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# Parental influence on high school students' mathematics performance in Vietnam

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**Abstract**

This research investigates parental involvement's effects on high school students' self-esteem, anxiety, attitudes, and mathematics achievement. The study included 1,337 students from 11 high schools in Hanoi, Vietnam, chosen via convenience sampling. Participants in this research were asked to answer the questionnaires. The partial least squares structural equation modeling (PLS-SEM) method was utilized to explore the direct and indirect relationships between parents' involvement and students' mathematics performance. Results reveal that parental involvement and expectations positively affect students' mathematics achievement. Parental involvement negatively impacts students' attitudes toward mathematics; however, parental expectations positively impact students' attitudes toward mathematics. Parental involvement decreases students' negative self-esteem, while parental expectation increases students' negative self-esteem. Notably, parental involvement helps weaken students' anxiety in mathematics, but the more anxiety students have, the lower their mathematics achievement. It is recommended that parents and students should have more daily conversations. Parents should not place their excessive expectations and involvement on their children.

**Keywords:** attitude towards mathematics, mathematics achievement, parental influence, PLS-SEM, Vietnamese high school students

## INTRODUCTION

Family involvement makes an immense contribution to children's learning success (Amatea & West-Olatunji, 2007; Tárraga García et al., 2018). Therefore, parental involvement has attracted researchers' interest for a long time (Lara & Saracostti, 2019; Topor et al., 2010). According to El Nokali et al. (2010), parents' involvement improves their children's academic performance and social and emotional skills. Students' achievement rises as the relationships between parents and schools strengthen (Powell et al., 2010). The more parents engage in their children's academic activities, the more their children's learning performances improve (Castro et al., 2015). For instance, parents' involvement results in boosting their children's reading literacy, science, and mathematics (Gest et al., 2004; Mirazchiyski & Klemencic, 2014; Senler & Sungur, 2009).

Learning mathematics well is always appreciated because it relates to intelligence and the ability to receive and solve problems (D'Ambrosio, 2007). Therefore, parents often care about their children's mathematics learning by talking about it, reminding their children to learn mathematics, sending their children to extra lessons at the center, and exchanging with mathematics teachers at school (Jay et al., 2018; Yan & Lin, 2005). Research showed that parents' involvement is a predictor of students' mathematics performance (Cai, 2003; Patall et al., 2008). The definition and measurement of parent involvement include activities in which parents participate at home and cooperation between schools and parents (Abdullah et al., 2011; Kohl et al., 2000). According to McNeal Jr (2001), it can be divided into four components:

(1) the discussion between parents and their children,

(2) their participation at school,

(3) the guidance for their children's behavior,


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**Contribution to the literature**

- This paper contributes to the literature on the parent-child interactions in Vietnam.
- This paper contributes to the existing literature on the direct and indirect effects of family on high school students' mathematics achievement.
- The sample of this paper is 1,337 and is rather representative. This paper adds to the literature on the use of PLS-SEM in educational research.

(4) the direct involvement in the student learning process with social-cultural elements.

Ceballo et al. (2014) also said that most studies suggest that the connection with the school is reflected in discussions with teachers, appearances at school events, school support activities, and parent-teacher conferences. Epstein and Sanders (2002) affirmed how families are involved in helping children build literacy skills, complete homework, and plan post-secondary education. From that, parental involvement in this study mainly focuses on the abovementioned components.

Besides, parental expectations tremendously influence students' academic results in general and mathematics in particular. For instance, Fan (2001) proved that parental aspiration positively impacts students' academic growth among many parental involvement dimensions. The other research indicated that parental aspiration has the strongest association with students' academic performance among many parental involvement dimensions (Fan & Chen, 2001). Moreover, according to Hascoët et al. (2021), parents' hopes for their children's success positively predict their children's final mathematics performance.

Students' academic results can be affected by many other issues, such as their anxiety (Vitasari et al., 2010), self-esteem (Zhao et al., 2021), and attitude to learning (Mao et al., 2021). Notably, parents' involvement and expectation during their children's learning process can help their children overcome their anxiety, which improves students' mathematics achievement on word problems and algebraic reasoning (Vukovic et al., 2013). Moreover, Wang et al. (2021) indicated an indirect association between father-child interaction and a child's academic performance through self-esteem. Especially students with family-based support have a positive attitude toward learning (Mahamood et al., 2012). Such an attitude can help students improve their academic results (Mao et al., 2021).

For the oriental culture, including the Vietnamese one, people attach great significance to the level of education and academic achievement. Primarily, the Vietnamese are influenced by Chinese Confucian thought. Many studies in China show Chinese parents look forward a lot to their children as an accepted concept of their expectations for their children's bright future (望子成龙) (Leung & Shek, 2011). The other research in Korea also point this out "parental expectations, the willingness of making up for parents' dedication, have also affected their only child, leading them to set higher self-education expectations." (Li et al., 2020, p. 5). Families tend to pay attention and invest early to equip their children with knowledge, even from the preschool level. Some examples mentioned about the investment in the education of Vietnamese families are the initiative of parents in seeking additional study places (teachers, tutors, etc.) for kids, and the discussions with the teacher about the child's learning situation (Dang & Rogers, 2016).

