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DIGITAL LITERACY AS A MEDIATOR OF THE EFFECT OF THE INDEPENDENT CURRICULUM AND LEARNING MOTIVATION ON ACADEMIC ACHIEVEMENT: A PLS-SEM ANALYSIS

A LITERACIA DIGITAL COMO MEDIADORA DO EFEITO DO CURRÍCULO AUTÓNOMO E DA MOTIVAÇÃO PARA A APRENDIZAGEM NO DESEMPENHO ACADÉMICO: UMA ANÁLISE PLS-SEM

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Abstract

This study aims to examine the role of digital literacy as a mediator in the relationship between the implementation of the Independent Curriculum, learning motivation, and student academic achievement. This study develops a structural model to explain how curriculum reform improves achievement by strengthening digital competencies. A survey method was used with purposive sampling of 124 seventh and eighth-grade students at a public junior high school in Indonesia. Data were collected using a four-point Likert-scale questionnaire and analyzed using the Partial Least Squares–Structural Equation Modeling (PLS-SEM) approach. The results indicate that implementing the Independent Curriculum has a positive and significant effect on digital literacy and academic achievement. Furthermore, digital literacy was shown to mediate the relationship between the implementation of the Independent Curriculum and learning motivation, and indirectly contributed to improved academic achievement. These findings emphasize the importance of strengthening digital literacy.

Keywords: Independent Curriculum; Digital Literacy; Learning Motivation; Academic Achievement; PLS-SEM; Curriculum Reform

Resumo

Este estudo tem como objetivo examinar o papel da literacia digital como mediadora na relação entre a implementação do Currículo Independente, a motivação para a

aprendizagem e o desempenho acadêmico dos estudantes, desenvolvendo um modelo estrutural para explicar como a reforma curricular melhora o desempenho ao fortalecer as competências digitais; foi utilizado o método de survey com amostragem intencional de 124 estudantes do sétimo e oitavo anos de uma escola pública de ensino fundamental na Indonésia, com dados coletados por meio de questionário em escala Likert de quatro pontos e analisados pelo método Partial Least Squares–Structural Equation Modeling (PLS-SEM); os resultados indicam que a implementação do Currículo Independente exerce efeito positivo e significativo sobre a literacia digital e o desempenho acadêmico, sendo que a literacia digital também medeia a relação entre a implementação do currículo e a motivação para a aprendizagem, contribuindo indiretamente para a melhoria do desempenho acadêmico; esses achados enfatizam a importância do fortalecimento da literacia digital.

Palavras-chave: Currículo Independente; Literacia Digital; Motivação para a Aprendizagem; Desempenho Acadêmico; PLS-SEM; Reforma Curricular.

1. Introduction

Education plays a strategic role in improving society's quality of life because it shapes the thinking skills, attitudes, and character of the younger generation. Law of the Republic of Indonesia Number 20 of 2003 concerning the National Education System emphasizes that education aims to develop individuals who are faithful, intelligent, independent, and have noble character in order to realize a civilized nation. In the 21st century, the education system must adapt to social and digital transformations. Education reform no longer focuses solely on mastering content, but rather on strengthening 21st-century competencies such as critical thinking, creativity, collaboration, and digital literacy.(Prayitno et al., 2025). According to Syah, learning achievement is an ideal product of learning, encompassing psychological aspects that are shaped by learning experiences Learning achievement encompasses students' mastery of knowledge, attitudes, and skills after learning. Environmental factors influence these outcomes, but motivation has been shown to be the primary determinant of success in the learning process (Rahyuni et al., 2021).

In response to these challenges, the Indonesian government introduced the Independent Curriculum, which emphasizes learning flexibility, school autonomy, and strengthening competencies and character through the Pancasila Student Profile. This curriculum is designed to make learning more in-depth, contextual, and student-centered. Several studies have shown that implementing the Independent Curriculum encourages active student participation and creativity, ultimately improving academic achievement. (Nugroho et al., 2025) .

