

Family Educational Investment and Adolescents' Self-Efficacy: The Mediating Role of Learning Motivation and the Moderating Effect of Gender

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Abstract

This study explores the relationship between family educational investment, learning motivation, and self-efficacy, with a novel focus on gender differences as a moderating factor. By addressing existing research gaps, the study aims to inform more evidence-based parenting strategies that promote adolescents' academic achievement and psychological well-being. Utilizing a convenience sampling method, a structured questionnaire was administered incorporating validated scales to assess family involvement, student motivation, and self-efficacy. Descriptive statistics and mediation analyses were conducted on the collected data. Findings indicate that increased parental time investment is positively associated with higher levels of self-efficacy and learning motivation, and that improvements in self-efficacy are frequently accompanied by enhanced learning motivation.

Keywords

Educational psychology, self-efficacy, gender differences, learning motivation.

1. Background

Self-efficacy, defined as an individual's belief in their ability to successfully complete tasks, is a critical predictor of adolescents' academic performance, motivation, self-regulation, and overall well-being [1]. As a fundamental concept in educational psychology, self-efficacy influences students' academic involvement and goal-setting behaviors. While research on self-efficacy is abundant, there remains a significant gap in empirical studies exploring how family educational investment impacts its development, particularly studies that incorporate learning motivation as a mediator and gender differences as a moderator.

Family educational investment, encompassing both time commitment and financial resources, is a critical factor in fostering adolescents' cognitive development, emotional well-being, and academic achievement. This form of investment typically involves activities such as supplying educational resources, engaging in instructional interactions, and offering various types of learning support. Although existing research consistently demonstrates a positive link between parental educational input and adolescents' self-efficacy, the specific pathways through which this influence operates remain insufficiently explored and require further empirical clarification.

Learning motivation, encompassing intrinsic and extrinsic dimensions, reflects the internal drives and external stimuli that guide students' participation in academic tasks. Intrinsic motivation stems from a genuine interest in learning, while extrinsic motivation is driven by the pursuit of external rewards or social recognition [2]. When adolescents perceive a high level of educational investment from their families, they are more likely to demonstrate increased motivation, which in turn enhances their perceived self-competence. Motivated students are more inclined to value academic tasks, set purposeful goals, and maintain persistent effort in

pursuit of achievement. Moreover, sustained parental support fosters the development of adolescents' self-regulatory capacities and motivational resilience, encouraging a stronger sense of responsibility for learning and a greater ability to cope with academic challenges. This dynamic highlights learning motivation's mediating role between family educational investment and adolescents' self-efficacy.

Additionally, this study integrates gender as a moderating factor in examining the mediating mechanism linking family educational investment and self-efficacy. Existing literature suggests that boys and girls may exhibit differential responses to distinct forms of parental engagement, with evidence indicating that time-oriented educational investment may have a more pronounced impact on the self-efficacy of female adolescents [3]. The causal pathways behind these gender-specific patterns remain underexplored. This study aims to clarify gender's moderating role in the mediation model linking family educational investment, learning motivation, and self-efficacy.

In conclusion, this study explores the interactions between family educational investment, learning motivation, and self-efficacy, with gender as a moderating variable. The primary objective is to offer empirical insights that can guide the creation of evidence-based parenting strategies designed to enhance adolescents' academic achievement and overall psychological health.

2. Literature Review

2.1. Research on family educational investment and self-efficacy

Parental educational investment, encompassing both financial support and emotional involvement, has been found to positively affect children's academic self-efficacy [4]. Access to enriched educational resources fosters self-awareness, exposes children to new knowledge, and broadens their cognitive horizons, thus enhancing their academic self-concept. Moreover, socioeconomic disparities significantly shape educational outcomes, with children from lower-income or working-class families often exhibiting lower self-efficacy and academic motivation due to limited parental investment in education [5]. Beyond these direct effects, parental involvement also influences self-efficacy through indirect mechanisms. Specifically, parental behaviors serve as models; through observational learning, adolescents internalize these behaviors, which in turn strengthens their confidence in their academic capabilities [1].

Gender differences play a crucial moderating role in the relationship between family educational investment and self-efficacy. Cultural and societal expectations associated with gender roles often shape distinct parental engagement patterns—for instance, placing greater emphasis on academic achievement for boys while fostering emotional and social development in girls. These differentiated expectations can result in gender-specific variations in adolescents' self-efficacy beliefs [6].

