012). However, control will also trigger a sense of compulsion and pressure in students, which will make the need for autonomy even more dissatisfied, and learning behavior will only change temporarily, which is not conducive to the formation of lasting learning motivation (Alvarez, Tormo-Barahona, Castillo, & Moreno-Murcia, 2021). Therefore, this research proposes to strengthen teachers' supportive teaching style (Pöysä, et al., 2019; Ekornes, 2021). Based on students' autonomy, emotional and competence needs, this research accordingly proposed three types of teacher's support (Ryan & Deci, 2017): teacher's autonomy support, emotional support and competence support, and examines the correlation between them, which also supplements the theoretical gaps in the research framework of teacher's support.

Secondly, student engagement in maths can measure learning quality and predict academic achievement (Lei, Cui, & Zhou, 2018; Servet & Çelik, 2021) , can reduce student dropout rates (Foreman-Murray, Krowka, & Majeika, 2022) and effect on student's growth (Upadyaya & Salmela-Aro, 2021; Zhen et., 2018; Hong, Liu, Zhen, Jiang, & Jin, 2018). However, in Chinese junior middle school mathematics classrooms, students often show serious non-engagement and disciplinary behaviors, which affect their academic achievement in maths (Meer, Scott, & Pratt, 2018).

Therefore, researchers should look for influencing factors of student engagement. In consulting the existing literature, it is found that environmental factors and self-related factors can significantly affect student engagement (Zhou et al., 2020). Specifically, some background factors, including parental influence, teacher's support, and a master-oriented atmosphere in the classroom, promote student participation in the school (Upadyaya & Salmela-Aro, 2021; Havik & Westergård, 2020). Teacher support is more predictive of student engagement and academic achievement than parental support and peer support (Lam, Wong, Yang, & Liu, 2012; Benlahcene, Kaur, & Awang-Hashim, 2021). Students with lower expectations from their teachers have more negative expectations about their abilities and future performance, and gradually become discouraged and stop participating in learning (Tian, Tian, & Huebner, 2016). Existing research only studied the impact of teacher's autonomy or emotional support on student engagement Therefore, according to the SDT theory, the study investigated the relationship between teacher' autonomy support (AS), emotional support (ES) and competence support (CS) and student engagement in mathematics, as well as the influence and relative contribution of these three kinds of teacher's support on student engagement.

Furthermore, academic self-efficacy was significantly positively correlated with academic behaviors (Yu & Singh, 2018; Wu, Li, Zheng & Guo, 2020; Gutiérrez & Tomás, 2019). Students who believed that they were capable of completing learning tasks would work harder and be more confident when encountering setbacks, and better cope with various challenges, thus improving their learning engagement (Martin & Rimm-Kaufman, 2015; Beri & Stanikzai, 2018). Studies confirmed that teacher autonomy support affected student engagement in mathematics through the mediating

effect of academic self-efficacy (Wang et al., 2017). A contextual model of student engagement showed that contextual factors affected student engagement by individual factors (Lam, Wong, Yang, & Liu, 2012; Skinner & Belmont, 1993). This model also indicated that teacher support as a contextual factor affected academic self-efficacy as a personal factor (Jungert & Koestner, 2015; Jin and Wang, 2019) and then affected student engagement (Martin & Rimm-Kaufman, 2015). Therefore, it is necessary to investigate whether academic self-efficacy plays a mediating role between teacher's support and student engagement.

Moreover, the gender difference in mathematics learning of junior middle school students was analyzed based on the academic quality survey data of District A in Shanghai, China in 2014 and 2016. The data analysis results showed that compared with girls, boys had higher confidence and less pressure in math learning. Teachers believed that girls were not as advanced as boys in mathematics and passed on stereotype information to students in the classroom. Students internalized the cognition of these gender stereotypes, which led to differences between girls and boys in math self-efficacy and math interest (Watt, 2016). Compared with boys, girls tended to have lower mathematical self-efficacy and interest in mathematics (Keller, 2001). Teacher's emotional support had a greater impact on girls' emotional engagement and academic self-efficacy than boys' (Pöysä et al., 2019; Griggs, Rim-Kaufman, Merritt, Barton, 2013; Kim, Dar-Nimrod, & Maccann, 2018). There could be two reasons: on the one hand, there were gender differences in teacher expectations and support, and on the other hand, girls were more concerned about their academic test scores (Skinner, Furrer, Marchand, & Kindermann, 2008). However, other studies indicated that the influence of teacher-student relationship on boys and girls was not significantly different (Hughes

& Cao, 2018). This study will investigate whether gender moderates the direct or indirect effects between teacher support and student engagement in mathematics.

