frontiers | Frontiers in Education

ORIGINAL RESEARCH
published: 22 April 2022
doi: 10.3389/feduc.2022.854549

The Link Between Parent–Child Relationship and Learning Engagement Among Adolescents: The Chain Mediating Roles of Learning Motivation and Academic Self-Efficacy

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Specialty section:
This article was submitted to Educational Psychology, a section of the journal Frontiers in Education

Received: 14 January 2022
Accepted: 22 February 2022
Published: 22 April 2022

Citation:
Shao Y and Kang S (2022) The Link Between Parent–Child Relationship and Learning Engagement Among Adolescents: The Chain Mediating Roles of Learning Motivation and Academic Self-Efficacy. Front. Educ. 7:854549. doi: 10.3389/feduc.2022.854549

Previous studies have indicated that parent–child relationship as well as learning motivation and academic self-efficacy is an influential factor of learning engagement, but the impact mechanism of the relevant factors needs to be explored. The purpose of the current study is to investigate how parent–child relationship is related to learning engagement *via* the mediating roles of learning motivation and academic self-efficacy. Structural equation modeling (SEM) was adopted for the analysis of 280 participants from China. Results showed that parent–child relationship was directly correlated with adolescents' learning engagement. Results also showed that parent–child relationship indirectly predicted adolescents' learning engagement *via* learning motivation and academic self-efficacy respectively and sequentially. More importantly, it was revealed that the direct effect was much lower than the total indirect effects which include the indirect effect of learning motivation, the indirect effect of academic self-efficacy, and the indirect effect of learning motivation and academic self-efficacy. Among the three indirect effects, the indirect effect of learning motivation and academic self-efficacy was the greatest. Major findings were discussed with implications and limitations in the study.

Keywords: parent–child relationship, learning motivation, academic self-efficacy, learning engagement, adolescents

INTRODUCTION

Parent–child relationship is defined as a kind of unique and influential relationship established in the process of interaction between parents and their children, which is critical to adolescents' physical and mental development (Zeigler-Hill and Shackelford, 2020). It not only decreases adolescents' anxiety (Kerns and Brumariu, 2014; Bradford et al., 2016), shapes their moral behaviors (Grusec et al., 2014), but also boosts their engagement (Malczyk and Lawson, 2017), which is conducive to their academic achievement. As an essential factor in learning, student engagement has three main components, namely, behavioral, emotional, and cognitive engagement (Fredricks et al., 2004; Archambault et al., 2009). Among them, behavioral engagement embodies the

connotative nature of student engagement (Newmann, 1992), meaning students' engagement in learning activities, including their efforts, attention, and persistence (Skinner et al., 2008), which has become a focus of research. From the aspect of behavioral engagement, learning engagement is conceptualized as students' active psychological state which includes three dimensions, namely, energy, absorption, and dedication (Schaufeli et al., 2002a; Christenson et al., 2012). Researchers have indicated that parent–child relationship is related to adolescents' learning engagement, in which learning motivation is an influential factor (Heatly and Votruba-Drzal, 2019). Besides, researchers have shown that academic self-efficacy is also a factor that influences adolescents' learning engagement (Fan and Williams, 2010). However, it is unclear about the impact mechanism of the interrelated factors, which needs further exploration.

To investigate the impact mechanism of parent–child relationship on adolescents' learning engagement to improve their learning engagement, the theory of self-determination theory (SDT) has to be referred to. SDT is relevant to a motivational process in which human behaviors are driven by natural desires (Deci and Ryan, 1985b), which has been regarded to be one framework to comprehend learning engagement (Ryan and Deci, 2017). SDT states that human behaviors arise from their motivation that social partners, such as parents, teachers, and peers exert a positive impact on by satisfying their psychological needs, namely, relatedness, competence, and autonomy (Deci and Ryan, 1985a). Among them, relatedness means the contact with others or being part of a community, which provides individuals with the needed emotional security. Competence refers to personal abilities in the interaction with the environment (Deci and Ryan, 2000). Autonomy means the necessity to act out of volition and be in line with personal values rather than coercion or pressure (Grolnick and Raftery-Helmer, 2013), in terms of behaviors related to self-initiation and self-regulation (Wang and Holcombe, 2010). When adolescents interact with their parents, they can receive emotional support and be more likely to feel being respected and loved by their parents. Interactions with parents help to create a cozy atmosphere for the development of relatedness and personal competence (Pempek, 2017). With necessary relatedness and competence available, adolescents can make decisions independently and express their views with psychological maturity, which results in the development of their personal autonomy (Karabanova and Poskrebysheva, 2013). Generally, parent–child relationship contributes to the development of adolescents' learning motivation by strengthening their needs for relatedness, competence, and autonomy. Academic self-efficacy, as a predictor between learners' motivation and behaviors (Bandura, 1977), is also naturally enhanced. With enhanced academic self-efficacy, adolescents are more actively engaged in learning (Jung and Lee, 2018). Thus, the self-determination theory can provide a theoretical perspective for expounding how parent–child relationship is related to learning engagement through the mediating roles of learning motivation and academic self-efficacy. Based on this theory, a theoretical model has been constructed to test the link between parent–child relationship and learning engagement, as well as the mediating roles of learning motivation and academic self-efficacy (shown in **Figure 1**).

