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Article

Investigation and Strategy Research on the Causes of Middle School Students' Learning Difficulties in the Context of the Leading Country in Education

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Abstract: The purpose of this research is to analyze the causal mechanisms of learning difficulties of middle school students and use them to propose strategies to help them. This research is particularly valuable for its focus on middle school students. Research on this critical transition period is often lacking compared to primary and high school. Therefore, this research establishes a structured equation model and analyzes the data from the survey using the partial least squares method. The data were obtained from a 13,900 Wenzhou City, China students' questionnaire. The research found that learning strategies were the most significant influences on learning effectiveness, followed by learning motivation and learning relationships. Meanwhile, learning relationships had a significant impact on learning pressure. Therefore, this research proposes targeted support strategies. It aims to enhance learning motivation (Set achievable learning goals for each student with learning difficulties based on their actual situation), optimize learning strategies (Encourage students with learning difficulties to learn self-regulatory strategies such as goal setting, time management, and self-reflection), and improve learning relationships (Establish a good social network to promote positive interaction between students with learning difficulties and their peers). At the same time, it reduces students' learning pressure. Ultimately, the learning effectiveness of students with learning difficulties is improved.

Keywords: support strategies; leading country in education; students with learning difficulties; middle school students

1. Introduction

The Chinese Government has always emphasized the relationship between a leading country in education and a strong country. It has proposed accelerating the transformation from an extensive education country to a leading country in education (Huang & Zhang, 2020). Building a leading country in education is not just about quantitative increases but, more importantly, about qualitative improvements. Therefore, the Chinese Government promotes fairness in education to facilitate a balanced distribution of educational resources and improve the overall quality of education.

Some research suggests that promoting fairness in education can help students in different areas and at different levels to satisfy each student's learning needs and abilities (Mikk & Metcalf, 2020). Fairness in education is centered on ensuring that children at different levels of learning and with different needs can obtain educational

resources and support that match their abilities (Darling-Hammond & Adamson, 2014). Obviously, among these different levels of students, those relatively challenging to learn become the focus of support.

An analysis of the literature reveals that most research has focused primarily on the causes of the development of learning difficulties. Relatively little research has been done on interventions and strategies to address these problems (Fletcher et al., 2019; Zhang & Wang, 2020). Specifically, scholars have focused on the cognitive differences, socioeconomic background, and educational environment of students with learning difficulties (Duncan & Murnane, 2011). While these factors significantly impact the development of students with learning difficulties, there is still a lack of research on effectively improving the performance of students with learning difficulties through specific educational practices (Hughes et al., 2021; Li, 2022). At the same time, most of the research was focused on elementary, high school, and college students, but little attention was paid to middle school students (Langenkamp, 2010).

Therefore, this research poses three research questions:

(1) What factors cause learning difficulties in middle school students?
(2) Which of these factors causes poor learning effectiveness and learning pressure among middle school students?
(3) What are some reasonable support strategies to address the learning difficulties of middle school students?

2. Hypothesis Development

Learning effectiveness refers to the changes and improvements in knowledge, skills, and attitudes students achieve in the unique learning process, usually measured in academic achievement, comprehension, or problem-solving skills (Pintrich, 2003). In this research, learning effectiveness refers to the comprehensive experience of non-academic achievement, the ability to continue exploring learning, and the improvement of thinking and abilities through homework that students gain through learning activities in school.

Learning pressure refers to the negative and uncomfortable feelings that students experience when achieving learning goals. It can affect students' achievement motivation and academic performance (V. Covington M. et al., 2007). In this research, learning pressure refers to the physical and mental fatigue, tension, or anxiety that students feel during the learning process and their overall experience of self-perceived coping and ability to deal with learning pressure.

Learning motivation refers to the internal drive for an individual to participate in learning activities. This drive can be internal or external (Deci & Ryan, 2000).

In this research, learning motivation refers to the internal or external psychological factors that drive students to participate in and continue learning activities.

