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The Effects of Self-Confidence and Learning Commitment on Learning Independence: The Mediating Role of Intrinsic Motivation

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ABSTRACT

Confidence, motivation, and learning independence are key psychological factors in elementary students' academic success. However, limited research has examined these constructs simultaneously within a comprehensive structural model, particularly in the Indonesian elementary education context. This study examines the effects of self-confidence and learning commitment on learning independence, with intrinsic motivation as a mediating variable among elementary school students in Cirebon, Indonesia. This study analyzes the relationship between self-confidence, learning commitment, intrinsic motivation, and learning independence among elementary school students. The study uses a quantitative approach with an explanatory survey design. The research sample consisted of 360 elementary school students who were selected using probability sampling techniques. Data were collected through a Likert scale questionnaire and analyzed using Partial Least Squares Structural Equation Modeling. Learning commitment positively and significantly affected intrinsic motivation and learning independence. Self-confidence also positively affected intrinsic motivation and learning independence, though with a smaller influence. Intrinsic motivation did not significantly affect learning independence. The mediation analysis showed that intrinsic motivation did not significantly mediate the relationship between the independent and dependent variables. PLS-predict results show that the model has strong predictive relevance. These results imply that classroom strategies aimed at enhancing students' intrinsic motivation and independent learning behavior should prioritize strengthening learning commitment, and that interventions relying solely on motivational messaging may be insufficient without concurrent efforts to build sustained learning commitment.

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1. INTRODUCTION

Psychological factors play an important role in elementary school students' learning because they can influence students' academic experiences, learning behavior, and achievement. One of the psychological challenges commonly experienced by students is learning anxiety. Learning anxiety refers to worry, fear, or tension that arises when students face learning activities or academic demands. Approximately 56% of students report experiencing anxiety when facing academic tasks, particularly in subjects that require high cognitive abilities, such as mathematics and reading [1]. These findings are reinforced by the UNESCO report. In addition, a UNESCO report indicates that academic stress experienced at an early age may negatively affect students' psychological well-being [2]. These conditions may show up in elementary school learning as reluctance to participate in classroom activities, fear of making mistakes, and a lack of confidence when completing academic tasks.

Learning anxiety and learning commitment are two variables that often emerge as crucial factors in elementary school students' learning process. Research shows that about 45% of elementary school students experience moderate to high levels of learning anxiety, which negatively impacts academic performance and class participation [3]. High learning anxiety makes it difficult for students to understand the material, avoid assignments, and show low confidence when facing learning evaluations. In contrast, low learning commitment is characterized by a lack of perseverance, discipline, and student involvement in learning activities [4]. This condition worsens learning outcomes and hinders the development of positive attitudes towards learning. The relationship between learning anxiety, learning commitment, and self-confidence becomes increasingly complex when motivational factors play a role in students' psychological processes. This shows that the problems are not single but multidimensional and interrelated.

Learning independence is an important outcome in elementary education because it shows students' ability to manage their own learning, such as starting tasks, completing assignments, managing time, and taking responsibility for their learning. At the elementary level, developing this ability matters because students gradually take more responsibility for their learning. Previous research has also shown that students' beliefs about their abilities relate to learning independence [5]. Therefore, this study positions learning independence as the main dependent variable.

Learning anxiety is defined as an emotional condition in the form of feelings of tension, worry, and fear that arise in learning situations, especially when facing academic demands [6]. Learning commitment refers to students' level of engagement with learning activities, demonstrated through effort, perseverance, and consistency [7]. Self-confidence is understood as an individual's belief in their ability to complete tasks and face learning challenges [8]. Motivation as a mediating variable is defined as internal and external motivation that directs student learning behavior [9]. Self-efficacy theory and *self-determination* provide the basis for the view that confidence and motivation are closely related in influencing learning behavior. Recent research shows that intrinsic motivation can reduce the negative impact of learning anxiety and increase student confidence [10]. In this

study, anxiety and commitment are positioned as determinant factors, motivation as mediators, and confidence as an observed psychological outcome.

Self-confidence and learning commitment may influence learning independence in different ways. Self-confidence can encourage students to believe they can complete learning tasks, while learning commitment can encourage them to remain consistent and responsible in completing those tasks. Students who believe in their abilities and remain committed to learning are therefore more likely to manage their learning independently. However, self-confidence should not be considered the same as self-efficacy. Self-efficacy refers to a person's belief that they can perform a specific task, while self-confidence is a broader feeling of assurance about one's ability. Thus, this study uses self-efficacy theory only to explain the role of students' perceived ability in learning behavior, not to treat self-confidence and self-efficacy as identical constructs.