The cognitive-behavioral engagement of middle school students was generally lower than that of elementary school students. However, the degree of influence of teacher-student relationship on cognitive-behavioral engagement varied among students of different grades, and the degree of influence perceived by junior middle school and high school students was greater than that of elementary school students (Yang, Bear, & May, 2018). It is necessary to further study whether grade significantly moderate the direct or indirect relationship between teacher's support and student engagement in mathematics. Research showed that the higher a student's achievement was, the higher the cognitive engagement score (Moreira et al, 2018). Past academic performance had a greater impact on self-efficacy beliefs (Hwang, Choi, Lee, Culver, & Hutchison, 2016). Teacher's support positively affects student engagement (Havik & Westergård, 2020), and students' academic achievement may be independent of teacher's support and affects students. Based on this, this research will examine whether passing maths or not has moderating effect in the direct or indirect relation between teacher's support and student engagement.

Achievement motivation is a critical near-end factor that affects student engagement and can directly predict the level of student engagement (Tas, Subaşı, & Yerdelen, 2019; Hsieh & Yu, 2022). Students who are approach goal oriented (mastery-approach and performance-approach) persist longer in the face of learning difficulties (Miller, Fassett, & Palmer, 2021) and learning challenges in order to pursue success, and then be willing to devote themselves to academic study (Kimbark, Peters, &

Richardson, 2017; Tas, 2016). When students perceive the teacher's support, students who hold performance-avoidance goal orientation think that their abilities are fixed, but in order to avoid making themselves appear stupid or clumsy than others, they will choose simpler tasks and are still willing to invest their energy in learning (Alkan, 2020; Lazarides & Rubach, 2017). Students who have mastery-avoidance goal orientation can easily lead to tasks that cannot be achieved due to underutilization of their own abilities, which reduces academic self-confidence and is not conducive to student engagement (Hangen, Elliot, & Jamieson, 2019; Miller, Fassett, & Palmer, 2021). It can be further investigated whether achievement goal orientation have moderating effect in the direct or indirect relationship between teacher's support and student engagement.

1.4 Purpose of the Study

The primary purpose of this research was to explore the relation between different dimension of teacher's support (Autonomy Support [AS], Emotional Support [ES], Competence Support [CS]). The secondary purpose was to investigate the relation between teacher's support and student engagement. Another purpose was to examine teacher's support's direct effect on student engagement. Furthermore, the purpose is to examine whether academic self-efficacy moderate the relation between teacher's support and student engagement in maths. Moreover, the purpose is to examine the moderating effect of gender/ grade/ passing grades or not/ achievement goal orientation on the mediating chain of teacher's support affecting student engagement through academic self-efficacy.

1.5 Objectives of the Study

Consistent with the purpose of this study, the objectives were to:

1. examine the relationship between different aspects of teacher' support (autonomy support, emotional support and competence support).
2. examine the relationship between different aspects of teacher' support (autonomy support, emotional support and competence support) and student engagement in mathematics.
3. examine the direct effect of teacher's support on student engagement in mathematics.
4. examine the mediating role of academic self-efficacy between teacher's support and student engagement in mathematics.
5. examine the moderating effect of gender/ grade/ passing grades or not /achievement goal orientation on intermediary chain of teacher's support and student engagement in mathematics.

1.6 Research Question

To achieve the above purpose of the study, the research lists the following research questions:

1. What are the relationships between the different aspects of teacher's support (autonomy support, emotional support and competence support) ?
2. Does teacher's support correlate to student engagement ?
3. Does teacher's support have a significant effect on student engagement ?

4. Does academic self-efficacy mediate teacher's support effect on student engagement ?
5. Does gender/ grade/ passing grades or not/ achievement goal orientation moderate the mediating effect of teacher's support on student engagement through academic self-efficacy?

1.7 Research Hypothesis

According to the research questions, this study puts forward the corresponding research hypothesis. Among the variables mentioned below, teacher's support was the independent variable, student engagement was the dependent variable, academic self-efficacy was the mediating variable, and gender, grade, passing grades or not and achievement goal orientation were the moderating variables.