Related literature analysis shows that learning motivation is one of the key factors affecting students' learning effectiveness. In particular, students with high internal motivation usually achieve better academic performance and more profound understanding (Schunk, Pintrich, & Meece, 2008; Jiang et al., 2022). At the same time, there is a positive relationship between learning motivation and learning effectiveness. When learners' motivation levels increase, their performance in the classroom and learning effectiveness also improve significantly (Keller, 1987). Therefore, this research proposes the following hypothesis:

H1: *Learning motivation has a direct and significant positive effect on learning effectiveness.*

Learning strategies refer to the plans, techniques, and methods students use in learning. They are designed to enhance learning efficiency and effectiveness (Pintrich, 2000). In this research, learning strategies refer to the various methods and techniques students use in the learning process.

The use of learning strategies is inextricably linked to students' learning effectiveness. Empirical research almost unanimously shows that learning strategies positively affect learners' learning effectiveness (Plonsky et al., 2019). As Dunlosky et al. (2013) point out, specific learning strategies, such as spaced repetition and self-testing, can significantly improve long-term memory and learning effectiveness, especially in high-level cognitive tasks. This research proposes the following hypothesis:

H2: *Learning strategies have a direct and significant positive effect on learning effectiveness.*

Learning relationships refer to the interactions and connections between learners and teachers, peers, and family members in education and learning (Baker, 2006). The learning relationships in this research refer to the teacher-student, peer, and parent-child relationships.

On the one hand, collaboration and interaction between teachers and students directly impact students' learning effectiveness (Roorda et al., 2011). On the other hand, peer relationships among students also impact learning effectiveness (Schunk & DiBenedetto, 2020). Learning relationships not only affect students' learning effectiveness, but they are also closely related to their learning pressure. Baker (2006) suggests positive relationships between teachers and students can alleviate students' learning pressures, especially when facing academic challenges and difficulties. In addition, Liu et al. (2023) found that when a relationship is established between students and parents without mutual understanding, the stress and anxiety of both students and parents increase. Therefore, this research proposes the following hypotheses:

H3: *Learning relationships have a direct and significant effect on learning pressure.*

H4: *Learning relationships have a direct and significant positive impact on learning effectiveness.*

Students with learning difficulties experience cognitive, affective, or social barriers to learning. These barriers interfere with their academic performance in school environments despite often having normal or near-normal intelligence levels in other areas (Lyon et al., 2003). In this research, we use the degree of learning pressure and learning effectiveness as the degree of performance of students with learning difficulties. Students with learning difficulties have high learning pressure and low learning effectiveness.

Based on the above hypotheses, the learning difficulties model in this research includes three predictor variables (learning motivation, learning strategies, and learning relationships) and two dependent variables (learning pressure and learning effectiveness). Figure 1 shows the details.