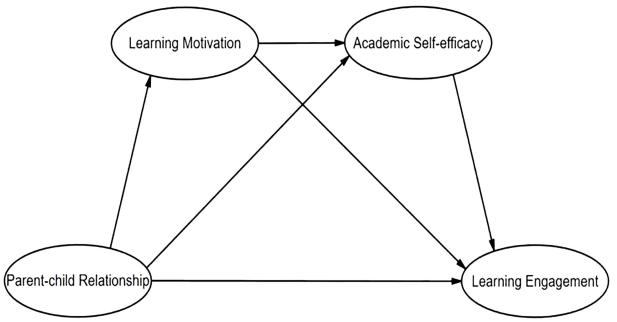

FIGURE 1 | The proposed theoretical model.

Parent–Child Relationship and Learning Engagement

Parent–child relationship plays a crucial role in adolescents' emotional, cognitive, and behavioral development (Chang et al., 2017), which has gradually been a major topic of research. Current research has indicated that parent–child relationship is highly associated with learning engagement (Shannon et al., 2016; Havermans et al., 2017; Malczyk and Lawson, 2017). For example, adolescents with a high level of parent–child relationship are more likely to present higher learning engagement (Malczyk and Lawson, 2019). In other words, adolescents with more parental support or affection are more devoted to learning. On the contrary, adolescents with a low level of parent–child relationship are more likely to present lower learning engagement. For example, harsh parenting, as an important source of the low-quality parent–child relationship, can weaken adolescents' classroom engagement (Wang et al., 2017). The above empirical evidence has proved that parent–child relationship influences adolescents' learning engagement. Therefore, the following hypothesis is proposed:

> H1: Parent–child relationship is positively related to learning engagement.

Learning Motivation as a Mediator

Learning motivation is a complex overarching concept, which is influenced by a set of psychosocial factors both internal and external (presented in the learner's social and natural environment) to the learner (Harlen and Crick, 2003). In the SDT framework, learning motivation is classified into three categories, namely, intrinsic motivation, extrinsic motivation, and amotivation. Intrinsic motivation is understood as the motivation to perform learning activities for the pleasure or interest derived from engaging in the learning activities. Extrinsic motivation means the motivation to perform learning activities for external reasons, such as the desire to earn a reward or to avoid a punishment. Amotivation is defined as a lack of motivation (Tanaka, 2013). Also, learning motivation is divided into three categories: surface motivation, deep motivation, and achievement

motivation. Surface motivation refers to the motivation to perform learning activities for coping with examinations and passing tests. Deep motivation means the motivation to perform learning activities for inherent interest in activities. Achievement motivation is the motivation to conduct learning activities for high scores or praise (Lei et al., 1997). Among the three kinds of learning motivation, surface motivation and achievement motivation are the embodiment of extrinsic motivation, while deep motivation is intrinsic in nature. Students with stronger learning motivation tend to set higher goals and actively perform learning tasks. And they are likely to obtain higher learning engagement (Cook and Artino, 2016).

Learning motivation is often influenced by parent–child relationship. Empirical studies have revealed the prominent role of parent–child relationship in learning motivation. Chen et al. (2018) has pointed out that parent–child relationship has an important impact on students' learning motivation. Also, parental rearing patterns play an important role in students' learning motivation (Cheung and Catherine, 2008). Specifically, students with more support from their parents are more likely to have strong beliefs and orientations in learning engagement. These pieces of evidence show that parent–child relationship can enhance adolescents' learning motivation.

Learning motivation is also considered to be one of the key factors affecting students' learning engagement (Guo, 2018). Students with higher learning motivation are likely to have higher levels of learning engagement despite the difficulties and risks in learning. Some researchers have demonstrated that learning motivation can help establish high expectations which motivate them to participate in learning actively (Eccles, 1983; Chen and Jang, 2010). Other researchers have indicated that learning motivation influences students' classroom participation, thus affecting their learning engagement (Martin, 2007; Wu et al., 2013). Similarly, Heatly and Votruba-Drzal (2019) have also verified that parent–child relationship plays a crucial role in adolescents' learning motivation, thereby affecting their learning engagement. Based on these, we propose the following assumptions:

> H2: Parent–child relationship is positively related to learning motivation.
>
> H3: Learning motivation is positively related to learning engagement.
>
> H4: Learning motivation may play a mediating role in the link between parent–child relationship and learning engagement.