This investment usually is for some subjects on which Vietnamese parents place great importance. All subjects in the curriculum play an equal role in testing and assessment in Vietnam; however, in the perception of Vietnamese parents, there is a distinction among the subjects. For example, mathematics, literature, and English are considered essential subjects during students' learning process because they are taught from primary school to high school and are compulsory subjects in the national high-school exam in Vietnam. In particular, mathematics is conceived to show students' intelligence and ability to absorb and solve their problems. Besides, mathematics takes up much time, is a compulsory subject in important transfer exams, is the key to being able to enter university, and has many opportunities in the future. In big cities, parents' focus is more on their children's mathematics results due to pressure from entering high school. Next is the pressure to maintain and improve achievement. Study mathematics to progress to the high school graduation exam.

In Vietnam, there are different results regarding the effects of family on children's educational outcomes. For example, children's academic achievement is positively affected by their parents' high educational levels (Thuong et al., 2019). According to Nguyen and Vu (2022), children whose family includes both a father and a mother have a good opportunity to enroll at all education levels. However, those whose family includes a father, or a mother have a low opportunity to enroll at all education levels, especially at the high school and college levels (Nguyen & Vu, 2022). The study aimed to answer how parents influence students' mathematics performance through attitudes, anxiety, negative self-esteem, and outcomes. Thereby, discussions suggest changes in awareness, behavior, attitude, and

coordination of families, schools, and society in helping students learn mathematics more effectively.

## THEORETICAL AND HYPOTHESIS RESEARCH

### Parental Influence on Students' Academic Achievement

Students' attitudes and behaviors are directly affected by parent-child and parent-school involvement practices, which indirectly affects the student's achievement to various extent (McNeal, 2014). Parents' involvement positively influences the educational achievement of children (Wilder, 2014), especially mathematics performance (Huang et al., 2021; Otani, 2020; Pan et al., 2006). In the findings of other research, Gordon and Cui (2012) and Houtenville and Conway (2008) agreed that parental involvement in students' educations would lead to their children's better academic performance. Other similar results were in two meta-analyses by Jeynes (2003, 2005). In the former, it is noted that parental involvement shows a statistical relationship to the increased academic results for only African-American learners. In the latter, parental involvement was about increased achievement for urban secondary students. According to Huang et al. (2021), parents' cognitive involvement and behavioral involvement had significant and positive effects on their children's mathematics results, while their personal involvement had a nonsignificant effect on their children's mathematics results.

Expectations from parents make vital contributions to their children's learning achievement (Fan & Chen, 2001; Lubienski & Crane, 2010). Similarly, the other study with 2,088 sixth-grade learners in North Carolina demonstrated that parent's expectations significantly and positively influenced reading and mathematics marks (Bowen et al., 2012). Der-Karabetian (2004) conducted the study on seventh and eighth-grade students and concluded that parents' expectation has the strongest effects on European American and Latino-American students' mathematics achievement. Previous research proves a strong association between parents' expectations and students' mathematics achievement; therefore, this research proposes the following hypothesis:

1. **H1a:** Parental expectation positively influences students' mathematics achievement.
2. **H1b:** Parental involvement positively influences students' mathematics achievement.

### Parental Influence on Students' Attitude, Anxiety, and Self-Esteem

Parent involvement has positive and negative effects on the attitude toward mathematics. In terms of positive effects, parental influences consist of parent involvement regarding the attitude towards mathematics through the studies by Davadas and Lay (2017) and Mahamood et al. (2012) concluded that parents' involvement exerts positive and potent influences on the performance of adolescents. Moreover, direct and indirect parent influence is clearly distinguished by Cao et al. (2006) and Kafoussi et al. (2019). For instance, helping children solve mathematics challenges is an example of direct parental influence, which plays a less vital role in their children's mathematics results. The indirect impacts of the parents, such as parents' encouragement, hope, and attitude toward mathematics, strongly affect their children's attitudes toward mathematics. Regarding the adverse effects, helping students with mathematics homework challenges parents more than helping students in other fields like reading and writing (Peters et al., 2008). Evidence shows the negative influences of parents' involvement on learners' mathematics homework (Patall et al., 2008). More precisely, parents' involvement positively affects children's homework and performance in reading, but it hurts children's results in mathematics.

In Hui-Chen Huang and Mason's (2008) research, parents' activities and attitudes toward their children's learning also positively affect their children's self-esteem. For instance, receiving help from parents assists students in increasing their self-esteem (Plunkett et al., 2017). According to Parker and Benson (2004), parents' support positively correlates with adolescents with high self-esteem. Another finding shows that involvement from parents affects the self-esteem of the Arab population in Israel (Fisher & Friedman, 2009). Finally, Gith (2017), Kafoussi et al. (2019) and Ruholt et al. (2015) assert that parental involvement in the educational process of their children can boost their children's self-esteem.