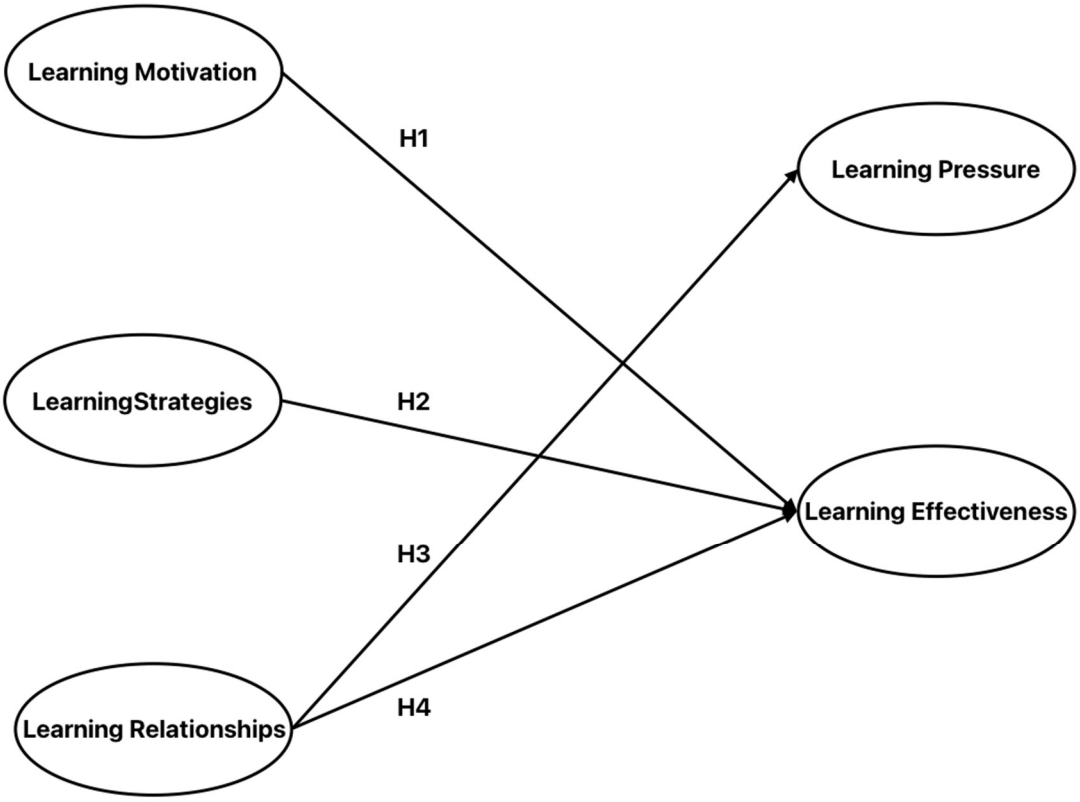

Figure 1. The learning difficulties model.

3. Measurement Scale

The data collection method involved using a five-point Likert scale that provided respondents with options ranging from "strongly disagree" to "strongly agree". To measure learning pressure, we used response options ranging from "hardly or never" to "always". To standardize model estimation for each option, the scale is defined as follows: "almost or never" corresponds to 1, "rarely so" corresponds to 2, "sometimes so" corresponds to 3, "often so" corresponds to 4, and "always so" corresponds to 5. A detailed presentation of the measurement scale and descriptive statistics is available in Table 1. The CR and AVE values for each construct are shown in Table 2.

"Learning pressure" consists of 5 items, all oriented toward physical and mental tiredness, tension, or anxiety felt during the learning process. Similarly, "learning effectiveness" consists of 3 items, "learning motivation" consists of 4 items, "learning strategies" consists of 7 items, and "learning relationships" consists of 3 items.

We also tested the scale's reliability and validity; the results showed that each construct met the reliability and validity criteria, and the composite reliability was also confirmed (Table 2) (Fornell & Larcker, 1981; Hair et al., 2013).

Table 1. Measurement scale and factor loadings.

Construct	Item	Items	Loading	STDEV
Learning Effectiveness	LE1	"I can achieve in other areas of school besides academic achievement."	0.739	0.069
	LE2	"I continue to learn by inquiry."	0.940	0.012
	LE3	"The assignment enhances my thinking, cognition, or ability, etc."	0.923	0.015
Learning Motivation	LM1	"I take the initiative to study even without supervision or prodding from parents or teachers."	0.766	0.058
	LM2	"I know exactly what the learning objectives are."	0.874	0.030
	LM3	"I am interested in and enjoy the learning activities in my classroom."	0.932	0.019
	LM4	"It is easier for me to be motivated and motivated to learn."	0.940	0.016
Learning Pressure	LP1	"Being in school always makes me feel exhausted."	0.853	0.032
	LP2	"I feel nervous, overwhelmed, or anxious when I think about studying."	0.868	0.029
	LP3	"Overall, I am in good academic shape."	0.824	0.059
	LP4	"I sometimes feel pressured to study but can make positive adjustments."	0.821	0.060
	LP5	"Compared to last semester, my study load was."	0.704	0.053
Learning Relationships	LR1	"I feel happy spending time with my teachers at school."	0.877	0.025
	LR2	"I feel happy spending time with my classmates/friends."	0.759	0.062
	LR3	"My family is constantly concerned and communicates with me about my life at school."	0.736	0.093
Learning Strategies	LS1	"I will memorize over and over what I think is important and needs to be remembered."	0.740	0.060
	LS2	"I can organize and synthesize what I have learned using mind maps, list grids (outlines), and drawing relationship diagrams."	0.787	0.044
	LS3	"When I create a study plan and realize that I cannot execute it in time, I adapt it to the situation."	0.778	0.045
	LS4	"I like to refer to various sources to get a multifaceted understanding."	0.888	0.027
	LS5	"I make reflective revisions based on feedback from teacher and classmate evaluations."	0.899	0.022
	LS6	"I like introducing new and different ways to explore problems and form solutions."	0.915	0.018
	LS7	"Through my studies and assignments, I learned how to solve real-life problems better."	0.873	0.029

Table 2. Construct reliability and validity.