The relationship between learning anxiety and self-confidence has been extensively studied, with results showing a significant negative correlation. Increased learning anxiety correlated with decreased student confidence in completing academic assignments [11]. Other findings suggest that learning commitment is positively related to self-confidence because highly engaged students tend to be more confident in their abilities [12]. Learning motivation has been shown to mediate this relationship, strengthening or weakening it. Intrinsic motivation can reduce the negative effects of anxiety on self-confidence [13]. However, some studies have found inconsistent results, where anxiety to a certain degree can actually increase students' alertness and performance [14]. This analysis shows that the relationship between variables is dynamic and is influenced by other psychological factors that play a simultaneous role.

Several previous studies have examined the influence of learning anxiety, learning commitment, and motivation on various aspects of student learning outcomes. Direct relationships between variables have been examined without considering the mediation model comprehensively [13], [14]. Other studies tend to focus on secondary and higher education, so elementary school students have received limited attention. Research that integrates learning anxiety and simultaneous learning commitments in a single structural model is also limited. Researchers have not empirically tested motivation as a mediating variable in the context of primary school students' confidence, especially in Indonesian education. This gap shows the need for research that examines variable relationships more comprehensively and contextually. This study's novelty lies in integrating self-confidence and learning commitment as joint predictors of intrinsic motivation and learning independence within a single structural equation model, tested empirically among elementary school students in Cirebon. This primary-education context remains underexplored relative to secondary and higher education settings in the existing literature.

This research is urgent for the development of educational psychology studies, especially regarding factors that affect students' confidence from an early age. Theoretically, this study contributes to enriching the conceptual model of the relationship between learning anxiety, learning commitment, motivation, and self-confidence. Practically, the results can serve as a basis for teachers to design learning strategies that reduce anxiety and increase student commitment and motivation to learn. The right intervention is expected to increase

student confidence and improve learning outcomes. Educational institutions can also use these findings as a reference for developing learning policies more oriented toward students' psychological well-being. This research is even more relevant in basic education, which emphasizes character formation and long-term learning readiness.

This study aims to analyze the influence of learning anxiety and learning commitment on elementary school students' confidence, considering motivation as a mediating variable. The study's specific objectives include testing the direct effect of learning anxiety on self-confidence, the effect of learning commitment on self-confidence, and the indirect influence through learning motivation. The research questions asked whether learning anxiety negatively affects self-confidence, whether learning commitment positively affects self-confidence, and whether motivation mediates the relationship between these variables. The research hypothesis was formulated structurally to test the direct and indirect relationships between variables. These objectives are formulated in line with the problems and research gaps identified previously.

The conceptual framework illustrates that learning anxiety negatively influences self-confidence, while learning commitment positively influences it. Learning motivation is positioned as a mediating variable that bridges the relationship between the independent and dependent variables. The direction of this relationship is based on the theories of *self-efficacy and self-determination*, which emphasize the importance of internal factors in determining learning behavior. This study uses a quantitative approach with an explanatory correlational design. The subjects of the study were elementary school students who were selected through certain sampling techniques. The research instrument is a questionnaire using a rating scale that has been tested for validity and reliability. Data analysis is carried out using *Structural Equation Modeling* to test the direct and indirect relationships between variables simultaneously.

Learning independence is an essential competency students must have to meet the demands of 21st-century learning. In an academic context, independence includes not only the ability to learn independently but also initiative, critical thinking skills, responsibility, and the ability to synthesize knowledge. This aligns with findings that the concept of independence is multidimensional and highly contextual in education [15]. Developing learning independence is an important foundation for forming students who are adaptive and reflective in their learning process.

In addition, learning independence cannot be separated from the formation of students' self-concepts. Self-concept and self-esteem are not formed instantly from birth, but develop through social interaction, especially in the family environment. Parents play a significant role in shaping students' self-perception, which ultimately affects their confidence and learning independence [16]. Students with positive self-concept tend to have higher confidence in managing their learning process independently.

Intrinsic motivation is a key factor that strengthens learning independence. Intrinsic motivation is described as the main determinant of optimal learning outcomes and as an internal driver that helps students learn independently without heavy reliance on others [17]. With strong internal motivation, students are more active, diligent, and responsible in the learning process. The urgency of research on independence and learning motivation is

further strengthened by empirical findings showing the significant influence of these two variables on students' academic achievement. Learning independence and intrinsic motivation positively contribute to improved student learning outcomes [18]. Students with high levels of independence and motivation tend to achieve better academic outcomes.

Intrinsic motivation may explain how self-confidence and learning commitment are related to learning independence. Based on Self-Determination Theory, intrinsic motivation develops when students' basic psychological needs for autonomy, competence, and relatedness are supported. Autonomy means students feel that they have choices in learning, competence means they feel capable of completing learning tasks, and relatedness means they feel supported and connected to teachers and peers [19], [20]. In this study, self-confidence is mainly related to the need for competence, while learning commitment may support students' continued engagement in learning. These conditions may encourage intrinsic motivation and, in turn, support learning independence. However, intrinsic motivation may not always lead directly to independent learning because elementary-school students may still need guidance from teachers and parents.