Academic Self-Efficacy as a Mediator

Self-efficacy (SE) is defined as "an individual belief in one's capabilities to organize and execute the courses of action required in producing given attainments" (Bandura, 1997, p. 3). Within a learning context, SE is frequently described in terms of Academic Self-Efficacy (ASE) (Honicke and Broadbent, 2016), which refers to an individual faith in one's ability to perform a specific learning task (Schunk, 1989; Zimmerman et al., 1992). Similarly, academic self-efficacy is understood as learners' judgments about their abilities to achieve educational goals successfully (Elias and MacDonald, 2007). Academic self-efficacy has been conceptualized as two components, namely, learning capability and learning behavior (Liang, 2000). Students with higher academic self-efficacy are more likely to set higher goals and make more efforts to achieve their goals (Bassi et al., 2007). Even when encountering academic difficulties, they still insist on overcoming them (Chouinard et al., 2007; Masud et al., 2016).

Academic self-efficacy is often affected by parent–child interaction (Mulyadi et al., 2016). Support from parent–child interaction is significant in forming a positive attitude and enhancing the ability to make judgments in learning (Chen et al., 2018). When encouraged and affirmed of their capability, students are more likely to experience less self-doubt, exercise greater effort, and persist in their learning (Fan and Williams, 2010). Additionally, parent–child imitation in parent–child interaction contributes to the development of adolescents' cognition (Karbach et al., 2013; Pempek, 2017). Therefore, parent–child relationship exerts a significant influence on adolescents' academic self-efficacy (Llorca et al., 2017).

Academic self-efficacy affects adolescents' learning engagement (Caraway et al., 2003; Linnenbrink and Pintrich, 2003). Some researchers have concluded that adolescents with high academic self-efficacy can possess active thoughts and regard new learning tasks as challenging not as threatening, thus maintaining high engagement in learning (Stubbs and Maynard, 2017). Other researchers have argued that adolescents with low academic self-efficacy can hold negative feelings, and think of the heavy tasks as threats rather than challenges, so they reduce learning goals and show low learning engagement (Rajan et al., 2017). Similarly, Llorca et al. (2017) have also reported that adolescents feeling more connected with their parents have higher academic self-efficacy, which plays a key role in their learning engagement. Therefore, this study speculates that there is a positive correlation between adolescents' academic self-efficacy and their learning engagement, and academic self-efficacy may play an intermediary role between parent–child relationship and learning engagement.

Adolescents tend to actively accomplish tasks toward their learning goals through learning motivation to enhance their confidence in the completion of tasks (Sedaghat et al., 2011). So it is believed that adolescents' learning motivation is positively correlated with their academic self-efficacy. In other words, learning motivation promotes academic self-efficacy and further promotes learning engagement (Wu et al., 2020). Specifically, adolescents with strong learning motivation can better improve their judgment and evaluation of a task through their beliefs, interests, and will (Yang and Wu, 2012). Grounded on the analysis of the association between learning motivation and academic self-efficacy and the possible positive impact of parent–child relationship on them, this study is intended to explore whether parent–child relationship is positively associated with learning engagement *via* learning motivation and academic self-efficacy. In view of this, the following hypotheses are proposed:

H5: Parent–child relationship is positively related to academic self-efficacy.

H6: Learning motivation is positively related to academic self-efficacy.

H7: Academic self-efficacy is positively related to learning engagement.

H8: Academic self-efficacy plays a mediating role in the link between parent–child relationship and learning engagement.

H9: Learning motivation and academic self-efficacy play a chain mediating role in the link between parent–child relationship and learning engagement.

MATERIALS AND METHODS

Sampling and Data Collection

The participants are middle school students aged 13–14 years old from one school in Southeast China. According to the requirements of Structural Equation Modeling (SEM) (Zhang et al., 2020), a sample size between 200 and 500 is appropriate. To obtain this sample size, we employed the strategy of random sampling.

Data were collected *via* self-report questionnaires in September 2021. First, the consent to carry out the survey was obtained from principals and parents. Second, the content and the purpose of the survey were explained to the teachers and students in detail. Third, the questionnaires were completed in class. After 300 questionnaires were issued, the rating scale and the sample items were explained. The students were told that their participation was anonymous and voluntary, encouraged to express their views faithfully. Lastly, 280 valid questionnaires, with an effective response rate of 93.3% were obtained for data analysis. Of the 280 samples, 50.7% (N = 142) were boys, and 49.3% (N = 138) were girls. 46.1% (N = 129) were from Grade Seven and 53.9% (N = 151) were from Grade Eight. 82.9% (N = 232) lived in the towns, 17.1% (N = 48) lived in the countryside.