According to Gunderson et al. (2012), children's attitudes, including anxiety toward mathematics, are influenced by their parents in two keyways, such as through their parents' expectations and attitudes about their competence in mathematics. In the recent research by Chang and Beilock (2016) and Maloney et al. (2015), parents play prominent roles such as the primary socializers and role models to their children in developing mathematics anxiety of their children. In contrast, Vukovic et al. (2013) indicated that parental expectations reduce their children's anxiety levels.

Based on the previous study, parental involvement has positive impacts on students' self-esteem (Plunkett et al., 2017) and attitude toward learning (Davadas & Lay, 2017; Mahamood et al., 2012). However, parental involvement has negative impacts on students' anxiety (Vukovic et al., 2013). Therefore, this research suggests the following hypothesis.

1. **H2a:** Parental expectation positively influences students' attitude toward mathematics.

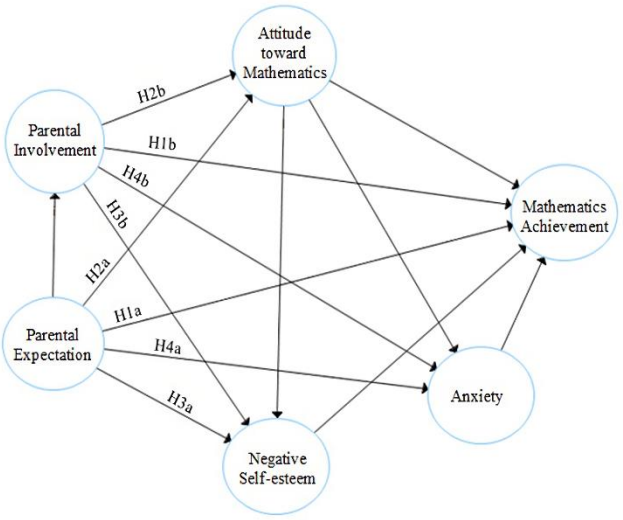


**Figure 1.** Theoretical framework of the study (Source: Authors' own elaboration)

2. **H2b:** Parental involvement positively influences students' attitudes toward mathematics.
3. **H3a:** Parental expectation negatively influences students' negative self-esteem in mathematics.
4. **H3b:** Parental involvement negatively influences students' negative self-esteem in mathematics.
5. **H4a:** Parental expectation negatively influences students' mathematics anxiety.
6. **H4b:** Parental involvement negatively influences students' mathematics anxiety.

In conclusion, this research proposes the theoretical framework (**Figure 1**).

As shown in **Figure 1**, the theoretical framework of the study includes eight main relationships to be proposed and investigated. In this research, independent variables include the parental expectation and involvement, and dependent variables include mathematics achievement, anxiety, negative self-esteem and attitude toward mathematics.

Testing the alternative hypothesis **H1** (e.g., an independent variable has negative or positive effect on the dependent variable) against the null hypothesis **H0** (e.g., an independent variable has no effect on the dependent variable) is implemented in this research. In other word, this research aims to provide the evidence to accept the proposed alternative hypotheses. Therefore, this research proposes eight alternative hypotheses mentioned above such as **H1a**, **H1b**, **H2a**, **H2b**, **H3a**, **H3b**, **H4a**, and **H4b**.

## RESEARCH METHOD

### Sample and Procedure

1,337 high school students studying at several public high schools in Hanoi, Vietnam, participated in this study. Convenience sampling is used in this research; however, participants are stratified by their grade (grade 10, 11, and 12) and school locations (urban and suburban Hanoi). The grades and locations represent the Hanoi capital's general population. The students aged between 16 (grade 10) and 18 (grade 12) years old. After using descriptive statistics, the distribution showed that 787 (58.9%) of the students in this study group are female, and 549 (41.1 %) are male. The participants are in grade 10 (32.5%), grade 11 (36.6%), and grade 12 (30.9%).

Most of the students' parents are living and working in Hanoi. They have stable income each month, and their monthly income is under 214 dollars (13%); from 214 dollars to under 426 dollars (34.6%); from 426 dollars to under 852 dollars (28.3%); above 852 dollars (18.6%).

The survey was conducted in the 2019-2020 academic year. High school teachers were joining in handing out the paper questionnaires to their students in the area. First of all, they clearly introduced the aim of the research and how to respond to the paper questionnaires. The students voluntarily agreed to respond to the paper questionnaires. The time to complete the material questionnaire was approximately 30 minutes. Teachers checked students' GPAs after students submitted their questionnaires.

We also noticed some of the characteristics of the study group as the number of hours they spend on mathematics at a tutoring center or home tutor per week, the hours they self-study on mathematics per week, the number of mathematics lessons they take at school in a week, etc. The result presented that the variety of responses (according to the mean hours they send at tutoring centers or home tutors) is 3.99 hours. Students spend an ordinary 5.82 hours of self-study. They also take medium 4.85 mathematics lessons per week at high school.