The independent curriculum is an education policy introduced by the Indonesian government to address the need for flexibility, relevance, and diversity in local education contexts. The goal of the independent curriculum is to provide schools and teachers with greater autonomy in determining curriculum materials and learning methods, strengthen the profile of Pancasila students, and emphasize competency- and character-based learning (Syakhrani, 2025). This policy is expected to develop students' potential (Pujiningsih et al., 2024) This shows that implementing the independent curriculum improves the quality of student learning. The implementation of the independent curriculum encourages students to be more active and creative in the learning process compared to the previous curriculum (Muhammad Safii Siregar & Moch. Iqbal, 2024). The Ministry of Education and Culture explains the advantages of the independent curriculum as focusing on essential material and developing student competencies at each stage, allowing students to learn more deeply, meaningfully, and enjoyably without rushing (Yoseptry et al., 2023). This explains that

the independent curriculum is more interactive and relevant to current developments (Enung Hasanah, Ika Maryani, Suyatno, 2023).

Theoretically, the relationship between curriculum and academic achievement can be explained through motivational approaches and learning technologies. Self-Determination Theory (SDT) holds that intrinsic motivation, grounded in the needs for autonomy, competence, and connectedness, is the primary determinant of learning success. A curriculum that provides space for exploration and independence is believed to increase student motivation and impact academic achievement (Suyana et al., 2024). On the other hand, in the digital learning ecosystem, curriculum effectiveness is heavily influenced by digital literacy. The Technology Acceptance Model (TAM) explains that perceptions of the ease and usefulness of technology determine its acceptance and use in the learning process. Therefore, digital literacy is a crucial prerequisite for technology-based curriculum innovations to truly impact learning outcomes.

One of the crucial elements determining the successful implementation of the Independent Curriculum is learning motivation. Learning motivation can be understood as a driving force within students that makes them serious, enthusiastic, and strongly motivated to engage in the learning process. According to the latest research, motivation is an individual's desire or desire to achieve goals (Fitriana Neni & Anjani, 2021) Motivation is the primary driver of active involvement in the learning process, a combination of factors such as interests, needs, personal values, expectations, and rewards that influence students' desire and dedication to learning. According to Hamalik, there are three uses of motivation: as a driving force for humans in achieving their hopes, as a directing force towards goals, and as a selector in determining the direction of action (Wajar et al., 2022). This shows that student motivation can be a primary driver behind their academic success and personal development. Motivation in the educational context can improve academic performance.

Digital literacy is a person's ability to search for, evaluate, use, and produce information, and to interact with various forms of digital technology (Kuncoro et al., 2022). This is an external motivational factor in the teaching and learning process, facilitating both students and teachers. According to recent research, digital literacy is increasingly crucial as digital learning resources, AI platforms, and online media-based materials proliferate (Wahyudi, 2021). According to the Ministry of Communication and Information, digital literacy is the ability to use a computer effectively and access content (Amaly & Armiah, 2021). Digital literacy refers to a person's ability to understand and use information presented through technology

(Damayanti et al., n.d.).

Although various studies have examined the influence of learning motivation and digital literacy on academic achievement, several research gaps remain. First, most studies examine the direct relationship between variables without explaining the underlying structural mechanisms. Second, digital literacy is often positioned as an independent variable rather than a strategic mediator in curriculum implementation. Third, empirical studies based on comprehensive structural models in the context of the Independent Curriculum, particularly in schools with limited resources, remain scarce in the international literature

Based on this gap, this study develops an integrative model that examines the role of digital literacy as a mediator in the relationships among Independent Curriculum implementation, learning motivation, and student academic achievement, using the Partial Least Squares–Structural Equation Modeling (PLS-SEM) approach. The novelty of this research lies in integrating theories of motivation and technology acceptance within a single analytical framework, positioning digital literacy as a strategic mediator, and providing empirical evidence in the context of curriculum reform in Indonesia. This research is expected to enrich the international literature and provide practical implications for strengthening digital transformation-based education policies.

2. Literature Review

2.1. Independent Curriculum

The independent curriculum provides students with the opportunity to engage in meaningful, personalized learning. It provides freedom and flexibility in implementation. Sadewa explained that a flexible curriculum is an approach to curriculum development that enables bold, engaging learning and adapts to various conditions (Pujiningsih et al., 2024). The flexible curriculum concept has several characteristics that support the continuity of learning: flexibility in implementation, adaptability to needs and conditions, character and competency development, and mutual cooperation and collaboration (Tunas & Pangkey, 2024). This aligns with the main characteristic of the independent curriculum, which supports learning recovery: project-based learning for the development of soft skills and character aligned with the profile of Pancasila students.