Questionnaire Design

The questionnaire was designed based on previous instruments with acceptable reliability and validity. It consisted of two main sections. The first section intended to measure the demographic characteristics of the respondents, including gender, grade, and place of residence. The second section was composed of four latent variables, namely, parent–child relationship, learning motivation, academic self-efficacy, and learning engagement, with nineteen measurement items (**Table 1**). All measurement items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly disagree). The six items of *parent–child relationship* were chosen from An's (2004) Chinese version modified according to Barnes and Olson's (1985) *Parent–child Relationship Scale*. The four items of *learning motivation* were chosen from Lei et al.'s (1997) study. The five items of academic self-efficacy were from Liang's (2000) study modified in line with Pintrich and De Groot's (1990) study. The four items of *learning engagement* were from Fang et al.'s (2008) Chinese version revised according to Utrecht Work Engagement Scale-Student (Schaufeli et al., 2002a,b). The revised items were tested to be reliable and valid in the context of Chinese culture, which has gained wide use in China. The specific measurement items are presented in **Table 1**.

Statistical Analysis

The data were analyzed with structural equation modeling (SEM) in SPSS 24.0 and Amos 24.0. First, confirmatory factor analysis (CFA) was performed to measure the model fit of each construct. Second, the reliability and validity of each scale were tested by providing the values of standardized factor load, CR, and AVE. Third, the multiple path coefficients were analyzed to confirm the hypotheses. Fourth, the method of maximum likelihood estimation was adopted to test the structural model. Fifth, the bootstrap method was used to examine the indirect effect of parent–child relationship on learning engagement.

RESULTS

Confirmatory Factor Analysis

Confirmatory factor analysis (CFA) was performed for each variable (parent–child relationship with six items, learning motivation with four items, academic self-efficacy with five items, and learning engagement with four items). It is believed that all factor loading values are greater than 0.5, indicating each variable has a good fit (Kline, 2005). The results of CFA showed that all factor loading values range from 0.603 to 0.897, greater than 0.5. Specifically, parent–child relationship showed a good model fit (Chi-square/df = 1.923, SRMR = 0.0276, SMSEA = 0.058, GFI = 0.979, AGFI = 0.952, CFI = 0.987, TLI = 0.979). So is learning motivation (Chi-square/df = 0.465, SRMR = 0.0082, SMSEA = 0.000, GFI = 0.998, AGFI = 0.992, CFI = 1.000, TLI = 1.008). Academic self-efficacy also meets the requirement with Chi-square/df = 0.581, SRMR = 0.0109, SMSEA = 0.000, GFI = 0.996, AGFI = 0.987, CFI = 1.000, TLI = 1.006, together with learning engagement (Chi-square/df = 1.392, SRMR = 0.0140, SMSEA = 0.037, GFI = 0.995, AGFI = 0.975, CFI = 0.999, TLI = 0.996).

Measurement Model

The measurement model was assessed by testing its reliability and validity. The value of Cronbach's α ranges from 0.80 to 0.89, indicating that the model has good reliability (Nunnally and Bernstein, 1994). Convergent validity is measured by factor loadings, composition reliability (CR), and the average variance extracted (AVE) (Chen and Lin, 2019), requiring all the indexes are be equal to or greater than 0.5. The square root values of AVE in each construct are greater than the correlation coefficient value, indicating

TABLE 1 | Latent variables and items.

Latent variable	Code	Measurement items
Parent–child relationship (PCR)	PCR1	I easily express my true feelings to my parents
	PCR2	My parents are willing to listen to my ideas attentively
	PCR3	I am satisfied with the way I communicate with my parents
	PCR4	If I encounter difficulties, I tell my parents about them
	PCR5	When I ask my parents questions, they always reply truthfully
	PCR6	My parents always try to understand me
Learning motivation (LM)	LM1	Most of the new subjects are interesting, so I often spend the extracurricular time on them, hoping to get more knowledge
	LM2	I find that I often obtain a sense of satisfaction from learning
	LM3	I have to work hard enough on a problem to reach a satisfactory conclusion
	LM4	I am determined to keep reading reference books about classroom learning
Academic self-efficacy (ASE)	ASE1	I believe that I can achieve good grades
	ASE2	Compared with the other students in the class, I have a stronger ability in learning
	ASE3	I can apply what I learn to practice
	ASE4	I can well understand the knowledge in the book and the content that teachers instruct
	ASE5	I like to choose the challenging learning tasks
Learning engagement (LE)	LE1	When I get up in the morning, I want to study
	LE2	I feel that I have a clear learning goal and learning is meaningful
	LE3	I am passionate about learning
	LE4	When I study, I feel time flying

TABLE 2 | Reliability and validity examination.