	Cronbach's Alpha	Reliability Coefficient (rho_a)	Composite Reliability (rho_c)	AVE
Learning Effectiveness	0.840	0.883	0.904	0.761
Learning Motivation	0.901	0.911	0.932	0.775
Learning Pressure	0.873	0.880	0.908	0.666
Learning Relationships	0.712	0.762	0.835	0.629
Learning Strategies	0.931	0.944	0.945	0.710

4. Sample Characteristic

For Partial Least Squares Structural Equation Modeling (PLS-SEM), choosing the right sample size is crucial to ensuring the accuracy and validity of the findings. Some researchers recommend a minimum sample size of 100–200 observations (Kock, 2018). Therefore, a significant sample size of 100 observations was selected for this research (Table 1).

The questionnaires were distributed to students in grades 7 and 8 at 21 schools in Wenzhou, China. The students also filled them out directly in class. The research took place over about one month. A total of 13,900 valid responses were collected, resulting in a response rate of 95.36%. In terms of gender in the sample, there were 7241 female students (52.0%) and 6659 male students (48.0%), with an equal ratio of male to female students. Figure 2 shows the details. In addition, this research mainly selected students in grades 7 and 8 as the research subjects, including 7508 grade 7 students (54.0%) and 6392 grade 8 students (46.0%), with an overall equal ratio. Figure 3 shows the details.

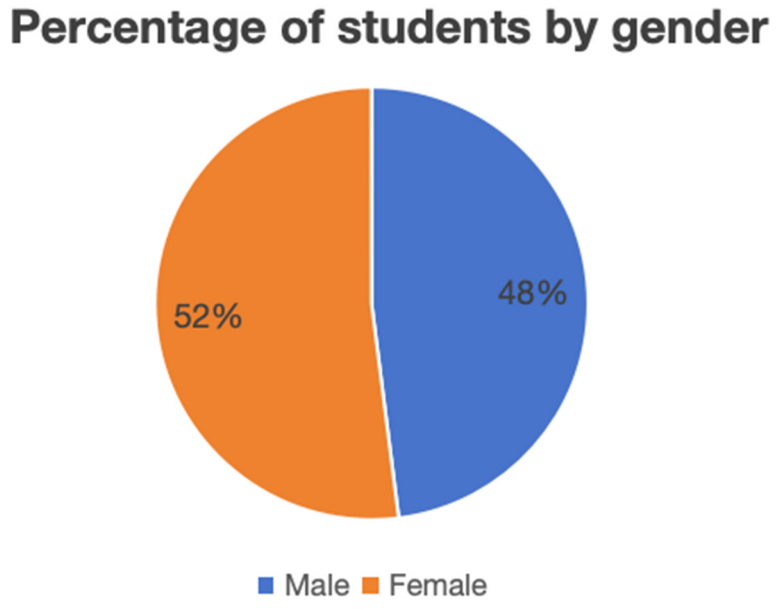

Figure 2. Gender ratio of survey respondents.