In modern learning, especially digital-based learning, independence and self-regulation are becoming increasingly important. Managing learning independently is needed to improve students' problem-solving skills [21], [22]. This shows that transforming the learning system requires students to depend less on teachers and manage learning strategies independently.

Learning commitment also has an important role in shaping learning independence. Learning commitment is the most substantial factor in building self-regulated learning [23]. High commitment will encourage students to remain consistent, disciplined, and responsible in completing academic assignments. Various problems are still found in the practice of learning in the field. Many students still show independent behavior, such as cheating, due to low motivation to learn [24]. In addition, although independent learning has a positive influence, student learning outcomes in some cases still do not reach the minimum completeness standard (KKM). Other factors also affect the relationship between independence and learning outcomes [25].

Previous research results on the relationship between independence, commitment, and academic achievement are inconsistent. Berek's research shows that, in a given context, no significant relationship was found between these variables [26]. This inconsistency indicates a research gap that needs further study, especially by considering other variables that may moderate or mediate the relationship.

In addition to internal factors, various external factors also influence independence and motivation to learn. Digital literacy is important in increasing students' learning motivation in the technological era [27]. Meanwhile, it shows that parental parenting and emotional intelligence play a role in shaping students' learning independence [28]. In the school environment, the role of teachers, including providing positive reinforcement such as praise, is very important in increasing students' confidence and independence [29].

Learning independence, motivation, and commitment to learning are interrelated variables that determine student learning success. However, empirical findings remain inconsistent, and complex external factors also influence these relationships. This research

is important because it will provide a more in-depth study of the relationship between these variables, especially in the context of elementary school students, while considering the role of relevant mediation and moderation variables.

Previous studies have examined self-confidence, motivation, commitment, and learning independence, but the relationships among these variables have not always been examined in one model, especially among elementary-school students. In particular, it remains unclear whether intrinsic motivation explains the relationship between self-confidence, learning commitment, and learning independence. Therefore, this study examines the effect of self-confidence and learning commitment on learning independence, with intrinsic motivation as a potential mediating variable. This model positions learning independence as the main outcome and clarifies how students' psychological and motivational factors may contribute to independent learning.

2. METHOD

This research uses a quantitative approach with survey techniques and an explanatory design. The quantitative approach is appropriate because it allows accurate measurement of variables and hypothesis testing through inferential statistical analysis [30]. According to Sugiyono, explanatory design is used to explain how independent variables affect dependent variables and how moderation variables serve to strengthen or weaken those relationships [31].

This study's population consists of all elementary school students in Cirebon. The sampling technique uses probability sampling, meaning every member of the population has an equal chance of being selected [32]. The sample size of 360 students was determined through an a priori power analysis based on the expected effect size, significance level ($\alpha = 0.05$), statistical power (0.80), and the maximum number of predictors in the structural model. This approach was used because power analysis provides a more appropriate basis for determining the minimum sample size in PLS-SEM than relying only on heuristic rules [33]. The questionnaire measured four constructs: self-confidence, learning commitment, intrinsic motivation, and learning independence. The instruments were adapted from previously validated measures and adjusted to the elementary-school context. Each construct was measured on a four-point Likert scale. The adaptation included wording adjustments, content review, and language checks to ensure the items were understandable to elementary-school students. Validity was assessed using outer loadings, AVE, and HTMT, while reliability was assessed using Cronbach's alpha and composite reliability [34], [35]. The Likert-scale questionnaire was designed to systematically measure participants' perceptions of each research variable [36]. Data collection was carried out by distributing questionnaires online and offline for a set period, with informed consent obtained from participants.

The research instrument consisted of a structured Likert-scale questionnaire measuring four latent constructs: Confidence (CF, 3 items), Intrinsic Motivation (IM, 3 items), Learning Commitment (LC, 5 items), and Learning Independence (LI, 3 items); the complete item list and response scale are provided in the instrument appendix. In terms of variables and measurement, Confidence and Learning Commitment were treated as exogenous variables, Intrinsic Motivation was positioned as the mediating variable, and

Learning Independence served as the primary endogenous outcome variable; each construct was measured reflectively using the indicators summarized in Table 1.

The PLS-SEM measurement model evaluated the validity and reliability of the research instrument using outer loading values, Cronbach's Alpha, Composite Reliability, and Average Variance Extracted (AVE) as the primary criteria, following the thresholds recommended by Hair [37]. The detailed results of this evaluation are presented in the Results section. This study obtained informed consent from parents or guardians and cooperating school authorities prior to data collection; participation was voluntary, respondent identities were kept anonymous, and all collected data were used solely for research purposes in accordance with prevailing ethical standards for research involving minors.