Latent variable	Item	UC	SE	*Z*-value	*P*-value	SC	Cronbach's α	CR	AVE
Parent–child relationship (PCR)	PCR1	1.000				0.603			
	PCR2	1.063	0.116	9.171	***	0.700			
	PCR3	1.177	0.125	9.403	***	0.726	0.858	0.860	0.507
	PCR4	1.251	0.127	9.811	***	0.775			
	PCR5	1.104	0.118	9.333	***	0.718			
	PCR6	1.148	0.121	9.514	***	0.739			
Learning motivation (LM)	LM1	1.000				0.762			
	LM2	1.011	0.087	11.612	***	0.720			
	LM3	1.131	0.088	12.859	***	0.798	0.837	0.839	0.566
	LM4	1.044	0.089	11.733	***	0.727			
Academic self-efficacy (ASE)	ASE1	1.000				0.720			
	ASE2	0.964	0.078	12.347	***	0.774			
	ASE3	1.041	0.086	12.089	***	0.758	0.883	0.884	0.605
	ASE4	1.104	0.082	13.512	***	0.850			
	ASE5	1.034	0.083	12.444	***	0.780			
Learning engagement (LE)	LE1	1.000				0.730			
	LE2	1.145	0.087	13.223	***	0.817	0.860	0.865	0.619
	LE3	1.215	0.085	14.310	***	0.897			
	LE4	1.021	0.092	11.076	***	0.686			

*UC, unstandardized coefficients; SE, standard error; SC, standardized coefficients.***p < 0.001.*

TABLE 3 | The discriminate validity test of latent variables.

Latent variable	Parent–child relationship	Learning motivation	Academic self-efficacy	Learning engagement
Parent–child relationship	**0.712**			
Learning motivation	0.400	**0.752**		
Academic self-efficacy	0.460	0.720	**0.778**	
Learning engagement	0.482	0.647	0.707	**0.787**

The square root of the AVE of four latent constructs is given in the diagonal, and the correlation coefficient is given on the below diagonal. The bold values represent the square root of AVE.

TABLE 4 | Goodness of fit index of the structural model.

Fit index	χ^2/df	SRMR	SMSEA	GFI	AGFI	IFI	CFI	TLI
Suggested value	0–3	<0.080	<0.080	>0.900	>0.900	>0.900	>0.900	>0.900
Value of this study	1.279	0.0432	0.032	0.938	0.919	0.985	0.985	0.982