RQ1: What are the relationships between the different aspects of teacher's support (autonomy support, emotional support and competence support) ?

H1a: Teacher's autonomy support is positively correlated with teacher's emotional support.

H1b: Teacher's autonomy support is positively correlated with teacher's competence support.

H1c: Teacher's emotional support is positively correlated with teacher's competence support.

RQ2: Does teacher's support correlate to student engagement ?

H2: Teacher's support is positively correlated with student engagement.

RQ3: Does teacher's support have a significant effect on student engagement ?

H3: Teacher's support can significantly affect student engagement.

H3a: Teacher's autonomy support can significantly affect student engagement.

H3b: Teacher's emotional support can significantly affect student engagement.

H3c: Teacher's competence support can significantly affect student engagement.

RQ4: Does academic self-efficacy mediate teacher's support effect on student engagement ?

H4: Academic self-efficacy plays a mediating role in the relationship between teacher's support and student engagement.

H4a: Academic self-efficacy plays a mediating role in the relationship between teacher's autonomy support and student engagement.

H4b: Academic self-efficacy plays a mediating role in the relationship between teacher's emotional support and student engagement.

H4c: Academic self-efficacy plays a mediating role in the relationship between teacher's competence support and student engagement.

RQ5: Does gender/ grade/ passing grades or not/ achievement goal orientation moderate the mediating effect of teacher's support on student engagement through academic self-efficacy?

H5: Gender moderates the relationship between teacher's support and academic self-efficacy.

H6: Grade moderates the relationship between teacher's support and academic self-efficacy.

H7: Pass or fail in mathematics moderates the relationship between teacher's support and academic self-efficacy.

H8: Achievement goal orientation plays a moderating role in the relationship between teacher's support and academic self-efficacy.

H8a: Mastery-approach goal plays a moderating role in the relationship between teacher's support and academic self-efficacy.

H8b: Mastery-avoidance goal plays a moderating role in the relationship between teacher's support and academic self-efficacy.

H8c: Performance-approach goal plays a moderating role in the relationship between teacher's support and academic self-efficacy.

H8d: Performance-avoidance goal plays a moderating role in the relationship between teacher's support and academic self-efficacy.

1.8 Theoretical Framework of Research

Yu (2019) proposed the models of the antecedents of student engagement. Figure 1.1 showed the relationship between teacher's support and student engagement (Yu, 2019; Lam, Wong, Yang, & Liu, 2012).

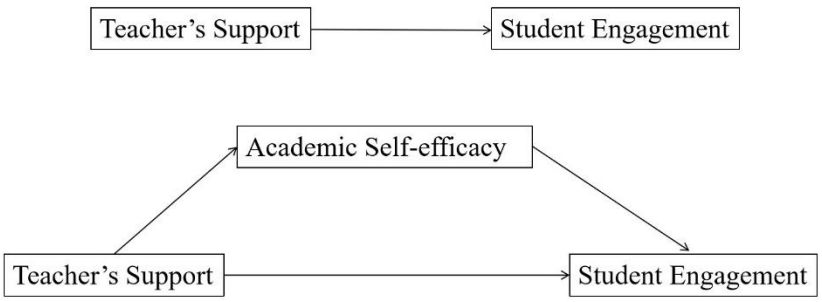

Figure 1.1. The models of the antecedents of student engagement

Based on social cognitive theory, social-relatedness factors affected student engagement (Lam, Pak & Ma, 2007; Lam, Wong, Yang, & Liu, 2012). Teacher's support was the main social-relatedness factor that affected student engagement (Plunkett, Henry, Houltberg, Sands, & Abarcamortensen, 2008; Jiang, Lee, Wan, & Chen, 2021). Some studies showed that teacher's support was more predictive of student engagement than parental support and peer support (Lam, Wong, Yang, & Liu, 2012; Ladd, Kochenderfer, & Coleman, 1997).

Several personal factors may directly affect student engagement. They can mediate the influence of contextual factors on student engagement. A potential determinant of student effort expenditure was self-efficacy (Bandura, 1977; Bronfenbrenner, 1986; Núñez et al., 2019; Dweck, 2006; Weiner, 1985). Students with high self-efficacy believed they had the ability to successfully execute the course of action. They tried challenging tasks and didn't give up easily. Wang (2017) found teacher's support significantly positively influenced academic self-efficacy (Scott & Walczak, 2009). As shown in this theoretical model, academic self-efficacy mediated the relationship between teacher's support and student engagement.