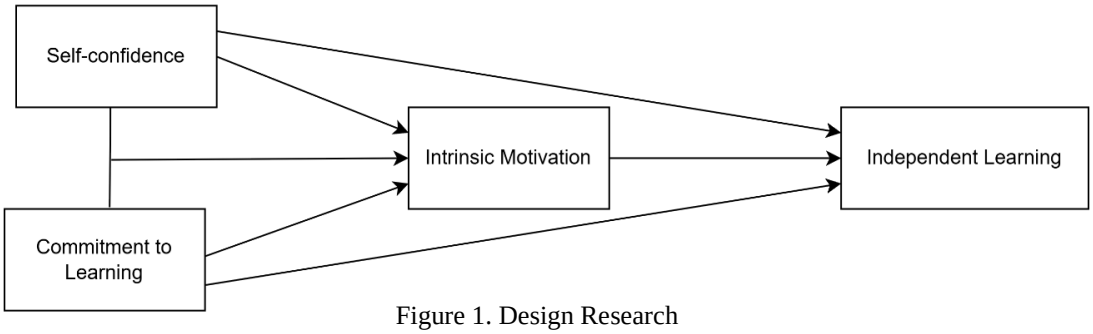


Figure 1. Design Research

To determine the direction and significance of moderation's influence on the relationship between variables, PLS-SEM and an interaction term were used to conduct moderation analysis [37]. Several important metrics are used to assess the model. These include the predictive relevance (Q2) to evaluate the predictive relevance of the model, the coefficient of determination (R2) to measure the model's predictive ability, the influence size (f2) to measure the strength of influence of each variable, and the square root of the R-squared (R1) to assess the model's predictive ability [37]. To analyze the moderation effect, an interaction variable between the independent and moderation variables is created. This is done to determine whether the moderation variable significantly strengthens or weakens the relationship between the independent and dependent variables. PLS-SEM was conducted using SmartPLS 4. The method was selected because the study examines a predictive structural model containing multiple latent constructs and direct and indirect relationships. Bootstrapping with subsamples was conducted to assess the significance of the estimated relationships. The measurement model was evaluated using outer loadings, Cronbach's alpha, composite reliability, AVE, and HTMT, while the structural model was assessed using R^2, f^2, Q^2_predict, and path coefficients. Indicators that did not meet the measurement criteria were reviewed and removed only when statistically and theoretically justified. Standard PLS-SEM terminology, including R^2, f^2, and Q^2_predict, is used throughout the analysis [38], [39].

3. RESULTS AND DISCUSSION

This section presents the findings from the measurement model and structural model evaluations using PLS-SEM, followed by an interpretation of the results in relation to the

study's hypotheses, theoretical framework, and previous research. Evaluating the measurement model (outer model) is an important stage in Partial Least Squares Structural Equation Modeling (PLS-SEM) to ensure that the indicators accurately measure latent constructs. According to Hair, the outer model test is carried out by evaluating convergent validity, discriminant validity, and construct reliability [37]. Convergent validity shows the extent to which indicators within a construct are highly correlated in measuring the same concept. Sarstedt also explains that adequate outer loading values indicate good instrument quality in representing the latent variables studied [40]. In addition, Ramayah's results emphasized that evaluating outer loadings is an important first step before testing the structural model because measurement quality affects the accuracy of interpreting the relationships between variables in the research model [41]. Therefore, this study first evaluates convergence validity through outer-loading values.

1. Output Algorithm

The PLS Algorithm is the initial stage in Partial Least Squares Structural Equation Modeling (PLS-SEM) and is used to estimate the relationships between indicators and latent constructs, as well as the relationships between constructs in the research model. This process generates important information, such as outer loading values, construct reliability, convergent validity, discriminant validity, and initial path coefficients, which are used to evaluate the quality of measurement and structural models. According to Ghozali, the PLS algorithm results ensure that the indicators used in the study represent latent variables measured validly and reliably before hypothesis testing through the bootstrapping procedure [42].

Prior to interpreting the measurement model, it is useful to note the demographic profile of the 360 elementary school respondents (e.g., grade level, gender distribution, and school type), as this information provides context for interpreting the structural model results presented below. In this study, the algorithm results were used to evaluate the measurement model (outer model), which consists of four constructs: Confidence (CF), Intrinsic Motivation (IM), Learning Commitment (LC), and Learning Independence (LI). Confidence (CF) describes the level of confidence students have in their ability to complete tasks, solve problems, and face various learning challenges effectively. Students with higher confidence tend to participate more actively in learning activities and are more willing to take initiative in overcoming academic difficulties. Intrinsic Motivation (IM) reflects the internal drive of students to learn due to interest, curiosity, enjoyment, and satisfaction in acquiring new knowledge and skills. This construct emphasizes learning behaviors that arise from personal interest rather than external rewards or pressures. Learning Commitment (LC) reflects students' seriousness, responsibility, persistence, and consistency in carrying out the learning process to achieve academic goals. Students with strong learning commitment are generally more dedicated to completing assignments, attending learning activities, and staying focused on educational objectives.