The Independent Curriculum (Curriculum Merdeka) is a government effort to

improve the quality of education by focusing on character building and strengthening student competencies. The indicators of the Independent Curriculum emphasize not only cognitive aspects but also attitudes and skills aligned with the Pancasila student profile (Tunas & Pangkey, 2024). The following is a profile of a Pancasila student, which comprises six dimensions: devotion to God Almighty, global diversity, mutual cooperation, independence, reasoning, critical thinking, and creativity (Priyadi et al., 2024). Diputera emphasized that the Pancasila student profile also characterizes graduates who aim to realize character education for Indonesian students and possess strong competencies grounded in the ingrained values of Pancasila (Wicaksana & Rachman, 2018).

2.2. Motivation to Learn

Learning motivation is a crucial aspect of the educational process, influencing student success in achieving academic goals. Various studies have shown that learning motivation is an internal drive that motivates students to be active and diligent learners. Internal factors, such as desires, interests, and personal goals, are the primary sources of motivation, alongside external factors from the student's environment, such as teacher and family support (Julita et al., 2025). This demonstrates that cognitive aspects are the primary foundation of academic achievement. This encompasses how students process information, from remembering basic facts to analyzing complex concepts. Exam scores and formative tests are the most common indicators because they directly measure students' mastery of the subject matter (Cahyono et al., 2021) This demonstrates that the ability to analyze and solve problems is the pinnacle of cognitive achievement, not simply answering established questions but facing new challenges and finding creative solutions.

In the context of mathematics education, this study demonstrates that learning motivation is closely related to mathematical literacy skills. Motivated students tend to be more critical and able to understand mathematical concepts in depth than those with low motivation (Amelia et al., 2023). This generally explains that proficiency or mastery of mathematics learning materials can determine the motivation to learn. Research shows that students with high motivation to learn mathematics are usually more active in critical thinking and can better understand mathematical concepts in depth. Conversely, low-motivated students tend to have difficulty understanding mathematical material thoroughly. Therefore, increasing motivation to learn mathematics is an important step to ensure a successful mathematics learning process and optimal results for students.

2.3. Digital Literacy

Herminyanto stated that digital literacy can generally be defined as the interest, attitude, and ability of individuals who use digital technology and communication tools to access, manage, integrate, analyze, and evaluate information, build new knowledge, create, and communicate with others in order to actively engage with the public (Sugiarto & Farid, 2023). According to the Ministry of Communication and Informatics, digital literacy is the correct and optimal use of computers and the ability to access content (Amaly & Armiah, 2021). This also aligns with the importance of developing digital literacy to develop audience capabilities, including through media literacy education. Internet access also influences the sustainability of digital literacy (Amelia Rizky Idhartono, 2022). Optimal internet access can facilitate students' use of existing learning platforms. Furthermore, superior human resources also influence the successful implementation of digital literacy in educational institutions.

The development of digital literacy is influenced by four aspects outlined in the concept. These four aspects are basic literacy skills, background information and knowledge, skills in Information and Communication Technology, and perspectives on thinking and attitudes. Basic literacy skills are the ability to read, write, understand symbols, and calculate numbers (Nasution, 2019). This demonstrates the ability to understand and use software symbols in digital media. The second aspect is background information knowledge, namely the ability to use existing knowledge to explore new information that enriches previous knowledge. This is demonstrated in the ability to search for information using search engines and select search results.

2.4. Student Learning Achievement

Learning achievement is the outcome attained by students after the learning process, reflecting changes in knowledge, skills, and attitudes resulting from their interactions with the learning environment. According to previous research, learning achievement is not merely an academic grade but also tangible evidence of success in mastering subject matter and in applying what has been learned in everyday life. (Anindya Citra Maharani et al., 2024) This indicates that learning achievement reflects students' success in achieving established educational goals and serves as an important benchmark for assessing the effectiveness of the learning process in schools or madrasas. Learning achievement is influenced by student motivation, which plays a key role in encouraging students to persevere and learn, and to work

harder to achieve their goals.

Learning achievement has several main indicators divided into three domains: cognitive, affective, and psychomotor. The cognitive domain encompasses students' intellectual abilities such as remembering, understanding, applying, analyzing, synthesizing, and evaluating learning material. The affective domain relates to students' attitudes, interests, values, and motivations in learning, reflecting how students receive and respond to the learning process. Meanwhile, the psychomotor domain assesses students' physical skills and ability to act, especially in the practice and application of material. The function of learning achievement is not only as a benchmark for student success in mastering the material, but also as an evaluation tool for teachers and educational institutions to improve the quality of learning and develop more effective methods (Chotimah, 2020). This shows that clear, measurable indicators of learning achievement can serve as a basis for designing appropriate learning strategies and supporting students' maximum potential.