1.9 Conceptual Framework of Research

The model of the relationship between teacher's support and student engagement in Figure 1.1 showed that teacher's support influenced student engagement through the mediating effect of academic self-efficacy. The theory of self-determination hold that the social environment supports three basic psychological needs of students: the psychological need of autonomy, the psychological need of relatedness, and the psychological need of competence, which can promote students' self-regulated learning behaviors and learning outcomes (Wang, Tian, & Huebner, 2019). This study proposed three dimensions of teacher's support corresponding to students' basic psychological needs (Campbell, Soenens, Beyers, & Vansteenkiste, 2018), which were specifically manifested as autonomy support, emotional support and competence support.

Based on this, this study examined the mediating role of academic self-efficacy between teacher's support and student engagement in mathematics, helping to reveal the internal mechanism of how teacher's support affected student engagement. Meanwhile, four moderating variables, gender/ grade/ passing grades or not/ achievement goal orientation, were introduced to examine the moderating effect of gender/ grade/ passing grades or not/ achievement goal orientation on the indirect path between teacher's support and student engagement. It was helpful to reveal the individual differences of teacher's support affecting academic self-efficacy, and provided theoretical basis and practical guidance for teachers to improve student engagement in mathematics in junior middle schools. The study hence built a the model to examine: (1) whether academic self-efficacy mediate the relation between teacher's support and student engagement, and (2) whether gender/ grade/ passing grades or not/

achievement goal orientation moderate the mediating effect of teacher's support on student engagement through academic self-efficacy. Figure 1.2 illustrated the proposed model.

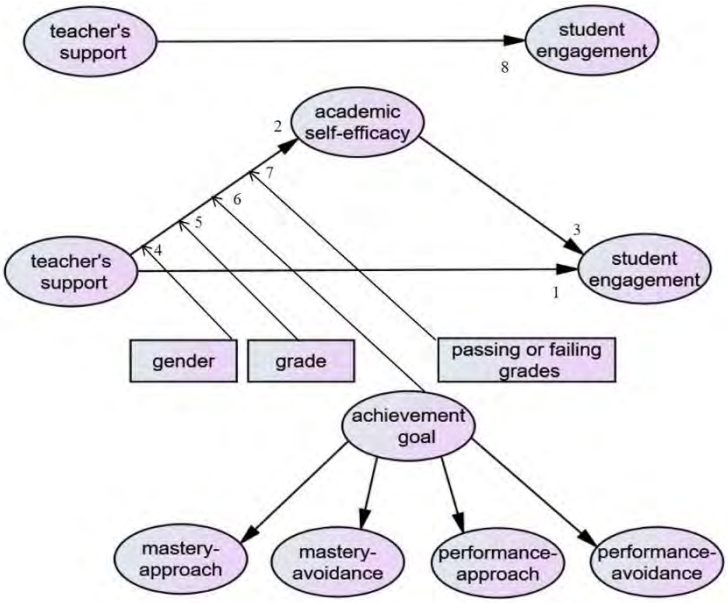

Figure 1.2. Conceptual moderated mediation model of teacher's support on student engagement. Independent variable: teacher's support; Dependent variable: student engagement; Mediating variable: academic self-efficacy; Moderating variable: gender, grade, passing or failing grades, achievement goal. 1 and 8 = direct effect; 2 and 3 = mediating effect; 4, 5, 6 and 7 = moderating effect.

1.10 Significance of the Study

Firstly, the significance of this study lied in the finding that teacher's autonomy support, emotional support and competence support were correlated to varying degrees. This finding made educators realized that these three dimensions of teacher's support were not isolated, but interrelated and promoted each other. It deepened the understanding of the relationship between different supportive behaviors of teachers.

Secondly, the significance of this study also lied in the finding that teacher's emotional support and competence support had a positive and significant impact on student engagement, while teacher's autonomy support had no significant impact on student engagement. Teacher's competence support had the greatest influence on student engagement in mathematics, followed by teacher's emotional support, and teacher's autonomy support had the least influence. The relative contribution of three dimensions of teacher's support to mathematics learning had guiding significance for teachers' mathematics teaching practice. Mathematics teachers should strengthen their competence support and emotional support to students, enhanced student engagement in mathematics.