Meanwhile, Learning Independence (LI) describes students' ability to organize, direct, monitor, and manage their learning activities independently without relying heavily on others. Learning independence also includes the capacity to make learning decisions,

utilize appropriate learning strategies, and evaluate learning outcomes to support continuous academic improvement. These four constructs were selected because they represent important psychological and behavioral factors that contribute to students' learning success and academic development.

These four constructs are important factors in the learning process because they are interrelated and shape students' learning success. Therefore, before testing the relationships between variables in a structural model, it is necessary to ensure that each indicator accurately measures its intended construct. The initial evaluation is carried out through outer loading testing to determine the extent to which each indicator explains the latent construct being measured. The results of the outer loading test are presented in Table 1.

Table 1. Outer Loading

Indicator	Outer Loading
CF1	0.795
CF2	0.811
CF3	0.767
IM10	0.855
IM11	0.605
IM9	0.606
LC26	0.798
LC27	0.676
LC28	0.552
LC29	0.577
LC30	0.720
LI18	0.572
LI19	0.688
LI20	0.749

The outer loading test results showed that all indicators in the Confidence (CF), Intrinsic Motivation (IM), Learning Commitment (LC), and Learning Independence (LI) constructs had loading factor values above 0.50. An indicator is declared to meet convergent validity if it has an outer loading value greater than 0.50, and a value above 0.70 indicates an excellent contribution to the measured construct [37]. In this study, the indicators CF1 (0.795), CF2 (0.811), CF3 (0.767), IM10 (0.855), LC26 (0.798), and LI20 (0.749) showed strong ability to represent their respective constructs. Although several indicators have relatively low loadings, such as LC28 (0.552), LC29 (0.577), and LI18 (0.572), these values remain above the minimum acceptable limit. Thus, all indicators are declared valid and feasible for measuring latent variables in this study.

Before interpreting the results in Table 2, it should be understood that the validity and reliability of constructs in quantitative research, especially those that use measurement model approaches such as *Structural Equation Modeling* (SEM) or *Partial Least Squares* (PLS), aim to ensure that the research instrument is truly able to measure the variables being studied consistently and accurately. Construct validity indicates the extent to which a variable's indicators represent the theoretical concept being measured, while reliability indicates the consistency of measurement results when the instrument is used repeatedly. In evaluating measurement models, common indicators include Cronbach's Alpha, Composite Reliability, and *Average Variance Extracted (AVE).* Cronbach's Alpha and Composite

Reliability assess the construct's internal consistency, while AVE assesses convergent validity, i.e., the extent to which indicators within a construct are highly correlated and can explain the construct's variance [37].

The results show that self-confidence is positively related to learning outcomes, although its effect size is smaller than that of learning commitment. This finding suggests that students who believe in their abilities are more willing to engage in learning activities and manage learning tasks. However, confidence alone may not be sufficient to produce consistent independent learning because students also need persistence, responsibility, and behavioral regulation. Therefore, self-confidence is an important psychological resource, but its smaller effect suggests that other factors may play a more direct role in students' learning independence.

In general, a construct is considered to meet the reliability criteria if Cronbach's Alpha and Composite Reliability values are above 0.70, although a value slightly below 0.70 is still acceptable in exploratory studies. Meanwhile, the recommended AVE value is at least 0.50, indicating that more than half of the indicator variance is explained by the construct [34]. Based on this theoretical basis, the following table presents the test results, which will be analyzed to determine each construct's feasibility in this study.

Table 2. Construct Reliability and Validity

Construct	Cronbach's Alpha	Composite Reliability	AVE
CF	0.703	0.709	0.834
IM	0.474	0.541	0.735
LC	0.690	0.714	0.801
LI	0.392	0.404	0.711

The reliability and validity of the constructs in this study showed that the *Confidence* construct (CF) had a Cronbach's Alpha value of 0.703, Composite Reliability of 0.709, and AVE of 0.834. The value has met the required criteria, namely an internal reliability of at least 0.70 and a convergent validity of at least 0.50, so it can be concluded that the CF construct has good measurement consistency and can explain the variance of the indicator strongly. The *Learning Commitment* (LC) construct also showed relatively good results, with a Composite Reliability value of 0.714 and AVE of 0.801, indicating that this construct meets convergent validity. Nevertheless, the Cronbach's Alpha value of 0.690 is slightly below the ideal limit of 0.70, although it is still tolerable in exploratory studies, suggesting that the internal consistency of the LC indicator remains adequate.