### Instrument

The purpose of the measurement scale is a standardized questionnaire that focuses on the parental influence on the mathematics performance of Vietnamese students with two main parts. On the top of the paper questioning is general information such as gender, grade, name of high school, GPA of mathematics, etc.

The second part is survey content, including five variables: parental involvement (three observative items), parental expectation (four observative items), attitudes (five observative items), anxiety (five observative items), and self-esteem (three observative items).

Each observative item is measured on the Likert scale with five answer options (1. strongly disagree, 2. disagree, 3. neither disagree nor agree, 4. agree, 5. strongly agree). **Table 1** describes the constructs, indicators used in this research.

**Table 1.** Constructs, indicators used in the questionnaire

| Constructs | Code | Contents |
|---|---|---|
| Parental expectation (PAREXP) | PAREXP1 | My parents are more concerned about my mathematics results than other subjects. |
| | PAREXP2 | My parents look for learning settings for me, which teachers famous for being good at teaching mathematics work in. |
| | PAREXP3 | My parents think learning mathematics well at school is very important for me. |
| | PAREXP4 | My parents yelled at me when I got a bad grade in mathematics. |
| Parental involvement (PARINVO) | PARINV1 | My parents work in mathematics-related jobs. |
| | PARINV2 | My parents are very good at mathematics. |
| | PARINV3 | My parents help me finish my homework. |
| Attitude towards mathematics (ATTM) | ATTM1 | What I learn can be used in my daily life. |
| | ATTM2 | What I learned is interesting. |
| | ATTM3 | Understanding mathematical ideas are important to me. |
| | ATTM4 | What I learned is useful to me. |
| | ATTM5 | What I learned has practical value. |
| Mathematics anxiety (ANX) | ANX1 | I lose a lot of energy when I do mathematics homework. |
| | ANX2 | I get bored thinking about studying mathematics. |
| | ANX3 | I go blank and cannot think clearly when doing mathematics homework. |
| | ANX4 | Just being in mathematics class makes me feel stressed and anxious. |
| | ANX5 | I am afraid to apply mathematics in my life. |
| Negative self-esteem (NSE) | NSE1 | I think I am not good at mathematics. |
| | NSE2 | I feel helpless with mathematics. |
| | NSE3 | I am inclined to feel that I am a failure since I am not good at maths as my classmates. |

**Table 2.** Factor loadings, Cronbach's alpha, CR, & AVE of reflective measurement models

| Constructs | Indicator | Factor loadings | Cronbach's alpha | CR | AVE |
|---|---|---|---|---|---|
| Parental expectation (PAREXP) | PAREXP1 | .801 | .726 | .836 | .630 |
| | PAREXP2 | .856 | | | |
| | PAREXP3 | .638 | | | |
| | PAREXP4 | .652 | | | |
| Parental involvement (PARINVO) | PARINV1 | .734 | .733 | .829 | .552 |
| | PARINV2 | .775 | | | |
| | PARINV3 | .867 | | | |
| Attitude towards mathematics (ATTM) | ATTM1 | .826 | .830 | .880 | .594 |
| | ATTM2 | .756 | | | |
| | ATTM3 | .754 | | | |
| | ATTM4 | .768 | | | |
| | ATTM5 | .749 | | | |
| Mathematics anxiety (ANX) | ANX1 | .805 | .803 | .863 | .559 |
| | ANX2 | .783 | | | |
| | ANX3 | .750 | | | |
| | ANX4 | .704 | | | |
| | ANX5 | .688 | | | |
| Negative self-esteem (NSE) | NSE1 | .742 | .622 | .797 | .567 |
| | NSE2 | .696 | | | |
| | NSE3 | .817 | | | |

Based on the literature review, the questionnaires used in this study have been established by the authors and validated. The items of the constructs are developed from previous related studies such as Davadas and Lay (2017), Huang et al. (2021), Plunkett et al. (2017), and Vukovic et al. (2013). They are pilot tested. The reliability test of the items is implemented using Cronbach's alpha.

The result in **Table 2** shows that Cronbach's alpha values of the constructs are within the range of 0.622 and 0.830, indicating that reliability is an acceptable level (Creswell, 2012).

In terms of GPA of mathematics, the maximum score of GPA is 10. The calculation formula for GPA after an entire school year in Vietnam is shown below:

$$GPA\ after\ an\ entire\ school\ year = \frac{ASFS + (2 \times ASSS)}{3},$$

where ASFS is an average score of the first semester and ASSS is an average score of the second semester.

## Data Analysis

Structural and measurement models were empirically examined employing partial least squares structural equation modeling (PLS-SEM).

**Table 3.** Discriminant validity (HTMT ratio of correlations) of reflective constructs

| Constructs | ANX | ATTM | NSE | PAREXP |
|---|---|---|---|---|
| ATTM | .201 | | | |
| NSE | .193 | .303 | | |
| PAREXP | .078 | .112 | .085 | |
| PARINVO | .100 | .106 | .220 | .554 |

In this study, the data obtained have been analyzed using the SmartPLS 3.0 software (Ringle et al., 2015) to explore and construct a theoretical model by first evaluating the measurement model and then the structural model. Thanks to PLS-SEM, a hypothetical model in this research was investigated by evaluating constructs with many manifest variables using regression-based approaches (Hair et al., 2017).