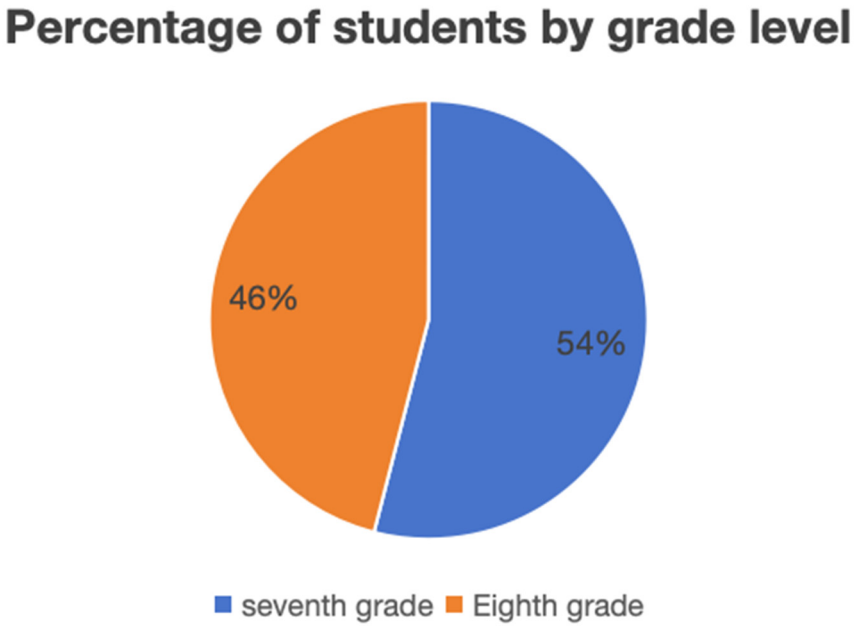

Figure 3. Percentage of survey respondents by grade level.

5. Results

To estimate the model, we used the PLS-SEM algorithm with the weighting path scheme in SmartPLS 4 software (Version 4.1.0.9) with a maximum of 3000 iterations and default initial weights, and employed bootstrapping, a nonparametric procedure, running 100 samples, to determine the statistical significance of the PLS-SEM results. Following the recommended method of Ringle et al. (2022), Reflectively specified constructs were analyzed using the indicator loadings, and an indicator loading above 0.7 suggested that the construct

accounted for more than 50% of the variance in the indicator, indicating an acceptable level of item reliability. The analysis results in this research show that the reliability of the project has reached an acceptable level. Details are shown in Table 1.

Composite reliability is a standard for evaluating reliability, with results ranging from 0.70 to 0.95, indicating acceptable to reasonable levels of reliability (Hair et al., 2022). Internal consistency reliability was measured using Cronbach's alpha, which uses similar thresholds as composite reliability (ρc). Another reliability coefficient, ρA, based on Dijkstra (2010), was also used to provide an exact and consistent alternative. The average variance extracted (AVE) from all items linked to a specific reflective variable was used to assess the convergent validity of the measurement models, and an AVE threshold of 0.50 or higher was deemed acceptable (Sarstedt et al., 2022). The values of composite reliability, Cronbach's alpha, reliability coefficient, and AVE for this research model have met the standards. Details are shown in Table 2.

The coefficient of determination (R^2) is then assessed to determine the explanatory power of each construct and the overall model. R^2 ranges from 0 to 1, and higher values indicate enormous explanatory power. As a general rule of thumb, R^2 values of 0.25, 0.50, and 0.75 are considered weak, moderate, and substantial, respectively (Hair et al., 2011). To determine the effect size of a variable, f^2 values of 0.35, 0.15, and 0.02 correspond to large, medium, and minor effects, respectively, and values below 0.02 suggest an absence of impact (Sarstedt et al., 2022).

The analysis revealed that the strongest predictor of "learning effectiveness" was "learning strategies", having a coefficient of 0.541, followed by "learning motivation" (0.349) and "learning relationships" (0.123). "Learning relationships" had a significant impact on "learning pressure", having a coefficient of 0.639.

Table 3 shows the f^2 values for these variables. "Learning relationships" has the most substantial effect on "learning pressure" with an f^2 value of 0.690. An f^2 value greater than 0.35 indicates a strong effect, followed by the "learning strategies" to "learning effectiveness" (0.368), which also indicates a strong effect, and "Learning motivation" to "learning effectiveness" (0.156) is between 0.35 and 0.15, showing a moderate effect, and "learning relationships" to "learning effectiveness" (0.097) is between 0.15 and 0.02, showing a slight effect.