Meanwhile, *the Intrinsic Motivation* (IM) and *Learning Independence* (LI) constructs show weaknesses in internal reliability, as indicated by Cronbach's Alpha values of 0.474 and 0.392, respectively, and Composite Reliability of 0.541 and 0.404, which are below the recommended minimum. This indicates that the indicators in the two constructs are not fully consistent in measuring the latent variable. Nonetheless, both constructs still have fairly high AVE values (0.735 for IM and 0.711 for LI), so convergent validity is met. Overall, these results suggest that although the convergent validity of the entire construct is good, some constructs still need indicator improvements to strengthen the internal reliability

of subsequent studies. Table 3 presents the discriminant validity test results (Fornell-Larcker criterion) in this study.

In contrast, intrinsic motivation does not significantly predict learning independence. This finding differs from the theoretical expectation that students who are internally motivated to learn will become more independent. One possible explanation is that intrinsic motivation reflects students' interest and enjoyment in learning, whereas learning independence requires additional behavioral skills, such as planning, time management, task completion, and monitoring learning progress. Elementary-school students may also still depend substantially on teachers and parents for learning guidance. Thus, students may enjoy learning without being able to manage it independently. This finding suggests that intrinsic motivation alone may not be sufficient to produce learning independence.

Table 3. Discriminant Validity (Fornell-Larcker Criterion)

Construct	CF	IM	LC	LI
CF	0.792			
IM	0.647	0.698		
LC	0.695	0.706	0.671	
LI	0.527	0.465	0.59	0.674

Discriminant validity using the Fornell-Larcker criterion aims to ensure that each construct differs from the others. The results showed that the square root of AVE for the Confidence construct (0.792) exceeded its correlations with other constructs, meeting the discriminant validity criteria. However, for the Intrinsic Motivation (0.698) and Learning Commitment (0.671) constructs, the correlation between them (0.706) exceeded the diagonal value. This indicates overlap between the Intrinsic Motivation and Learning Commitment constructs, so the model cannot optimally discriminate between them. Meanwhile, the Learning Independence construct (0.674) still shows a higher diagonal value than its correlations with other constructs. In general, the discriminant validity of the model has not been fully fulfilled, so additional testing using HTMT (Heterotrait-Monotrait Ratio) is needed to ensure the differences between constructs are more accurate. Table 4 presents the model fit results for this study.

Table 4. Model Fit

Table of Contents	Saturated Model	Estimated Model
SRMR	0.094	0.094
d_ULS	0.923	0.923
d_G	0.259	0.259
Chi-Square	485.636	485.636
NFI	0.633	0.633

Learning commitment contributes most strongly to intrinsic motivation and learning independence. This finding suggests that students committed to learning are more likely to maintain effort, complete tasks, and take responsibility for their learning. Compared with self-confidence, commitment is more closely related to sustained learning behavior. Therefore, learning commitment may function as a more proximal factor in developing learning independence because independent learning requires consistency and persistence in addition to positive beliefs about one's ability.

The fit model shows an SRMR value of 0.094 in both the Saturated Model and the Estimated Model. This value remains below the maximum limit of 0.10, so the model can be categorized as having an acceptable level of conformity. However, the NFI value of 0.633 is still far below the ideal limit of 0.90, indicating that the overall model fit is not optimal. A d_ULS value of 0.923 and a d_G of 0.259 were used as measures of model discrepancy, while a Chi-Square value of 485.636 indicated the degree of difference between the observed covariance matrix and the model's predicted covariance. Based on these results, the research model is feasible for further analysis, but it still needs improvement to achieve a better goodness-of-fit level. Table 5 presents the R-Square test results for this study.

Table 5. R-Square

Endogenous Variable	R^2	R^2 Adjusted
IM	0.546	0.543
LI	0.375	0.369

The R-Square value is used to measure the ability of independent variables to explain endogenous variables. The results showed that the R-Square value in the Intrinsic Motivation (IM) variable was 0.546. This value shows that 54.6% of intrinsic motivation variation is explained by the exogenous variables in the model, while the remaining 45.4% is explained by factors outside the study model. Meanwhile, the R-Square value of the Learning Independence (LI) variable was 0.375, meaning that 37.5% of the variation in learning independence is explained by the predictor variables in the model, while the remaining 62.5% is influenced by other factors not studied. Based on criteria [37], the R-Square value of 0.546 belongs to the moderate category, while the value of 0.375 belongs to the medium category. Thus, the model has a fairly good explanatory ability, especially for the Intrinsic Motivation variable. The test results in Table 6 are as follows. F-Square in this study.