2.2. Research on the link between learning motivation and self-efficacy

The relationship between learning motivation and self-efficacy is well-established in empirical research. Students with high learning motivation, especially intrinsic motivation, tend to develop stronger self-efficacy beliefs, leading to improved academic performance [7]. Conversely, individuals with higher self-efficacy, believing in their ability to succeed in academic tasks, often exhibit greater motivation and achieve better academic outcomes [8]. Thus, the connection between learning motivation and self-efficacy is reciprocal and mutually reinforcing, rather than a one-way causal effect.

2.3. Research on the link between learning motivation and family educational investment

Empirical studies have demonstrated that adolescents' learning motivation is substantially influenced by the temporal and emotional support provided by parents. This enhancement in motivation is largely a result of constructive parent-child interactions, during which parental encouragement and involvement stimulate adolescents' interest in and commitment to academic engagement [9].

2.4. Research on gender differences in self-efficacy

A growing body of research highlights the significant impact of gender differences on self-efficacy and learning motivation. Evidence indicates that female students are more responsive to emotional and time-based parental support, while male students are more influenced by financial educational investments. This divergence indicates that intrinsic motivation is more closely linked to academic success among girls, while boys show a stronger association between extrinsic motivation and academic outcomes [3]. Additionally, girls often report marginally lower academic self-efficacy than boys and may underestimate their academic abilities, a tendency influenced by sociocultural norms and differences in teacher expectations and support [10]. These gender-related variations are therefore considered as key control variables in the present study.

While existing research has established positive correlations among family educational investment, learning motivation, and self-efficacy, the differential impact of these variables across genders remains insufficiently examined. In particular, the mediating function of learning motivation within this framework has not been comprehensively analyzed in the context of gender-specific patterns, and the current literature offers limited insight into the complex interaction between gender and self-efficacy. Hence, this study seeks to address the existing gap in educational psychology by providing a more nuanced and empirically supported understanding of the impact of parenting practices.

Hypothesis 1: Family educational investment, including both financial contributions and time commitments, positively predicts adolescents' self-efficacy.

Hypothesis 2: Learning motivation acts as a mediating variable in the relationship between family educational investment and adolescents' self-efficacy.

Hypothesis 3: Gender moderates the mediating effect of learning motivation in the relationship between family educational investment and self-efficacy.

Hypothetical model:

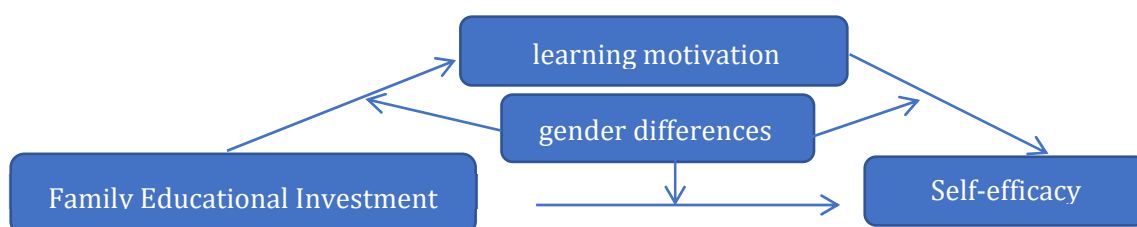


Figure 1. Relationship between IV & DV

3. Methods

3.1. Participants

This study will employ a convenience sampling method to recruit approximately 200 adolescents, aged 13 to 18 years, ensuring an equal distribution of 100 males and 100 females, along with their corresponding families.

3.2. Materials

Household Financial Investment Scale. To measure parental financial investment in children's education, this study used the Family Socioeconomic Status Questionnaire, adapted by Cui Yiran and Liang Guancheng from the 2019 international TIMSS framework. The scale includes 10 items, with higher scores reflecting greater educational resource availability and financial investment [11].

Family Time Investment Scale. Parental time investment was assessed using a revised Parental Participation Questionnaire, adapted by Cui Yiran and Liang Guancheng from the 2019 international TIMSS framework. The scale includes 4 items rated on a 4-point Likert scale, with higher scores indicating more frequent parental involvement. The scale shows acceptable internal consistency, with a Cronbach's alpha of 0.688 [12].

Academic Self-Efficacy Scale. The Academic Self-Efficacy Scale, developed by Liang Yusong et al. (2000), was used to assess students' academic self-perceptions across two dimensions: ability and behavioral self-efficacy. The 22-item scale is rated on a 5-point Likert scale, with reverse scoring for items 14, 16, 17, and 20. It demonstrates strong internal consistency, with Cronbach's alpha values of 0.909 for ability self-efficacy and 0.817 for behavioral self-efficacy.