In Figure 4, the R^2 value of LE is 0.880, which is greater than 0.75. This is considered to show that "learning motivation", "learning strategies" and "learning relationships" have significant explanatory power on "learning effectiveness". The R^2 value of LP is 0.408, which is greater than 0.25. This is considered to show that "learning relationships" have a weak explanatory power on "learning pressure".

The commonly used significance levels for *p*-values are 0.05, 0.01, and 0.001. These levels correspond to the criteria * $p < 0.05$ (statistically significant), ** $p < 0.01$ (very significant), and *** $p < 0.001$ (highly significant), respectively (Biau et al., 2010; Wasserstein & Lazar, 2016). Table 3 shows the results of the Bootstrapping algorithm analysis. The *p*-values for both "learning relationships → learning pressure" and "learning strategies → learning effectiveness" are less than 0.001, which is less than 0.000, indicating that the impact of learning relationships on learning pressure is highly significant and the impact of learning strategies on learning effectiveness is highly significant. The *p*-value for "learning motivation → learning effectiveness" is 0.004, which is less than 0.01, indicating that the impact of learning motivation on learning effectiveness is very significant. The *p*-value for "learning relationships → learning effectiveness" is 0.010, which is less than 0.05, indicating that the impact of learning relationships on learning effectiveness is statistically significant.

The above analysis results show that hypotheses 1, 2, 3, and 4 are all valid and significant. Table 3 presents the significance tests for the structural model's path coefficients and hypotheses confirmation.

Table 3. Path coefficients and the results of the significance tests.

Hypothesis	Path	Coefficient	*p* Values	f^2	Confirmed
H1	LM → LE	0.349	0.004	0.156	Yes
H2	LS → LE	0.541	0.000	0.368	Yes
H3	LR → LP	0.639	0.000	0.690	Yes
H4	LR → LE	0.123	0.010	0.097	Yes

Note: Learning Effectiveness = LE, Learning Motivation = LM, Learning Pressure = LP, Learning Relationships = LR, Learning Strategies = LS.