## RESULTS

### Measurement Model Assessment

Firstly, reflective measurement models are assessed on convergent and discrimination validity (Lewis et al., 2005).

**Table 2** presents the results of the reflective measurement model's factor loadings, Cronbach's alpha, composite reliability (CR), and average variance extracted (AVE).

As shown in **Table 2**, there are four indicators (PAREXP3, PAREXP4, ANX5, and NSE2) with factor loadings less than .70, so it seems these indicators need to be removed (Hair et al., 2011). However, all latent variables' value of AVE and CR is over .50 and over .70, respectively, which means that four indicators were kept in this study. In terms of Cronbach's alpha ranging from nearly .6 to .886, the alpha values of four latent variables are below .70 (Nunnally & Bernstein, 1994). Nevertheless, it cannot say that these constructs have a low level of reliability because

(1) Cronbach's alpha is so sensitive to manifest variables in each latent variable and

(2) the CR calculated the cumulative reliability of all these manifest variables to the constructs, and its values, which all are over .70, indicate that each construct has good reliability.

The square roots of the AVE of each construct are over the correlation coefficients of two constructs, which means that the construct has good discriminant validity (Fornell & Larcker, 1981). Recently, Heterotrait-Monotrait ratio of correlation (HTMT) instead of the cross-loading or the Fornell-Lacker criterion has been recommended to use for calculating discriminant validity since both are significantly overestimated and biased (Hair et al., 2017; Latan, 2018). If HTMT is less than .90, the discriminant validity is satisfied.

**Table 3** demonstrates that all HTMT ratios is less than 0.90 value at the significant level of .05, which indicates that these reflectively measured constructs in this research met the discriminant validity's criteria.

### Structural Model Assessment

Before estimating the path coefficients of the relationships, the inner variance inflation factor (VIF) values between measured latent variables were evaluated to identify any collinearity issues.

**Table 4** indicates that the inner VIF values between measured latent variables were below the suggested value of five, confirming that the structural model had no multicollinearity issues.

The path coefficients in this model are estimated by utilizing the bootstrapping technique with 5000 resamples (**Table 5**).

In the structural model, the effect size $f^2$ of each significant path relationship is also evaluated in this study. Effect size $f^2$ values of .02, .15, and .35 mean that an exogenous latent variable has a small, medium, or large effect on an endogenous construct, respectively. Next, $R^2$ values and Stone-Geisser's $Q^2$ values are utilized to estimate the predictive relevance of this research model. The $R^2$ values of .02, .13, and .26 demonstrate weak, moderate, and substantial predictive accuracy, respectively. Stone-Geisser's $Q^2$ value should be above zero, which means that this research model is considered to have predictive relevance (Hair et al., 2017).

The result revealed that parental expectation is one of the two affective factors that significantly have a direct effect on mathematics achievement (PAREXP -> MA: $\beta$= .063, $p<0.001$) (**Table 5**).

Parent expectation explained the prediction of MA at the moderate level ($R^2$=.174, $Q^2$=.168). Besides that, the total indirect effect of path parental expectation affecting mathematics achievement through parental involvement has statistical significance (PAREXP->PARINVO->ANX->MA: $\beta$=.008, $p<0.05$). The size effect of the indirect effect can be explained by the variance accounted for by the mediator (VAF: ratio of

**Table 4.** The collinearity of the structural model

| | PARINVO | ATTM | ANX | NSE | Mathematics achievement |
|---|---|---|---|---|---|
| PAREXP | 1.000 | 1.311 | 1.336 | 1.336 | 1.345 |
| PARINVO | | 1.311 | 1.337 | 1.337 | 1.381 |
| ATTM | | | 1.026 | 1.026 | 1.122 |
| NSE | | | | | 1.119 |
| ANX | | | | | 1.072 |