Table 6. F-Square

Relationships	f^2
CF-IM	0.103
CF-LI	0.036
IM-LI	0.001
LC-IM	0.280
LC-LI	0.112

F-Square is used to determine each exogenous variable's contribution to the endogenous variable. The results of the analysis showed that the relationship between Learning Commitment and Intrinsic Motivation had an f^2 value of 0.280, which was included in the category of moderate influence. This shows that learning commitment is a strong enough factor in increasing students' intrinsic motivation. The relationship between Confidence and Intrinsic Motivation has an f^2 value of 0.103, which falls into the category of minor influence. Furthermore, the relationship between Learning Commitment and Learning Independence has an f^2 value of 0.112, which is also included in the subcategory. The relationship between Confidence and Learning Independence has an f^2 value of 0.036, which shows a very small influence. Meanwhile, the relationship between Intrinsic Motivation and Learning Independence only has an f^2 value of 0.001, so it can be said that

it has almost no effect. Based on these results, Learning Commitment contributes most to the research model.

These findings indicate that increased student learning commitment has the potential to have a greater impact on intrinsic motivation and learning independence than the increase in other variables in the research model.

2. Boostrapping

Bootstrapping in quantitative research, especially in the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach, is a statistical resampling technique used to test the level of significance of the relationships between variables in the model. This technique works by repeatedly sampling the original data through a resampling-with-replacement process, so that many new samples are formed that are used to estimate standard errors, t-statistical values, and p-values. This method is very useful because it does not require normal distribution assumptions, making it suitable for use in social research data analysis with relatively small sample sizes and data that is not normally distributed.

Through bootstrapping, researchers can assess the significance of the relationship between constructs by comparing the t-statistic to the critical value (e.g., 1.96 at the 5% significance level) or by examining the p-value (< 0.05). If these criteria are met, then the relationship between variables is declared significant. Thus, bootstrapping is an important part of evaluating structural models to ensure the reliability of PLS-SEM analysis results [43]. The test results are presented in Table 7, which shows the path coefficients in this study.

Table 7. Path Coefficient

Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T statistics (O/STDEV)	P values
CF → IM	0.301	0.299	0.061	4.962	0.000
CF → LI	0.218	0.218	0.069	3.163	0.002
IM → LI	0.030	0.031	0.069	0.433	0.665
LC → IM	0.497	0.500	0.056	8.919	0.000
LC → LI	0.417	0.420	0.077	5.404	0.000

The bootstrapping analysis shows that most relationships between variables are significant. The first line has a coefficient of 0.301, a t-statistic of 4.962, and a P-value of 0.000, so it is significant. The second path has a coefficient of 0.218, a T-statistic of 3.163, and a P-value of 0.002, indicating a significant influence. The third path has a coefficient of 0.030, a T-statistic of 0.433, and a P-value of 0.665, so it is not significant because it does not meet the criteria of T-statistics > 1.96 and P-values < 0.05. Furthermore, the fourth path has a coefficient of 0.497, a t-statistic of 8.919, and a P-value of 0.000, indicating the strongest significant influence in the model. The fifth path is also significant, with a coefficient of 0.417, a T-statistic of 5.404, and a P-value of 0.000. Overall, the results of the hypothesis testing through bootstrapping showed that, of the entire relationships between the tested variables, most of the pathways had a significant influence, except for one insignificant pathway, so the research model in general can be said to have a strong structural relationship and is supported by empirical data. Test results are shown in Table 8.

Table 8. Specific Indirect Effects

Relationship	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T statistics (O/STDEV)	P values
CF → IM → LI	0.009	0.010	0.022	0.416	0.677
LC → IM → LI	0.015	0.015	0.035	0.430	0.667

Specific indirect effects were tested to determine whether the mediating variable could bridge the relationship between the independent and dependent variables. The results showed that the first indirect influence path had a coefficient of 0.009, a t-statistic of 0.416, and a P-value of 0.677. The second indirect influence path had a coefficient of 0.015, a T-statistic of 0.430, and a P-value of 0.667. The two pathways did not meet the significance criteria because the T-values were below 1.96 and the P-values were above 0.05. Thus, the mediation variables were not shown to bridge the relationship between the independent and dependent variables significantly. These results show that the model's influence is driven more by direct relationships than by mediation mechanisms.

The nonsignificant mediation effects should not be interpreted simply as a statistical failure. Instead, they suggest that intrinsic motivation may not be the main mechanism linking self-confidence and learning commitment to learning independence in this sample. Learning commitment may have a more direct role because it is closely related to students' persistence and responsibility in completing learning activities. In addition, the weak reliability of intrinsic motivation and learning independence in the measurement model should be considered when interpreting these findings. Low measurement reliability may attenuate the observed relationships between constructs. Therefore, the nonsignificant effects may reflect both the characteristics of learning among elementary-school students and limitations in the measurement instruments.