Learning Motivation Scale. Learning motivation was assessed using the scale developed by Yu Anbang (1991), designed to evaluate both intrinsic and extrinsic motivation. The instrument includes 12 items, evenly divided between two subscales, with responses rated on a 5-point Likert scale. Higher scores reflect greater learning motivation. The scale shows adequate reliability, with Cronbach's alpha values of 0.850 for intrinsic motivation and 0.682 for extrinsic motivation.

3.3. Procedure

The research was conducted by psychology undergraduates who had undergone professional training and acted as primary investigators. Prior to data collection, the study protocol was approved by the supervising faculty and the participating school. Participants were given a comprehensive briefing on the objectives, procedures, and methods of the study to ensure informed understanding, after which written consent was obtained. Data collection was carried out in a standardized manner, organized by class sessions, and completed questionnaires were immediately retrieved by the investigators on site.

3.4. Data analysis

3.4.1. Data cleaning and preprocessing

Initially, the dataset was screened for missing values. For entries with minor data loss, the multiple imputation technique was applied to ensure data completeness, whereas cases exhibiting extensive missing information were removed from further analysis. Following this preprocessing step, all continuous variables were standardized to facilitate subsequent statistical procedures.

3.4.2. Descriptive statistical analysis

Descriptive statistics (mean, standard deviation, skewness, and kurtosis) were calculated for each variable to assess the dataset's distributional characteristics.

3.4.3. Analysis of intermediary effects

Pearson or Spearman correlations were first conducted to explore the relationships between family educational investment, learning motivation, and self-efficacy. The mediating role of learning motivation was then examined separately for male and female subgroups using the PROCESS macro in SPSS. To improve the reliability of the mediation analysis, bootstrap resampling was applied to calculate confidence intervals for the indirect effects.

4. Result

4.1. Frequency analysis of population variables

Table 1. Population variables frequency analysis

Name	Option	Frequency	Percentage (%)	Cumulative percentage (%)
gender	woman	50	50.00	50.00
	man	50	50.00	100.00
Does the family own a car, van or truck?	A. No.	11	11.00	11.00
	B. yes, one	fifty-two	52.00	63.00
	C. Yes, more than one car.	37	37.00	100.00
How many computers are there at home (including desktop computers, notebook computers and tablet computers, excluding game consoles)?	A. No.	eight	8.00	8.00
	B. yes, one	34	34.00	42.00
	C. yes, two sets	25	25.00	67.00
	D. Yes, more than two. And smartphones)?	30	30.00	97.00
How many bathrooms are there in your home (rooms with bathtub and shower head or only shower head)?	A. No.	three	3.00	100.00
	B. yes, one	one	1.00	1.00
	C. yes, two	76	76.00	77.00
	D. Yes, more than two	15	15.00	92.00
About how many books are there in your home (don't count magazines, newspapers or school textbooks or reference books)	A.0 edition	eight	8.00	100.00
	B.1-10 copies	one	1.00	1.00
	C.11-25 copies	11	11.00	12.00
	D.26-100 copies	16	16.00	28.00
	E.101-200 copies	39	39.00	67.00
	F. More than F.200 copies	17	17.00	84.00
About how many new extracurricular books do parents buy for you every year?	A.0 edition	16	16.00	100.00
	B.1-10 copies	three	3.00	3.00
	C.11-25 copies	forty-nine	49.00	52.00
	D.6-100 copies	25	25.00	77.00
	E.101-200 copies	15	15.00	92.00
	F. More than F.200 copies	three	3.00	95.00
How many extracurricular books have you read?	A.0 edition	five	5.00	100.00
	B.1-10 copies	four	4.00	4.00
	C.11-25 copies	24	24.00	28.00
	D.26-100 copies	22	22.00	50.00
	E.101-200 copies	32	32.00	82.00
	F. More than F.200 copies	11	11.00	93.00
How many extracurricular talent classes (such as music, art, sports, calligraphy, hosting) have you participated in in the past three years?	A.0	seven	7.00	100.00
	B.1	28	28.00	28.00
	C.2	30	30.00	58.00
	D.3	18	18.00	76.00
	E.4	10	10.00	86.00
	F. Five	2	2.00	88.00
	G.6 or more (Chess, etc.)	four	4.00	92.00
How many remedial classes have you attended in the past three years (such as Chinese, Olympics, English, composition, etc.)	A.0	six	6.00	98.00
	B.1	2	2.00	100.00
	C.2	33	33.00	33.00
	D.3	16	16.00	49.00
	E.4	24	24.00	73.00
	F. Five	13	13.00	86.00
	G.6 or more	three	3.00	89.00
Pocket money given by parents every week	A. No.	four	4.00	93.00
	B.1-10 yuan	seven	7.00	100.00
	C.11-20 yuan	26	26.00	26.00
	D.21-50 yuan	twelve	12.00	38.00
	E.51-100 yuan	eight	8.00	46.00
	F. Above F.100 yuan	14	14.00	60.00