**Table 5.** The structural model of this research

| | Path relationship | Direct effects | Total indirect effects | Total effects | VAF (%) | $f^2$ | $R^2$ | $Q^2$ |
|---|---|---|---|---|---|---|---|---|
| H1a | PAREXP->MA | .063* | .156*** | .219*** | | .004 | .174 | .168 |
| H1b | PARINVO->MA | .317*** | .028** | .345*** | | .087 | | |
| H1c | PAREXP->PARINVO->ATTM->MA | | .001 | | | | | |
| H1d | PAREXP->ANX->MA | | -.005 | | | | | |
| H1e | PAREXP->PARINVO->ANX->MA | | .008* | | | | | |
| H1f | PAREXP->NSE->MA | | -004 | | | | | |
| H1g | PAREXP->PARINVO->NSE->MA | | .004 | | | | | |
| H1h | PAREXP->PARINVO->MA | | .154*** | | 70.32 | | | |
| H1i | PAREXP->ATTM->MA | | -.002 | | | | | |
| H1k | PARINVO->ATTM->MA | | .002 | | | | | |
| H1l | PARINVO->ANX->MA | | .017* | | | | | |
| H1m | PARINVO->NSE->MA | | .009 | | | | | |
| H2a | PAREXP->ATTM | .155*** | -.081*** | .075* | | .019 | .026 | .013 |
| H2b | PARINVO->ATTM | -.158*** | | -.166*** | | .021 | | |
| H2c | PAREXP->PARINVO->ATTM | | -.081*** | | | | | |
| H3a | PAREXP->NSE | .080** | -.115*** | -.006 | | .009 | .042 | .020 |
| H3b | PARINVO->NSE | -.189*** | | -.235*** | | .044 | | |
| H3c | PAREXP->PARINVO->NSE | | -.115*** | -.016 | | | | |
| H4a | PAREXP->ANX | -.056 | -.065* | | | .001 | .007 | .002 |
| H4b | PARINVO->ANX | -.102* | | -.092* | | .007 | | |
| H4c | PAREXP->PARINVO->ANX | | -.045* | | | | | |

Note. ***p<.001; **p<.01; & *p<.05

indirect effect to total effect). According to Ramayah et al. (2018), VAF includes three levels, namely VAF<20%, 20%≤VAF≤80%, and VAF>80% indicating no mediation, partial mediation, and full mediation, respectively. Parental involvement has significant affection within the total indirect effect from parental expectation on mathematics performance (PAREXP->PARINVO->MA: β=.154) with a VAF value of 70.32% (in the range of partial mediation). This means that 70.32% of the effect of parental expectation on mathematics performance is explained based on their involvement.

In contrast, results found that the correlation is substantially between parents' involvement and mathematics results with a small effect (PARINVO->MA: β=.317, p<.001, $f^2$=.087). Anxiety is the sole factor that statistically mediated the association between parental involvement and mathematics results (PARINVO->ANX->MA: β=.017, p<.05).

The findings also show two variables of parents having a contrariwise effect on attitude towards mathematics. Parental expectation has a positive direct effect (PAREXP->ATTM: β=.155, p<.001, $f^2$=.019); in the meantime, parental involvement has a negative direct effect on attitude towards mathematics (PAREINVO->ATTM: β=-.166, p<.001, $f^2$=.021). Nevertheless, the involvement of parents was found to mediate the expectation of parents and attitude towards mathematics, which showed a negatively affected level (PAREXP->PARINVO->ATTM: β=-.081, p<.001). However, attitude towards mathematics is not considered substantial on mathematics performance.

According to the path relationship to mathematics results, negative self-esteem is not the primary factor affecting mathematics results. However, there are some surprising findings through analysis: parental expectation and involvement affect negative self-esteem with high statistical significance. The detections presented the more expected of the parent, the higher the level of NSE (PAREXP->NSE: β=-.109, p<.001). Meanwhile, the involvement of parents reduced remarkably negative self-esteem (PARINVO->NSE: β=-.235, p<.001, $f^2$=.044). In addition, parents' involvement mediates the association between parental expectations and negative self-esteem, which has a significant mean (PAREXP->PARINVO->NSE: β=-.115, p<.001).

Moreover, anxiety exerts a significantly negative impact on mathematics performance. However, the findings only recognized the reverse affection of parental involvement and anxiety (PARINVO->ANX: β=-.092, p<.05). In other words, the increase in parental involvement can reduce the level of anxiety of students. Parental involvement was found to mediate the link between parents' expectations and anxiety (PAREXP->PARINVO->ANX: β=-.045, p<.05).

**Figure 2** depicts the path analysis results.

## DISCUSSION

The first findings show that parents' expectations and involvement boost their children's mathematics achievement. Past research indicated that parents' involvement and expectation regarding children's education are significantly positive influential factors on their children's learning results (Gordon & Cui, 2012; Wilder, 2014), especially the mathematics performance (Huang et al., 2021; Otani, 2020; Pan et al., 2006).