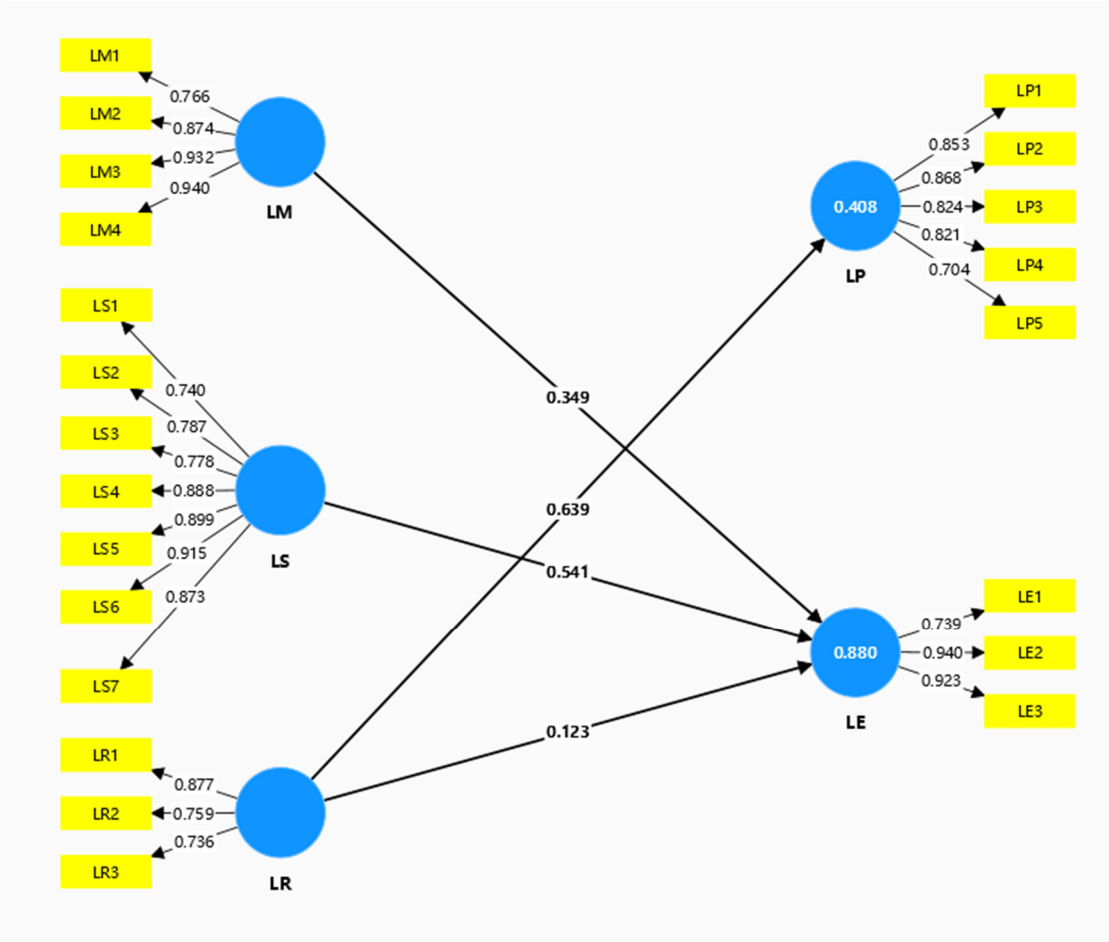

Figure 4. The learning difficulties resulting from model. Note: Learning Effectiveness = LE, Learning Motivation = LM, Learning Pressure = LP， Learning Relationships = LR, Learning Strategies = LS.

6. Discussion

The results of this research support Hypothesis 1: Learning motivation has a direct and significant positive impact on learning effectiveness. Our research confirms the findings of Lei et al. (2024) that "learning motivation" has a positive impact on "learning effectiveness" with a moderate effect (f^2 = 0.156). The p-value of "learning motivation" on "learning effectiveness" in the path coefficient of the Bootstrapping algorithm is 0.004 ($p < 0.01$), which is considered to be a very significant effect of learning motivation on learning effectiveness. This also confirms that there is a significant positive correlation between learning motivation and learning effectiveness.

The group of students with learning difficulties often lack sufficient learning motivation, which directly affects their learning effectiveness. To help these students, we can propose support strategies in the following areas: First, stimulate internal motivation and set achievable short-term and long-term learning goals for each student with learning difficulties based on their actual situation. For example, weekly target progress wall stickers can be used to break long-term goals down into 5–7 quantifiable milestones, and a customized digital badge can be issued for each completed stage. Second, improve the learning environment. The strategy for changing the educational environment should start with unifying the definition and diagnostic criteria for learning difficulties, paying attention to the individual education plan for students, and providing multi-level educational placements. This means that schools should provide a variety of educational environments, such as regular classes, resource rooms, and separate classes based on students' learning situations. For example, a dynamic learning environment assessment system has been established, which stipulates that resource classrooms must be equipped with a 1:3 teacher-student ratio and multimedia interactive equipment and that environmental adaptability assessments must be conducted twice each semester. Third, promote home-school cooperation. The family is an important influence on students' learning motivation. For example, a digital platform for home-school cooperation has been developed, requiring parents to sign the learning log three times a week, and an AI-driven motivation level early warning system has been set up, which automatically sends home-school communication reminders when students fail to reach the basic learning duration for three consecutive days.

The results of this research support Hypothesis 2: Learning strategies have a direct and significant positive impact on learning effectiveness. We found that "learning strategies" were the most significant influences on "learning effectiveness" (path coefficient 0.541), and the *p*-value of "learning strategies →learning effectiveness" in the Bootstrapping algorithm path coefficient is 0.000, which is less than 0.001, indicating that the impact of learning strategies on learning effectiveness is highly significant. These results are consistent with previous research findings, which show a positive correlation between "learning strategies" and "learning effectiveness" (Collins, 2009).