According to the data of this survey, 50% of men and 50% of women participated in the survey. In terms of family vehicles, most families own one or more cars, vans or trucks, accounting for 52% and 37% respectively, and a few families do not have such vehicles, accounting for 11%. In terms of the number of home computers, 34% have one, 25% have one, 33% have two or more computers (including 3% with three or more computers), and 8% have no computers. Most families have one bathroom, accounting for 76%. A few families have two or more bathrooms, accounting for 15% and 8% respectively. Only 1% of families have no bathroom. Family collections are diversified. Most families have 26 or more books, of which 26-100 books account for 39%, 101-200 books account for 17%, and more than 200 books account for 16%. Some families have fewer books, accounting for 1%, 11% and 16% respectively. Every year, parents buy 1-10 books for their children, accounting for 49%, and 11-25 books account for 25%. The number of books purchased is relatively low (0) and more (101 or more). The number of extracurricular books that students have read is mostly concentrated in 11 or more books, of which 26-100 books account for 32%, 11-25 books account for 22%, 101 books and above account for 18%, and some students read less, with 0 books and 1-10 books accounting for 4% and 24% respectively. In terms of extracurricular class participation, the number of people who participated in extracurricular talent classes in the past three years was scattered, with 0 accounting for 28%, 1 accounting for 30%, and 2 or more gradually decreasing; However, the number of participants in subject remedial classes is 0, accounting for 33%, 1-2, accounting for 40%, and the proportion of 3 or more is gradually decreasing. As for the pocket money given by parents every week, 26% of them have no pocket money, and 27% of them are above 100 yuan. The amount of pocket money in each file is relatively evenly distributed.

4.2. Reliability test

Cronbach's alpha coefficient is commonly used to assess a questionnaire's internal consistency and reliability, with values ranging from 0 to 1. A value above 0.70 typically indicates satisfactory reliability. To compute this coefficient, item scores are analyzed to evaluate inter-item correlations and internal consistency. Based on these calculations, Cronbach's alpha is derived. A high coefficient value indicates strong correlations and consistency between items, thereby signifying the instrument's high reliability. The reliability estimates for the questionnaire are presented in the table below.

Table 2. Reliability test

Number of terms	Sample size	Cronbach's alpha
38	100	0.912

4.3. Validity test

Validity refers to how well a measurement instrument assesses the intended construct. In this study, construct validity was evaluated using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity. The KMO statistic, ranging from 0 to 1, assesses sample adequacy, with higher values indicating stronger validity. A KMO value above 0.90 indicates excellent validity, 0.80-0.90 suggests good validity, 0.60-0.80 reflects moderate validity, and below 0.50 indicates inadequate validity. The validity results are shown in the table below.

Table 3. Validity test

KMO and Bartlett		
	KMO	0.766
	Approximate chi-square	2026.593
Bartlett sphericity test	<i>df</i>	703
	<i>P</i>	0.000

4.4. 4.4 Descriptive analysis

Table 4. Descriptive analysis of family educational investment, self - efficacy, learning motivation

name	Min	Max	M	SD	median
Family Educational Investment	1.250	4.000	3.598	0.722	3.875
Self - efficacy	2.273	4.682	3.801	0.555	3.841
Learning motivation	2.000	4.750	3.708	0.574	3.708

Judging from the scale score, the average Family Educational Investment index is 3.598, which is in the middle and high level, with a score range of 1.25-4.00; The average score of self-efficacy is 3.801, which is slightly higher than the Family Educational Investment, reflecting students' high recognition of their own abilities, ranging from 2.27 to 4.68; The average score of learning motivation is 3.708, which indicates that students' learning enthusiasm is in the upper-middle level, and its score range is 2.00-4.75.