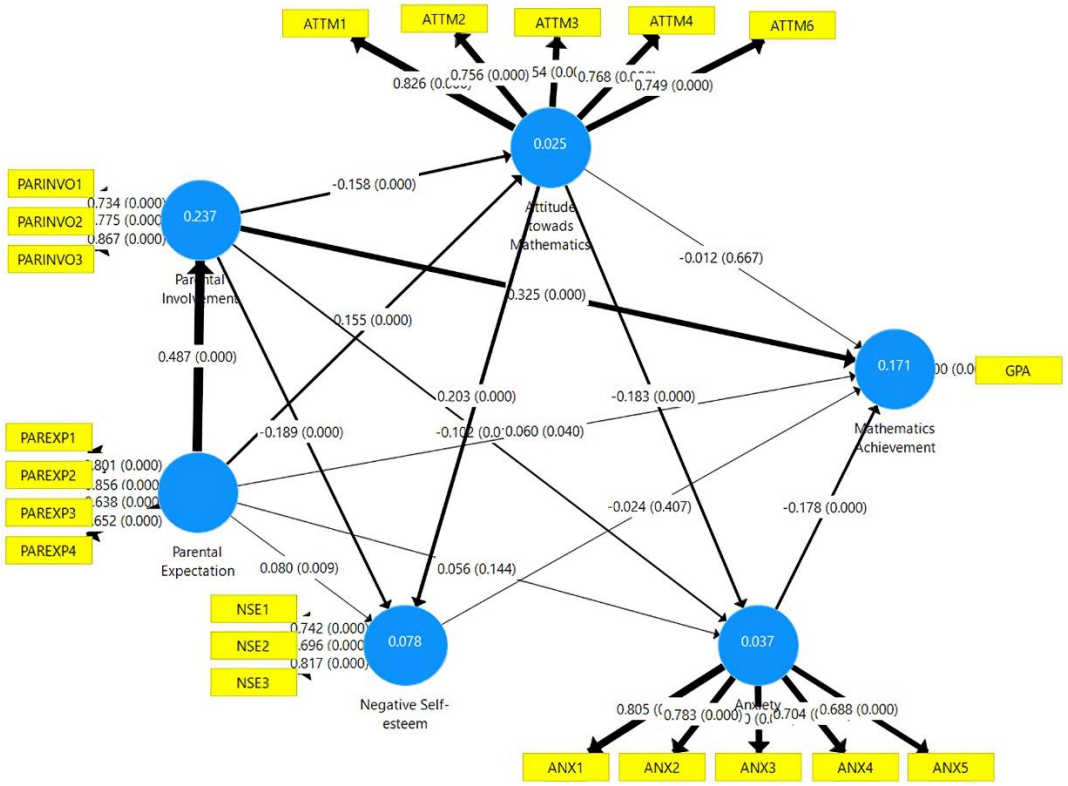


**Figure 2.** Path analysis results (Source: Authors' own elaboration)

Deslandes and Bertrand (2005) demonstrated that parents could be engaged in the learning activities of their children in many ways at both home and school. For example, at home, parents can give their children thoughts or recommendations for the projects of their children or assist their children in tackling the tests when their children give them academic invitations (Deslandes & Bertrand, 2005). Moreover, children can ask for their parents' ideas on their personal invitations in social areas, such as gameshows (Deslandes & Bertrand, 2005). Parents' involvement and expectations can differ based on many factors. In terms of their regions, Wiseman and Zhao (2020) indicated that Among four regions like East Asia, the Middle East, Europe, and the Pacific, parents living in the Middle East had the highest aspirations for their children's success, while those in Europe had the lowest ones. Moreover, nonimmigrant parents in the Pacific, East Asia, and the Middle East regions are the predominant groups with higher aspirations, while immigrant parents in Europe are the dominant group (Wiseman & Zhao, 2020). Regarding their children's gender, parental aspirations for the daughter's educational success are higher than those for sons in Europe (Wiseman & Zhao, 2020). Regarding the parent gender, mothers provide more homework help than fathers (Deslandes & Cloutier, 2000). According to Wang et al. (2021), mother-child interaction significantly and positively influences a child's academic results and vice versa. Regarding cultural differences, parents from Asian regions, like China and Pakistan, tend to have higher aspirations for the educational results of their children (Stevenson, 2013; Talha et al., 2020). According to Pan et al. (2006), Chinese mothers prefer teaching their children number learning at home to American parents. Therefore, Chinese children's individual mathematics tests and interaction tasks are better than American children's ones (Pan et al., 2006).

The second research results demonstrate that parental expectations significantly and positively affect their children's mathematics attitudes and negative self-esteem. Past research proved the positive impact of parents' expectations on the mathematics attitude of their children (Davadas & Lay, 2017; Ozturk et al., 2016) and negative self-esteem (Atmaca & Ozen, 2019). Davadas & Lay (2017) indicated that parents' effects (including parents' affective support and fathers' help and expectancy) positively link their children's attitudes toward mathematics. Besides mathematics, Ozturk et al. (2016) found that children whose parents frequently communicated daily and held high expectations for their learning boost their attitude toward literacy. Moreover, the parents' unrealistic expectation is likely to come from perfectionism or is prone to become pressure on their children, which cause an increase in their children's negative self-esteem. Atmaca and Ozen (2019) showed a significantly negative link between parents' pressure for their children's learning success and self-esteem. Students whose parents pressure the educational

achievement of their children and whose academic depression increases are more frightened about negative academic evaluation, which leads to losing their children's self-esteem (Atmaca & Ozen, 2019). Notably, the difference in expectations between parent and their children need to be concerned. Agliata and Renk (2008) reported that the difference between parents' and children's expectations leads to a decrease in the self-worth and college adjustment of their children. Notably, the difference between parental hopes and children's self-performance also results in a decrease in their children's self-worth and more challenges in adjustment. This means that their children "judge their current performance on how well they believe they are meeting an ideal, whether it is based on their own or their parents' expectations of them" (Agliata & Renk, 2008, p. 980).