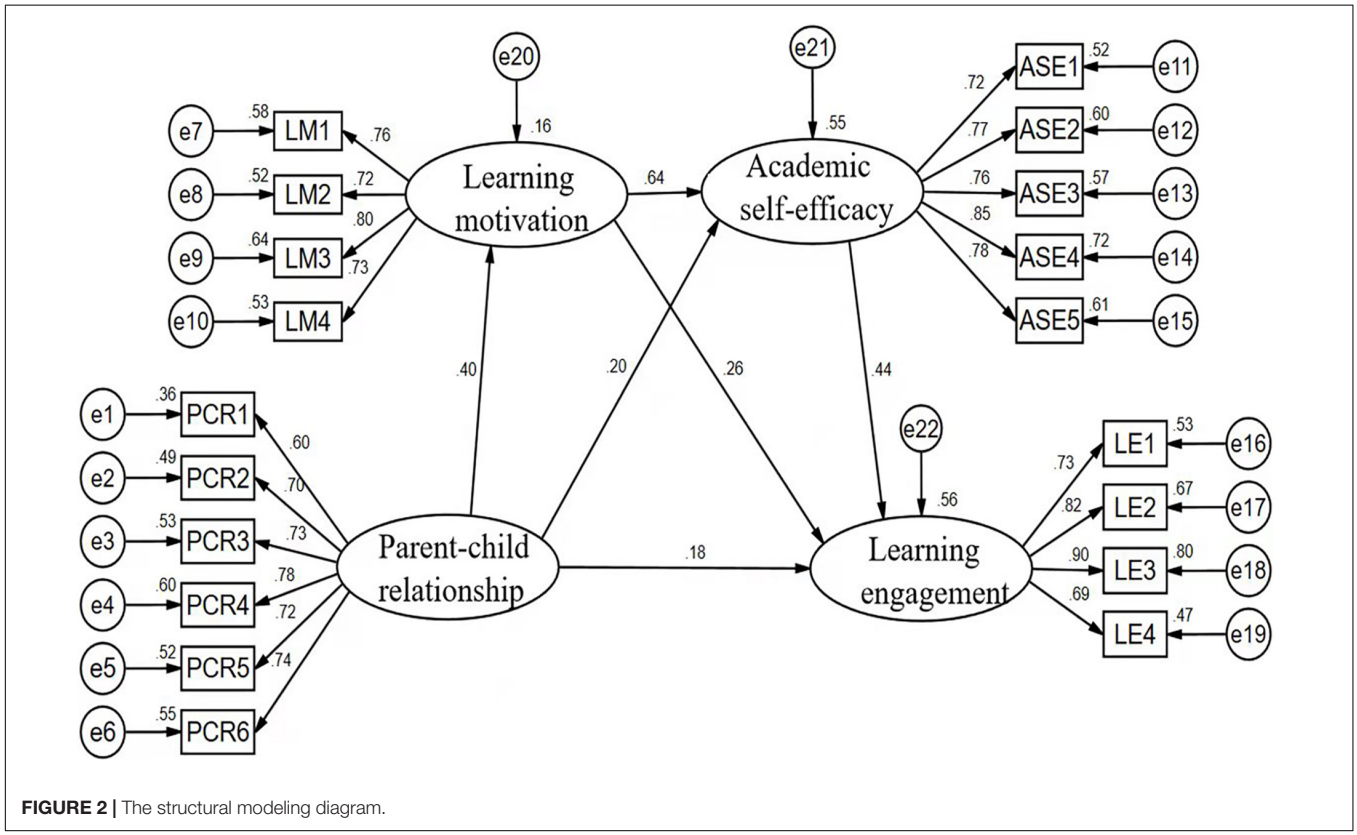

FIGURE 2 | The structural modeling diagram.

that discriminant validity is obtained (Fornell and Larcker, 1981).

As shown in **Table 2**, the values of Cronbach's α ranged from 0.837 to 0.883. The values of the factor loadings were between 0.603 and 0.897. The CR and AVE values of each latent construct ranged from 0.839 to 0.884, from 0.507 to 0.619, respectively. As seen in **Table 3**, the square root values of AVE in each construct were greater than the correlation coefficient value between the other constructs. Overall, all the values exceeded the cut-off value, indicating that the measurement model is acceptable.

Structural Model

In the study, the method of maximum likelihood estimation was used to assess the structural model with Amos 24.0. Zhang et al. (2020) have demonstrated a good-fitting structural model needs to meet the following conditions with χ^2/df between 0 and 3, GFI, AGFI, IFI, TLI, CFI greater than 0.9, SRMR less than 0.05, SMSEA less than 0.08. **Table 4** shows that χ^2/df = 1.279, GFI = 0.938, AGFI = 0.919, IFI = 0.985, CFI = 0.985, TLI = 0.982. All values reached the cut-off value, indicating the structural model had a good fitting degree.

In addition, **Figure 2** indicates the path coefficients and explanatory variance of the structural model with standardized parameter estimates. The construct of *Parent–child Relationship* explained 16% of the variance in the construct of *Learning Motivation*, corresponding to a standardized regression coefficient of 0.400. The constructs of *Parent–child Relationship* and *Learning Motivation* jointly explained 55% of the variance in the construct of *Academic Self-efficacy*, corresponding to standardized regression coefficients of 0.460 and 0.720, respectively. The constructs of *Parent–child Relationship, Learning Motivation*, and *Academic Self-efficacy* jointly explained 56% of the variance in the construct of *Learning Engagement* with the corresponding standardized regression coefficients of 0.482, 0.647, and 0.707, respectively. All the path coefficients were statistically significant ($P < 0.01$) by performing a bootstrap procedure with 5000 resamplings. Therefore, the structural model was supported by these empirical data.

Hypotheses Tested

As seen in **Table 5**, parent–child relationship and learning engagement established significant and positive relationships ($\beta = 0.482$, $P < 0.01$), hence hypothesis H1 was supported;

TABLE 5 | The test results of path relationship.

Hypothesis	Path	Unstandard estimates	Standard error	*Z*-value	Sig.	Standard estimates	Hypotheses tested
H1	PCR→LE	0.350	0.064	5.460	***	0.482	Supported
H2	PCR→LM	0.297	0.062	4.794	***	0.400	Supported
H3	LM→LE	0.475	0.068	6.962	***	0.647	Supported
H5	PCR→ASE	0.340	0.064	5.295	***	0.460	Supported
H6	LM→ASE	0.538	0.073	7.338	***	0.720	Supported
H7	ASE→LE	0.517	0.071	7.234	***	0.707	Supported

*PCR, parent–child relationship; LE, learning engagement; LM, learning motivation; ASE, academic self-efficacy. ***p < 0.001.*

TABLE 6 | Direct, indirect, and total effects of the hypothesized model.