3. Method

This study used a quantitative, ex post facto design to examine the effects of implementing the Independent Curriculum and learning motivation on student achievement, with digital literacy as a mediating variable. The quantitative approach was chosen to allow for objective measurement of variables and hypothesis testing through inferential statistical analysis. The ex-post facto design was used because the research variables were not manipulated, and causal relationships were analyzed based on naturally occurring conditions. The study population was 181 seventh and eighth-grade students at SMPN 1 Sambit, with a sample size of 124 respondents determined using the Slovin formula at a 5% margin of error. Data collection used a four-point Likert-based questionnaire. The research instruments included the Independent Curriculum variables (active participation, collaboration, creativity), learning motivation (perseverance, independence, interest, resilience in the face of adversity), digital literacy (the ability to access, manage, evaluate, and produce digital content), and learning achievement (cognitive, affective, and psychomotor aspects).

Data analysis was conducted using Structural Equation Modeling based on Partial Least Squares (SEM-PLS) to simultaneously test the measurement and structural models. This method was chosen because it can accommodate complex models, test direct and indirect effects, and tolerate non-normal data distributions and moderate sample sizes. The analysis included evaluating construct validity and

reliability, testing path coefficients, and estimating the mediating effect of digital literacy on the relationship between the Independent Curriculum, learning motivation, and academic achievement. This approach allows for comprehensive testing of the conceptual model, grounded in the theoretical foundations of motivation and technology acceptance.

4. Results

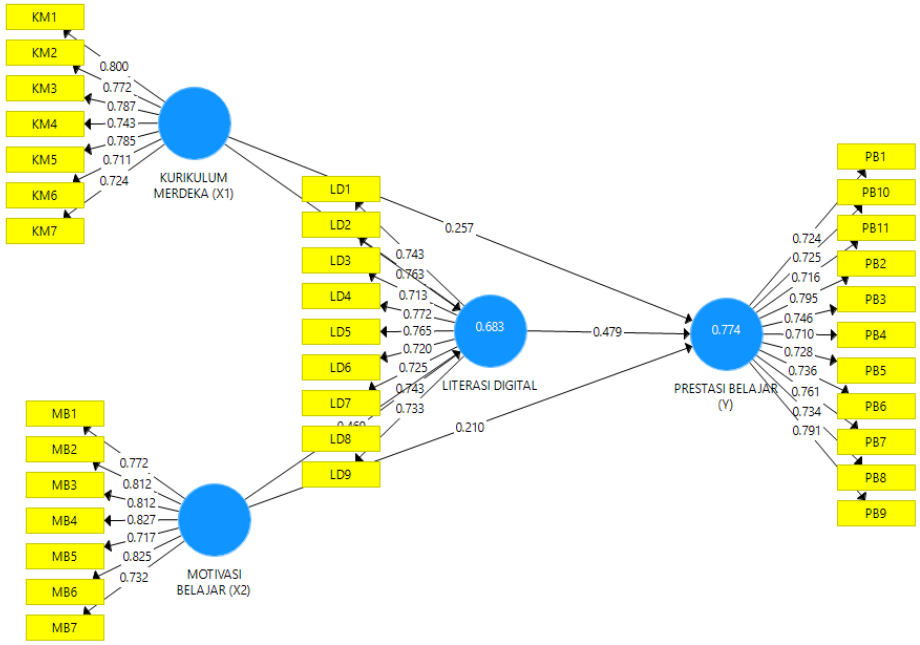

Figure 1: Evaluation of the Measurement Model

The convergent validity measurement uses a factor loading value limit of 0.70. Based on Table 2, the overall loading factor value for each sub-variable is >0.70 (0.717 – Feeling Bored to 0.812 – High Motivation). This means that the correlation between the sub-variables and the variable can be explained by 71.00% to 81.20%. The Average Extracted Variance (AVE) value for each variable was >0.50 (0.552 for Learning Achievement (Y) to 0.579 for Independent Curriculum (X1). Therefore, it can be concluded that each sub-variable and each instrument variable in the research model meet the convergent validity requirements.