On the other hand, this research finds that parents' involvement significantly and negatively influences their children's mathematics attitude, anxiety, and negative self-esteem. Past research proved the negative impacts of parents' involvement on the anxiety of their children (McLeod et al., 2007; Vukovic et al., 2013), negative self-esteem (Parker & Benson, 2004; Plunkett et al., 2017), and attitude toward learning (Soni & Kumari, 2017). Parents spend much time taking part in the academic activities of their children at home (like helping solve their children's homework), which leads to a decline in their children's anxiety (Raju & Asfaw, 2009; Vukovic et al., 2013) and an increase their children's self-esteem in learning (Ho, 2003). Parents express more emotional support, such as taking care of, paying more attention, appraising their children's success, and giving advice, which makes their children less anxious (McLeod et al., 2007) and more positive self-esteem (Parker & Benson, 2004; Trumpeter et al., 2008). Moreover, parents actively join their children's activities at school, which brings more emotional benefits to their children (Ho, 2003; Wang & Sheikh-Khalil, 2014). Notably, many researchers reported that maternal support and monitoring are more likely to boost students' esteem in learning (Bean et al., 2003; Carlson et al., 2000). However, in some cases, the more parents are involved in the educational and extra-curricular activities of their children, the more their children's attitude toward these activities decreases. In terms of academic activities, according to Usher (2009), children's attitude toward mathematics is prone to be affected by their parents, who express a similar attitude and are unable to teach them this subject. Likewise, they are prone to become anxious about mathematics and express their negative attitude toward this subject when they feel their parents' mathematics anxiety (Soni & Kumari, 2017). It is undeniable that mathematics is a big challenge for parents, and not all parents can provide academic support regarding mathematics (Drummond & Stipek, 2004). Notably, reading is supported more than mathematics in low-income families (Drummond & Stipek, 2004). In terms of extra-curricular activities, children's attitude toward these activities is worse and worse when they feel that their parental involvement becomes parental pressure (Sánchez-Miguel et al., 2013). Ryan Dunn et al. (2016) reported that this attitude is negatively impacted when they know their parent invest much money in their activities. Children are young and somewhat sensitive; sometimes, they can misunderstand their parents' actions, attitudes, behavior, and words. Thus, parents should give their children positive academic and emotional supports which students can directly understand and feel.

Parents' psychological concerns, such as their aspirations, are not the direct influential factor on their children's academic, and they are impacted by other elements such as singleton (Li et al., 2020) or have an effect on the other elements such as parental involvement (Yamamoto & Holloway, 2010), which indirectly influences their children's learning results. According to Li et al. (2020), the only-child policy in China affects parents' educational expectations (linked with self-educational expectations), which jointly positively affects their children's science attainment. Moreover, Davis-Kean (2005) found positive indirect links between parental expectations and the educational acquisition of their children through parents' home-based involvement in middle school children's activities. The parental expectation is more likely to boost their involvement (Davis-Kean, 2005). Parents are more involved in their home literacy, which prompts their children's learning performance (Davis-Kean, 2005). Goldenberg et al. (2001) indicated that holding high expectations ensures parents are ready to join in their child's academic activities at home and school so that their child can overcome educational challenges and improve academic achievement. Similarly, this research's finding is in accordance with the research by Davis-Kean (2005) and Goldenberg et al. (2001).

## CONCLUSION

This study concentrates on the impacts of parents on their child's mathematics results and affective factors (like mathematics self-esteem, anxiety, and attitude) in Vietnam. The findings show that both parents' expectations and involvement have positively direct and indirect impacts on their children's mathematics results. Besides, parental expectations and involvement have negative and direct impacts on their children's mathematics self-esteem and attitude, respectively.

These results recommend an increase in parent-teacher and parent-children interactions. At school, teachers (including head teachers and teachers in charge of each subject) should pay more attention to the students who express negative attitudes and motivation in learning mathematics in particular and other subjects

in general. Afterward, they should inform the student's parents so that their parents and teachers can cooperate to help students overcome the challenges. Moreover, parents should actively contact the teachers if their children have difficulty learning. The parent-teacher interactions should be implemented as frequently as possible. Besides, the family environment makes a vital contribution to boosting students' self-esteem, anxiety, and attitude toward learning. Parents should give their children more academic and social help via conversations and family-bonding activities. Importantly, parents should not put excessive expectations and involvement, which is prone to become pressure on their children.

This research has some limitations. First, this research is implemented at the student's level, and the sample lives in the same urban areas. In the future, more research will focus on students in rural areas or the different dimensions of parental involvement. Moreover, there should be more studies on the impacts of parents' involvement in literature and English, which are the other compulsory subjects, and get many concerns from parents in Vietnam. Notably, research on educational policy and practices that promote parent-school, parent-teacher, and parent-student interaction needs doing.

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