Path relationship		Point estimate	Product of coefficient		Bootstrapping			
					Bias-corrected 95% CI		Percentile 95% CI	
			SE	*Z*-value	Lower	Upper	Lower	Upper
Test of indirect, direct, and total effects								
DistalIE	PCR→LM→ASE→LE	0.111	0.039	2.846	0.053	0.212	0.046	0.198
LMIE	PCR→LM→LE	0.103	0.047	2.191	0.026	0.215	0.021	0.207
ASEIE	PCR→ASE→LE	0.089	0.041	2.171	0.025	0.195	0.023	0.192
TIE	Total indirect effect	0.302	0.062	4.871	0.200	0.446	0.193	0.440
DE	PCR→LE	0.174	0.085	2.047	0.014	0.352	0.013	0.350
TE	Total effect	0.476	0.083	5.735	0.321	0.636	0.327	0.639
Comparison of indirect effects								
LMDIEdiff	LM vs. DistalIE	−0.007	0.070	−0.100	−0.160	0.121	−0.151	0.129
ASEDIEdiff	ASE vs. DistalIE	−0.022	0.047	−0.468	−0.139	0.055	−0.130	0.070
LMASEdiff	LM vs. ASE	0.015	0.072	0.208	−0.122	0.163	−0.129	0.155
Percentage of indirect effects								
P1	DistalIE/TIE	0.366	0.108	3.389	0.222	0.674	0.181	0.606
P2	LMIE/TIE	0.342	0.149	2.295	0.087	0.676	0.065	0.667
P3	ASEIE/TIE	0.293	0.107	2.738	0.078	0.499	0.081	0.508
P4	TIE/TE	0.635	0.145	4.379	0.394	0.963	0.400	0.964
P5	DE/TE	0.365	0.145	2.517	0.037	0.606	0.036	0.600

Parent–child relationship was significantly and positively associated with learning motivation (β = 0.400, $P < 0.001$), therefore hypothesis H2 was verified; Learning motivation was significantly and positively related to learning engagement (β = 0.647, $P < 0.01$), therefore H3 was supported; Parent–child relationship was significantly and positively associated with academic self-efficacy (β = 0.460, $P < 0.001$), therefore H5 was supported; Learning motivation had a significant and positive influence on academic self-efficacy (β = 0.720, $P < 0.001$), thus H6 was supported; Academic self-efficacy was significantly and positively associated with learning engagement (β = 0.707, $P < 0.001$), therefore H7 was supported. Overall, H1, H2, H3, H5, H6, and H7 were all statistically significant in the expected direction, and their paths were supported by the empirical data.

Analyses of the Mediating Effect of the Parent–Child Relationship on Learning Engagement

The mediating effects were analyzed with the bootstrap method, which was proposed by MacKinnon (2008). It is suggested that the *Z*-value is greater than 1.96 and the value of bias-corrected 95% confidence intervals doesn't contain 0, demonstrating that the mediating effect is statistically significant. As seen in **Table 6**, the total effect of parent–child relationship on learning engagement was 0.476 ($Z = 5.735$, bias-corrected 95% CI [0.321, 0.636], $P < 0.001$) and the direct effect of parent–child relationship on learning engagement was 0.174 ($Z = 2.047$, bias-corrected 95% CI [0.014, 0.352], $P < 0.001$), showing that both the total effect and the direct effect were statistically significant. The indirect effects were 0.111 ($Z = 2.846$, bias-corrected 95% CI [0.053, 0.212], $P < 0.001$) in the pathway of parent–child relationship-learning motivation-academic self-efficacy-learning engagement, 0.103 ($Z = 2.191$, bias-corrected 95% CI [0.026, 0.215], $P < 0.001$) in the pathway of parent–child relationship-learning motivation-learning engagement, and 0.089 ($Z = 2.171$, bias-corrected 95% CI [0.025, 0.195], $P < 0.001$) in the pathway of parent–child relationship-academic self-efficacy-learning engagement, showing that all the indirect effects were statistically significant.

Data analysis showed that the indirect effect of parent–child relationship on learning engagement was related to learning

motivation and academic self-efficacy, which significantly and positively played partial mediating roles in the link between parent–child relationship and learning engagement. Therefore, learning motivation and academic self-efficacy significantly mediated the association between parent–child relationship and learning engagement and played partial mediating roles. And H4, H8, and H9 were also supported. In addition, the effect percentage showed that the direct effect of parent–child relationship on learning engagement explained 36.5%, while the indirect effect of parent–child relationship on learning engagement accounted for 63.5%, much greater than that of the direct effect. Among the three indirect effects, the indirect effect from parent–child relationship to learning engagement *via* learning motivation and academic self-efficacy was the greatest.

DISCUSSION

This study attempted to explore the link between parent–child relationship and learning engagement. In parallel, it also attempted to explore the mediating roles of learning motivation and academic self-efficacy in that link. The major findings are as follows.

The results of the study showed that parent–child relationship was directly related to learning engagement, which is consistent with prior studies, that is, students with better parent–child relationship are more likely to engage themselves more in learning (Randolph et al., 2006; Lukie et al., 2014; Shannon et al., 2016). One possible reason is that good parent–child interaction makes adolescents feel warm and loved, and promote their mental health (Zhao et al., 2021), which is beneficial to adolescents' devotion to learning. The results of this study further highlighted that parent–child relationship is an influential factor of learning engagement.