Furthermore, the significance of this study also lied in the finding that the mediating effect of academic self-efficacy on teacher's support and student engagement in mathematics. It helped people to understand the internal mechanism of how teacher's support affected student engagement in mathematics. Teachers tried to make supportive teaching behaviors aimed at improving students' academic self-efficacy in mathematics, which would improved student engagement in mathematics.

Moreover, the significance of this study lied in the finding that gender, passing grades or not and achievement goal orientation had varying degrees of moderating effects on the intermediary chain between teacher's support and student engagement. It was suggested that the supportive teaching behavior of mathematics teachers should consider the individual difference of students such as gender, academic achievement and achievement goal orientation, so as to improve student engagement in mathematics.

1.11 Study Limitations

This study can provide theoretical support for improving the mathematics engagement of junior middle school students. However, it must be noted that the research population, sampling method and measurement method have certain limitations.

This study was sampled from a city in China. Although systematic random sampling was used, the geographical scope of the sampling determined that the sample was not representative enough.

In this study, students were asked to answer and fill out all the questionnaires. Students' attitude towards doing the questionnaire will affect the results of the survey. Since the teacher support questionnaire is for students to report the teaching behavior of their math teacher, students may have answers that evade or do not conform to their actual situation, and students may not understand the items of the questionnaire.

1.12 Operational Definition

The following items are defined operationally according to the actual meanings they convey or imply in the study: teacher's support, autonomy support; emotional support; competence support; academic self-efficacy; student engagement; achievement goal orientation.

Teacher's Support

Social support appeared earlier in the study of Caplan (1974) and used to refer to the help that an individual obtained from a social network (including family members, neighbors, teachers, and peers, etc.). Social support included four recognized categories: emotional, informational, appraisal, and instrumental support (Semmer et al., 2008; Moeini, Barati, Farhadian, & Ara, 2018). Although different sources of social support, such as parents, teachers and peers, are beneficial to students' healthy development and academic achievement, their relative importance varies. In the classroom context, teachers are the organizers and implementers of teaching activities, and their influence on students' learning motivation and task involvement is more direct and authoritative (Alrajeh & Shindel, 2020).

The concept of "teacher support" comes from social support, which is the encouragement and support behavior that teachers give to students. Tardy's (1985) social support framework defined teacher support as a teacher giving informational, instrumental, emotional, or appraisal support to a student, in any environment (Kerres Malecki & Kilpatrick Demary, 2002; Moeini, Barati, Farhadian, & Ara, 2018; Malecki & Elliott, 1999). Chinese scholars proposed that teacher support behavior referred to the sum of teachers' support behaviors such as instrumental guidance, knowledge guidance, emotional help and social interaction for students (Jiang, Zhao, Li, Huang, & Shu, 2018). The micro aspect is the concept of teacher support from teachers' unconditional trust in students in the classroom, helping students to improve their learning, improving students' interest in learning, and establishing friendships with students (Fraser, 1998; Aldridge, Fraser, & Huang, 1999). Teacher support includes teachers' expectations of mutual aid behavior, emphasis on teaching content, teacher

assistance, and emotional care (Wentzel, Muenks, Mcneish, & Russell, 2017).

From SDT theory, the research explored the three types of teacher support (Autonomy support, Emotional support and Competence support) corresponding to students' autonomy needs, emotional needs and competence needs.

Autonomy Support (AS)

Autonomy support is the degree of freedom that teachers give students to decide their own behavior (Skinner & Belmont, 1993). Autonomous support as environmental factors related to the promotion of students' motivational behavior, which specifically involved respecting students' opinions and ideas, stimulating students' learning motivation, and cultivating students' autonomous learning (Legault, Green-demers, & Pelletier, 2006). Teachers' autonomous support refers that students have the right and opportunity to choose and make their own decisions on campus, whether in learning or in activities (Yu, Li, Wang, & Zhang, 2016). The performance of teacher autonomy support is that student-centered, leaving enough time and space for students to fully express their ideas, provide students with more choices in teaching design, reduce or eliminate controlled teacher behaviors, and clearly provide students with discretion to choose to participate in learning or activities and to take responsibility for their own actions on campus or in the classroom (Griffin, 2016; Stefanou, Perencevich, DiCintio, & Turner, 2004).