3. PLSpredict/CVPAT

PLS-SEM (Partial Least Squares Structural Equation Modeling) is a multivariate statistical analysis method used to test the relationships between latent variables in a research model. In contrast to covariance-based SEM (CB-SEM), which focuses on testing theory and overall model fit, PLS-SEM is more oriented toward prediction and theory development. Therefore, this method is well suited to both exploratory and predictive research, especially when the research model is complex, the sample size is relatively small, and the data are not normally distributed [40].

In PLS-SEM, analysis is carried out through two main components: the measurement model (Outer model) and the structural model (*Inner model*). The measurement model assesses the validity and reliability of indicators against latent constructs, while the structural model tests the relationships between constructs in the research model. In addition, PLS-SEM allows evaluation of the model's predictive capabilities through techniques such as PLSpredict, which assesses how well the model predicts unobserved data based on Q^2 Predict, RMSE, and MAE values [37]. Test results are shown in Table 8, LV Prediction Summary in this study.

Table 9. LV Prediction Summary Table

Leave variable	Q^2predict	RMSE	MAE
IM	0.536	0.689	0.540
LI	0.355	0.811	0.625

Predictive relevance using PLSpredict showed that the Intrinsic Motivation variable had a Q^2 Predict value of 0.536, while Learning Independence had a Q^2 Predict value of 0.355. According to Hair, a Q^2 Predict value greater than zero indicates that the model has good predictive ability of observational data [37]. In addition, the relatively low RMSE and MAE values indicate an acceptable level of prediction error. Therefore, this research model has strong predictive relevance and can adequately predict endogenous variables. These findings indicate that the model not only explains the relationships between variables but can also predict data that has not yet been observed.

DISCUSSION

Taken together, these findings indicate that learning commitment is the most influential determinant of both intrinsic motivation and learning independence among elementary school students, while self-confidence contributes a smaller but still meaningful effect. This pattern is consistent with earlier research by [23], [44], which found that stronger engagement and commitment to learning activities foster greater self-directed motivation and independent learning behavior.

The finding that intrinsic motivation does not significantly influence learning independence, and does not significantly mediate the relationship between the exogenous variables and learning independence, diverges from theoretical expectations drawn from self-efficacy and self-determination theory, which generally position intrinsic motivation as a central driver of autonomous learning behavior. One possible explanation is that, at the elementary school level, structured guidance, parental involvement, and consistent learning habits may shape learning independence more directly than internally generated motivation alone [16], [28]. Young learners may not yet have fully internalized the self-regulatory capacity required for intrinsic motivation to translate into independent learning behavior, suggesting that this mediating pathway may become more salient at higher educational levels.

These results carry theoretical implications by refining the applicability of self-efficacy and self-determination theory in primary education, indicating that commitment-based and confidence-based pathways may operate more directly than motivation-mediated pathways at this developmental stage. Practically, the findings suggest that teachers and schools should prioritize strategies that build learning commitment, such as consistent routines, constructive feedback, and structured accountability, alongside efforts to strengthen student confidence, rather than relying solely on motivational interventions to foster independent learning.

4. CONCLUSION

This study aims to analyze the relationship between confidence, learning commitment, intrinsic motivation, and learning independence in elementary school students.

The findings indicate that learning commitment was positively associated with intrinsic motivation and learning independence, while self-confidence was also positively associated with both outcomes. The relationship between intrinsic motivation and learning independence was not statistically significant, and intrinsic motivation did not significantly mediate the relationships examined.

These findings suggest that the revised model provides evidence of associations among key psychological and learning-related constructs in elementary education, contributing to a more focused understanding of how confidence and commitment relate to students' intrinsic motivation and learning independence. However, the interpretation of the structural estimates should be made cautiously because the Intrinsic Motivation and Learning Independence constructs showed low internal reliability, which limits confidence in the estimated relationships involving these constructs. In addition, the PLSpredict results should be interpreted as evidence of predictive performance within this sample rather than as sufficient evidence that the model has broadly good predictive capabilities.

Theoretically, this study contributes to the literature by showing that learning commitment is a more direct and dominant predictor of student motivation and independence than intrinsic motivation itself, refining existing assumptions drawn from self-efficacy and self-determination theory when applied to elementary-aged learners. This study has limitations related to its cross-sectional design, its focus on elementary school students in Cirebon, and its reliance on self-report questionnaire data, which may affect the generalizability of the findings. Future research is recommended to employ longitudinal designs, expand the sample to other regions and educational levels, and examine additional variables that may better explain the pathway between motivation and learning independence.

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