The results demonstrated that learning motivation functioned as one mediating role in the path from parent–child relationship to learning engagement, which is congruent with the finding of previous studies that learning motivation is a predictor of learning engagement (Guo, 2018; Heatly and Votruba-Drzal, 2019). Learning motivation can develop individuals' levels of learning engagement that can improve their conceptual understanding and thinking skills (Harlen and Crick, 2003). With enhanced learning motivation, students are able to show a higher level of learning engagement (Halliday et al., 2018). The emergence of learning motivation as a mediating role in the study further proved the significance of learning motivation in promoting learning engagement.

The results indicated another mediating role of academic self-efficacy. Consistent with previous studies, parents' interaction with their children helps build the parent–child relationship, which fosters children's academic self-efficacy and learning engagement (Fan and Williams, 2010) and the role of academic self-efficacy is underlined between parent–child relationship and learning engagement (Llorca et al., 2017). Students high in academic efficacy are more likely to show improvements in their effort and increase their enjoyment, interest, and engagement in learning activities (Skinner et al., 2008). In sum, the finding further confirmed the role of academic self-efficacy between parent–child relationship and learning engagement.

The results also indicated that learning motivation and academic self-efficacy served as a chain mediating role. This means that parent–child relationship can influence learning engagement *via* learning motivation and academic self-efficacy. The results also revealed that among the three mediating roles, the chain mediating role of learning motivation and academic self-efficacy was the greatest. Furthermore, it was shown that compared with the parent–child relationship ($\beta = 0.460$, $P < 0.001$), learning motivation had a greater influence on academic self-efficacy ($\beta = 0.720$, $P < 0.001$). This may demonstrate that academic self-efficacy was mainly from learning motivation in adolescents' learning process (Schunk and Pajares, 2002; Burić and Kim, 2020). In general, the finding has enriched the prior studies by analyzing the complicated associations among parent–child relationship, learning motivation, academic self-efficacy, and learning engagement framed by self-determination theory, which enlightens us that we should pay more attention to adolescents' learning motivation so as to enhance their academic self-efficacy, thus improving their learning efficiency and learning achievements.

Implications

The study has theoretical and practical implications. Theoretically, the findings provide extended knowledge in the link between parent–child relationship and learning engagement, as they give prominence to the vital role parents play in adolescents' learning engagement, and provide more support to the views of some researchers (Fan and Williams, 2010; Shire et al., 2016). In addition, the findings reveal the potential mediating roles of learning motivation and academic self-efficacy that may explain how parent–child relationship influences learning engagement, which provides pilot evidence for studying similar themes in other countries. Practically, the findings provide a direction for improving adolescents' learning engagement. Specifically, schools could provide parents with necessary training that may help parents realize the active impact of the parent–child relationship on adolescents' learning engagement and help them enhance the skills of building a sound relationship with their children, such as improving metacognitive knowledge regarding their children's thinking and learning process (Thomas and Anderson, 2013) and increasing responsive behaviors in interactions with their children (Kim and Mahoney, 2005). Besides, cooperative communication groups between parents and teachers could be established to facilitate adolescents' learning engagement. Teachers should help parents develop a supportive parent–child relationship with some strategies such as shared reading programs, joint sports activities, and parent–child exploration projects so as to promote their empathy and enhance their positive interactions. Also, teachers should communicate with parents frequently about their children's learning behaviors at school so that they can keep track of their children's progress. And both sides work together to take measures to enhance children's motivation in learning, thus

providing them with guidance and confidence to face challenges in academic activities.

Limitations and Future Research Directions

Limitations in the present study should be noted for future research. First, the causal relations among the four variables could not be inferred because of the cross-sectional study design. Longitudinal investigations could be conducted in future studies to examine the link between parent–child relationship and learning engagement. Second, this study explores the mechanism of learning motivation and academic self-efficacy between parent–child relationship and learning engagement. However, more factors affect learning engagement, such as learning environment, academic resilience, and self-assessment. In the future, more variables should be involved in the study. Third, the study adopted the self-report method to collect data, which may affect the objectivity of the assessment. In-depth research could be conducted through a third-party observation to collect data in future studies.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/**Supplementary Material**, further inquiries can be directed to the corresponding author/s.

AUTHOR CONTRIBUTIONS

SK developed the conceptual framework and revised the manuscript. YS analyzed the data and wrote the manuscript. Both authors contributed to the article and approved the submitted version.

FUNDING

We acknowledge support from the National Social Science Foundation (BEA180110).

SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: https://www.frontiersin.org/articles/10.3389/feduc.2022.854549/full#supplementary-material

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.