4.5. Correlation analysis

Table 5. Correlation analysis of family educational investment, self - efficacy, learning motivation

	Family Educational Investment	Self - efficacy	Learning motivation
Family Educational Investment	1	-	-
Self - efficacy	0.780***	1	-
Learning motivation	0.734***	0.786***	1

Notes: * $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

The correlation analysis results show a coefficient of 0.780 between Family Educational Investment and self-efficacy, between Family Educational Investment and learning motivation is 0.734, and between self-efficacy and learning motivation is 0.786, all of which are statistically significant at the 0.001 level. These findings demonstrate a strong positive correlation among Family Educational Investment, self-efficacy, and learning motivation. Specifically, increased Family Educational Investment is correlated with higher levels of self-efficacy and learning motivation, while higher self-efficacy is positively associated with enhanced learning motivation.

4.6. Intermediary test

Table 6. Intermediary test of learning motivation

	Self - efficacy	Learning motivation	Self - efficacy
constant	1.645*** (9.219)	1.608*** (8.031)	0.924*** (4.630)
Family Educational Investment	0.599*** (12.323)	0.584*** (10.699)	0.338*** (5.427)
Learning motivation			0.448*** (5.731)
R ²	0.608	0.539	0.707
Adjust R ²	0.604	0.534	0.701
variance ratio	F (1,98)=151.856,p=0.000	F (1,98)=114.469,p=0.000	F (2,97)=117.022,p=0.000

Notes:* p<0.05 ** p<0.01 *** p<0.001,Made by Process plug-in in IBM SPSS 27.0

In the mediating effect model, the regression coefficient for Family Educational Investment to self-efficacy was 0.599 (p < 0.001), and to learning motivation, it was 0.584 (p < 0.001). The coefficient between self-efficacy and learning motivation was 0.448 (p < 0.001). The model fitting degree of Family Educational Investment to self-efficacy is good, R²=0.608, adjusted R²=0.604, f = 151.856 (P = 0.000); The model fitting degree of Family Educational Investment to learning motivation is good, R²=0.539, adjusted R²=0.534, f = 114.469 (P = 0.000); Self-efficacy and Family Educational Investment have a good fit to the model of learning motivation, with R²=0.707, adjusted R²=0.701 and F=117.022(p=0.000). Self-efficacy serves as a partial mediator in the relationship between Family Educational Investment and learning motivation.

Table 7. Total indirect effect table

item	Total indirect effect	Boot SE	Z value	P value	BootLLCI	BootULCI
Family Educational Investment => self-efficacy	0.262	0.063	4.147	0.000	0.218	0.466
Sum of indirect effects	0.262	0.063	4.147	0.000	0.218	0.466

The total indirect effect analysis reveals a value of 0.262 for Family Educational Investment on self-efficacy, with a Bootstrap standard error of 0.063, a Z-value of 4.147, and a P-value of 0.000, indicating statistical significance. The Bootstrap confidence interval, ranging from [0.218, 0.466] and excluding 0, further supports the significance of the indirect effect.

5. Discussion

This study undertook a multidimensional examination of family educational investment, extending previous research by considering not only financial contributions but also the significant influence of parental emotional support on adolescents' academic development. Furthermore, the analysis integrated gender differences to inform the design of more individualized and effective parenting approaches. If the findings are confirmed to be both generalizable and reliable, they may offer valuable insights for enhancing adolescents' self-

efficacy, promoting the cultivation of socially adaptive individuals, and contributing to broader societal well-being.

6. Limitations

This study conducted a comprehensive and multidimensional analysis of family educational investment, building upon prior research by not only examining the financial contributions made by families but also by emphasizing the crucial role of parental emotional support in shaping adolescents' academic growth and overall development. By exploring both tangible and intangible forms of parental involvement, the study provides a deeper understanding of how various aspects of family educational investment influence adolescents. Moreover, the study incorporated gender differences as a key variable to explore how parenting strategies can be tailored to address the specific needs and challenges faced by male and female adolescents, thereby enabling the development of more individualized, targeted, and effective parenting practices. Should the findings prove to be both generalizable and reliable, they have the potential to provide critical insights into strategies that can enhance adolescents' self-efficacy. In doing so, the study could contribute significantly to fostering the development of socially adaptive and well-adjusted individuals, ultimately promoting the psychological well-being of adolescents and supporting broader societal progress and cohesion.

7. Conclusion

This study aims to clarify the role of family educational investment in shaping adolescents' self-efficacy, focusing on the mediating influence of learning motivation. The results hold potential significance for parents, educators, and policymakers by informing strategies that support adolescents' psychological well-being and contribute to broader societal progress. To overcome the limitations of the present research, future studies are recommended to employ more integrative and multidimensional methodologies, thereby enabling a more comprehensive exploration of the topic and strengthening its relevance to practical applications.

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