Emotional Support (ES)

Emotional care reflects the formation of high-quality interpersonal relationships between teachers and students and between students and students, such as good emotional encouragement, concern, respect and love (Skinner & Belmont, 1993). Jackson-Kersey and Spray (2016) defines emotional support as the teacher's willingness to express care, affection, and devote time and energy to communicate with the students interacting with it. Teacher' emotional support is manifested in full respect, trust and care for students, spending time caring for students, expressing care for students, enjoying communication with students, and providing students with resources (Gasser, Grütter, Buholzer, & Wettstein, 2017; Niemiec & Ryan, 2009; Malecki & Demaray, 2003).

Competence Support (CS)

Existing studies believed that a clear structure of learning environment was helpful to meet students' competence needs, and an important strategy to enhance students' sense of competence was to provide structure support. Therefore, in a sense, teacher competence support was also equivalent to structural support (Chi, 2017). The student engagement impact model proposed by Skinner and Belmont (1993) also showed that structural support could met ability needs. Structural support, also known as competence support in some senses, is the information that teachers give to students in terms of learning strategies and other aspects in order to enable students to achieve learning goals in the classroom learning environment (Skinner & Belmont, 1993). The performance of teacher competence support is that the teacher sets reasonable boundaries for student behavior, helps students engage in learning tasks, provides

students with ability-related feedback, and expresses confidence in students' ability to meet classroom requirements (Sierens, Vansteenkiste, Goossens, Soenens, & Dochy, 2009). Teachers provide students with clear and specific expectations, guidance, support, and constructive feedback (Jang, Reeve, & Deci, 2010). Hospel and Galand (2016) defined structural support as the amount and clarity of information provided to students on how to achieve teacher expectations and expected educational goals. Jackson-Kersey and Spray (2016) believes that teachers' competence support is shown by providing positive and motivating comments and suggestions to students in and out of class, designing different types of learning tasks, allow enough time for students to consolidate exercises, and guide students not to care too much about their test scores, but to see if they have learned the knowledge in the classroom.

Academic self-efficacy

Self-efficacy refers to the individual's sense of confidence and ability to successfully complete a specific learning task (Bandura, 1997). Legault, Green-demers, and Pelletier (2006) define efficacy belief as a student's self-evaluation of the ability to complete a given academic task. Academic self-efficacy refers to students' expectations and judgments about their own learning ability and completion of specific academic tasks in the learning process (Bandura, 1986; Bandura, 1977). This study refers to mathematics academic self-efficacy, which is students' subjective judgment and evaluation of their own mathematics learning ability (Hackett & Betz, 1989).

Student engagement

Hospel and Galand (2016) believe that engagement describes the level of energy and effort students put in throughout their learning activities. Furrer and Skinner (2003) believes that student engagement refers to a stable, purposeful, planned, active, focused, and resilient positive interaction between the individual and society and the natural environment. Lam et al. (2014) suggested that student engagement refers to a psychological process, and an intermediate variable that situational factors act on learning achievement. It is embodied in students' effort, interest, enjoyment, and full commitment.

Student engagement in this study refers to the behavior and emotional state of students actively participating in learning activities (Pierson & Connell, 1992; Ryan, 2000; Skinner, Zimmer-Gembeck, Connell, Eccles, & Wellborn, 1998; Connell & Wellborn, 1991). The behavioral dimension of student engagement is shown as effort, concentration and persistence (Wimpenny & Savin-Baden, 2013); the emotional dimension is shown as interest, enthusiasm and enjoyment (Meyer & Turner, 2002; Alrajeh & Shindel, 2020).

Achievement goal orientation

Achievement goals are the aim that one is committed to in guiding and sustaining his or her behavior in achievement settings (Elliot & Murayama, 2008; Elliot & McGregor, 2001; Meece, Anderman, & Anderman, 2006). Elliot and McGregor (2001) divided achievement goal orientation into four dimensions, namely, mastery-approach,

mastery-avoidance, performance-approach, and performance- avoidance goals (Elliot, 1999; Pintrich, 2000).

1.13 Summary

Chapter 1 introduced the research plan, containing study background, problem statement, study purpose, and study objectives. There are a total of five research questions and eight hypotheses. The research questions and hypotheses were discussed as they address the problem statement. The diagram presents the theoretical framework of this research. The significance of the study highlights how this study made an academic research theoretical contribution, practical contribution, and add value to educational settings. Study limitations and operational definition were also discussed.