Based on the factor loading coefficient value, the most dominant statement item in measuring Learning Achievement was the "Never Give Up" construct, with a value of 0.812 (X2.1). This means that the High Motivation construct can account for 81.20% of Learning Achievement. Meanwhile, the weakest item was "Feeling

Bored" with a value of 0.717 (X2.2 or 71.00%).

Table 2. Convergent Validity and Consistency Reliability

No	Variabel	Indikator	Conver Validity		Consistency Reliability		
			FL	AVE	CA	rho_A	CR
			(λ>0.70)	(>0.50)	(α>0.70)	(ϕ>0.70)	(δ>0.70)
1		KM1	0.800				
2		KM2	0.772				
3	Independent	KM3	0.787				
4	Curriculum	KM4	0.743	0.579	0.878	0.878	0.906
5	(X1)	KM5	0.785				
6		KM6	0.711				
7		KM7	0.724				
8		MB1	0.772				
9		MB2	0.812				
10	Motivation	MB3	0.812				
11	to learn	MB4	0.827	0.618	0.897	0.897	0.919
12	(X2)	MB5	0.717				
13		MB6	0.825				
14		MB7	0.732				
16		LD1	0.743				
17		LD2	0.763				
18		LD3	0.713				
19	Digital	LD4	0.772				
20	Literacy	LD5	0.765	0.551	0.898	0.898	0.917
21	(Z)	LD6	0.720				
22		LD7	0.725				
23		LD8	0.743				
24		LD9	0.733				
25		PB1	0.724				
26		PB2	0.795				
27		PB3	0.746				
28		PB4	0.710				
29	Learning	PB5	0.728				
30	achieve-	PB6	0.736	0.552	0.919	0.920	0.931
31	ment (Y)	PB7	0.761				
32		PB8	0.734				

No	Variabel	Indikator	Conver FL (λ>0.70)	Validity AVE (>0.50)	Consistency CA (α>0.70)	Reliability rho_A (ϕ>0.70)	CR (δ>0.70)
33		PB9	0.791				
34		PB10	0.725				
35		PB11	0.716				

The Fornell-Larcker value is explained by examining the correlation between the latent variable itself and the correlation variables of other latent variables. Based on the table below, the correlation value of the Independent Curriculum (X1) → Independent Curriculum (X1) has a value of 0.761, which is greater than the correlation value of the Implementation of the Independent Curriculum (X1) with other variables (Learning Motivation → 0.791; Learning Achievement → 0.794; and Digital Literacy → 0.775). Likewise, for the assessment of correlations with other variables. The HTMT test for all dimensions is <0.90 (0.861 to 0.573). Therefore, it can be concluded that the Fornell-Larcker and HTMT correlations for all variables in this research data instrument meet the discriminant validity test in measuring Learning Achievement.

Table 3. Discriminant Vaidity: The Fornell Larcker

Variable	X1	Z	X2	Y
Independent Curriculum (X1)	**0,761**			
Learning Literacy (Z)	0,775	**0,742**		
Learning Motivation (X2)	0,791	0,789	**0,789**	
Learning Achievement (Y)	0,794	0,844	0,791	**0,743**

Table 4. Discriminant Vaidity: The Fornell Larcker

Variable	X1	Z	X2	Y
Independent Curriculum (X1)				
Learning Literacy (Z)	0,870			
Learning Motivation (X2)	0,883	0,871		
Learning Achievement (Y)	0,878	0,919	0,860	