Therefore, this research can improve learning strategies in the following three ways: First, it can provide students with learning difficulties with achievable learning tasks in the short term and improve their learning motivation through a reward mechanism. For example, designing a "microtask challenge" system, breaking down knowledge points into interactive modules that can be completed in 15 minutes (e.g., mathematical applications can be broken down into three levels: reading the question, formula, and calculation), and unlocking physical reward coupons after completing every five modules. Second, it can provide students with learning difficulties with specialized learning resources and tools, such as online learning platforms, supplementary materials, and video resources. For example, we have developed an intelligent learning resource package that includes electronic teaching materials with adjustable reading difficulty (supporting five levels of text complexity settings) and a mistake analysis tool with instant feedback. In addition, it encourages students with learning difficulties to learn self-regulatory strategies such as goal setting, time management, and self-reflection. For example, a "strategies mentor" program can be implemented, in which each student with learning difficulties is matched with a trained peer mentor to carry out 30-minute strategies workshops twice a week.

The results of this research support Hypothesis 3: Learning relationships have a direct and significant impact on learning pressure. Our research shows a strong correlation between "learning relationships" and "learning pressure" ($f^2 = 0.690$). The *p*-value of the Bootstrapping algorithm's path coefficient for "learning relationships → learning pressure" is 0.000, which is less than 0.001, indicating that the effect of learning relationships on learning pressure is highly significant. This also confirms the results of previous research, which found that learning relationships can significantly affect students' pressure levels in different learning environments (Göktaş, 2023).

To improve the learning pressure of students with learning difficulties, support can be provided in the following two ways: First, courses or workshops on emotional management and stress regulation can be provided to help students with learning difficulties master self-regulation strategies. For example, weekly class emotional management workshops and monthly school-level stress workshops. These can include techniques such as deep breathing, mindfulness exercises, and goal setting so that they can better cope with academic pressure. Second, counseling and academic guidance centers can be set up in schools to provide regular emotional and academic support for students with learning difficulties. For example, a district-level professional psychological counselor rotation system that can be scheduled at any time can be set up.

The results of this research support Hypothesis 4: Learning relationships have a direct and significant positive impact on learning effectiveness. Our research shows that "learning relationships" have a positive relationship with "learning effectiveness" ($f^2 = 0.097$). The *p*-value of "learning relationships →learning effectiveness" on the path coefficient of the Bootstrapping algorithm is 0.010, which is less than 0.05. It is considered that the impact of learning relationships on learning effectiveness is statistically significant. This is consistent with the research by Tan et al. (2021), which shows that teacher-student interactions have a significant impact on promoting academic achievement.

For groups with learning difficulties, their academic performance can be improved in the following ways: First, set up a dedicated learning support program to provide learning support through upper-level students or volunteer teachers to help students in need overcome their academic weaknesses. In addition, establish a good social network to promote positive interactions between students with learning difficulties and their peers and enhance their sense of belonging and motivation to learn. For example, a "learning partner" matching system can be created. Based on learning style assessments and interest maps, three learning partners can be intelligently recommended for each student with learning difficulties, and they are required to complete two structured peer learning sessions per week.

7. Conclusions and Limitation

This research aims to explore the causal mechanisms of middle school students' learning difficulties in the context of the leading country in education and to propose corresponding support strategies. The research focuses on analyzing the significant impact of "learning motivation," "learning strategies," and "learning relationships"

on middle school students' learning difficulties and revealing the key factors affecting students' academic performance.

However, this research has certain limitations. Although the survey sample included students from different family backgrounds, it was limited to schools in some areas and could not fully reflect middle school students in different regions of China. Future research can expand the sample scope and collect data on a larger scale in schools in different regions to ensure the representativeness and broad applicability of the results.

Author Contributions

J.-J.Y.: Writing—original draft, Methodology, Investigation, Funding acquisition, Methodology, Formal analysis, Conceptualization; X.-N.L., H.-L.Z.: Conceptualization, Writing—original draft, Writing—review & editing; Q.-F.Z.: Conceptualization, Methodology, Investigation, Writing—original draft, Writing—review & editing; J.-N.W.: Methodology, Writing—original draft. All authors have read and agreed to the published version of the manuscript.

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Informed Consent Statement

Informed consent was obtained from all subjects involved in the study.

Data Availability Statement

The data and materials are available upon request to the corresponding author.

Conflicts of Interest

The authors declare no conflict of interest.

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