Evaluation of Structural Models

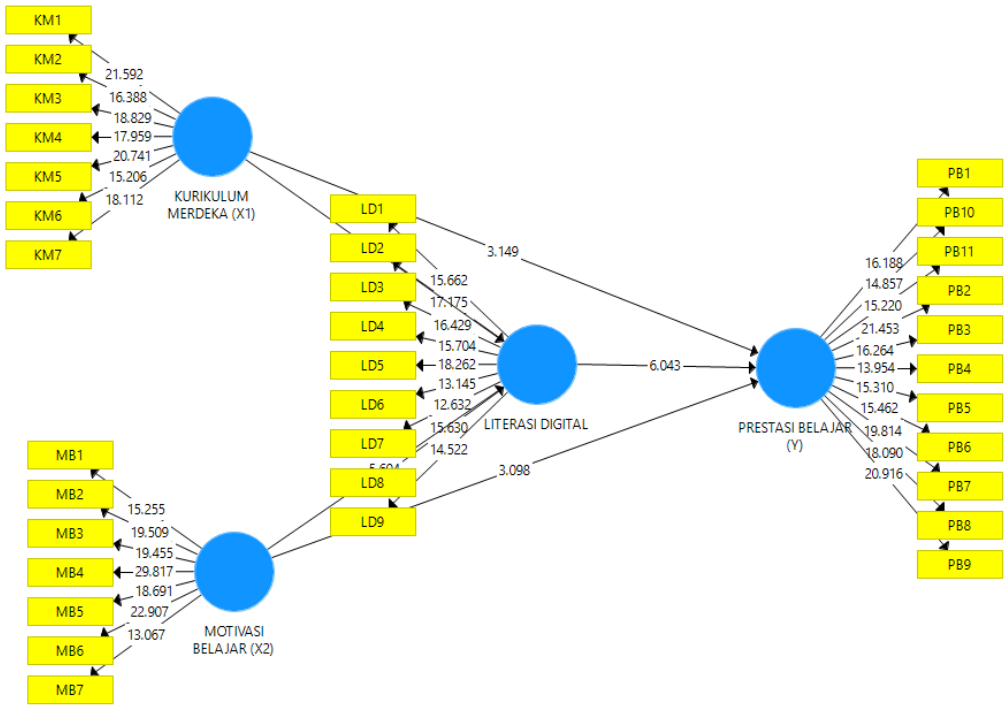

Figure 2

Based on the table below, the R2 coefficient for the Learning Achievement variable is 0.774. This means that the Independent Curriculum, Learning Motivation, and Digital Literacy influence the Learning Achievement variable by 77.40%, and the remaining 22.60% is influenced by other variables outside the research model. Therefore, the output effect size shows that the most dominant variable influencing Learning Achievement is Digital Literacy (F2 = 0.322 in the strong category), and the weakest variable is Learning Motivation (F2 = 0.058) in the small category.

Table 5. Measurement of Structural Model: R2, F2, Q2

Variabel	R2		F2		Construct Cross-validated (Q2)				
	Value	Decision	Value	Decision	Redundancy SSE	Q2	Communality SSE	Q2	Predictive Power
Independent Curriculum	-	;	0.092	Medium	868.000	-	493.452	0.432	Strong
Learning Literacy	0.683	Weak	0.322	Long	710.028	0.364	631.752	0.434	Strong

Variabel	R2		F2		Construct Cross-validated (Q2)				
	Value	Decision	Value	Decision	Redundancy SSE	Q2	Communality SSE	Q2	Predictive Power
Learning Motivation	-	-	0.058	Short	868.000	-	444.782	0.488	Strong
Learning achievement	0.774	Strong	-	-	802.363	0.412	757.826	0.444	Strong

Further testing, evaluating the predictive relevance value (Q2), aims to validate the model's predictive ability in the field. Based on the table above, all Q2 values exceed the cutoff point (greater than zero). The results of the Q2 predictive relevance calculation obtained values of 0.364 to 0.412 in Redundancy Construct Crossvalidated and 0.432 to 0.488 in Communality Construct Crossvalidated. So the model, in measuring overall Learning Achievement, explains 43.20% to 48.80% of the phenomena studied. The results of both procedures indicate that Learning Achievement has strong predictive power.

4.1. Measurement of Direct Effects

A hypothesis can be accepted at the 5% significance level if its T-statistic is greater than 1.96. Meanwhile, a hypothesis can be accepted with a positive or negative influence if the obtained B-value coefficient indicates a positive or negative direction of influence. Based on the table below, the hypothesis H1 (Independent Curriculum (X1) → Learning Achievement (Y) obtained β-values = 0.404 and P values = 0.000 (0.05). This indicates that the Independent Curriculum variable (X1) has a positive, significant effect on Learning Achievement (Y). This means that when the Independent Curriculum variable (X1) increases, the Learning Achievement variable (Y) will also increase significantly.
The hypothesis H2 (Independent Curriculum (X1) → Learning Literacy (Z) obtained β-values = 0.257 and P values = 0.001 (0.05). This indicates that the Independent Curriculum variable (X1) has a positive, significant effect on digital literacy (Z). This means that when the Independent Curriculum variable (X1) increases, the Digital Literacy variable (Z) will increase significantly as well.

The hypothesis H3 Learning Motivation (X2) → Learning Achievement (Y) obtained β-values = 0.476 and P-values = 0.000 (0.05). This indicates that Learn-

ing Motivation (X2) has a positive and significant effect on Learning Achievement (Y). This means that when the Learning Motivation (X2) variable increases, the Learning Achievement (Y) variable will also increase, and vice versa.
In hypothesis H4, Learning Motivation (X2) → Digital Literacy (Z), the β-value was 0.469, and the P-value was 0.000 (0.05). This indicates that Learning Motivation (X2) has a positive and significant effect on Digital Literacy (Z). This means that when the Learning Motivation (X2) variable increases, the Digital Literacy (Z) variable will increase as well, and vice versa.

In the hypothesis H5, Digital Literacy (Z) → Learning Achievement (Y) obtained β-values = 0.210 and P values = 0.003 (0.05). This indicates that Digital Literacy has a positive and significant effect on Learning Achievement (Y). This can be interpreted to mean that when the Digital Literacy (Z) variable increases, the Learning Achievement (Y) variable will also increase, and vice versa.

Table 6. Results of Path Cooficient: Dirrect Effects

Hypothesis	Path Analysis	β-Values (+/-)	Sample Mean	SDV	T-Statistics (>1,96)	P-Values (<0,05)	Decision
H-DIR$_1$	KM -> PY	0.404	0.406	0.085	4.727	0.000	Accepted
H-DIR$_2$	KM -> LB	0.257	0.258	0.080	3.218	0.001	Accepted
H-DIR$_3$	MB -> PB	0.479	0.481	0.078	6.182	0.000	Accepted
H-DIR$_4$	MB -> LD	0.469	0.470	0.084	5.583	0.000	Accepted
H-DIR$_5$	LD -> PB	0.210	0.208	0.071	2.967	0.003	Accepted

4.2. The Role of Digital Literacy in the Independent Curriculum and Learning Motivation on Learning Achievement

Based on the table below, the results of the H-IND1 hypothesis testing the mediating effect of the Digital Literacy variable (Z) indicate a positive (β-value = 0.195) and insignificant (T-statistic 3.878 > 1.96 and P-value 0.000 < 0.05) effect between the Independent Curriculum factor (X1) and Learning Achievement (Y). Therefore, H-IND1 states, "There is a positive and significant influence of Digital Literacy in mediating the Independent Curriculum on Learning Achievement."

In the H-IND2 hypothesis, the results of the mediation effect test of the Digital Literacy variable (Z) can be concluded that there is a positive (β-values =

0.227) and significant (T statistic 3.902 >1.96 and P values 0.000 <0.05) influence between the Learning Motivation factor (X2) on Learning Achievement (Y). So, H-IND2 states, "There is a positive and significant influence of the role of Digital Literacy in mediating Learning Motivation on Learning Achievement."

Table 7. Results of Path Coeficient: Indirect Effects

Hypothesis	Path Analysis	β-Values (+/-)	SDV	T-Statistics (>1,96)	P-values	Decision	Mediating Role
H-IND$_1$	KM -> LD -> PB	0.195	0.050	3.878	0.000	Accepted	Partial mediation
H-IND$_2$	MB -> LD -> PB	0.227	0.058	3.902	0.000	Accepted	Partial mediation

5. Discussion

The Independent Curriculum has a significant positive impact on improving student achievement. Through a more flexible approach that prioritizes independence, students are given space to actively discuss and develop a deeper understanding of the learning material. This encourages students to become proactive and creative learners. In line with Ande Reinaldi's opinion, the Independent Curriculum offers students more opportunities to explore their interests and talents, ultimately improving overall learning achievement (Reinaldi & Karim, 2025)

This research also aligns with Suriadi Ardiasyah's statement that implementing the Independent Curriculum can encourage students to develop independent learning skills (Ardiansyah, 2024) In addition to opening up opportunities for discussion, the Independent Curriculum's influence on learning achievement is also supported by a second indicator: collaboration. This research aligns with Anggraini's assertion that a positive learning environment significantly influences optimal learning outcomes for both students and teachers (Inovasi et al., 2024).

However, it contradicts Andika's research, which found that implementing the independent curriculum fails to improve learning effectiveness because it places too much burden on students, resulting in psychological stress (Nomor et al., 2025). Therefore, implementing the independent curriculum requires attention to students' psychological well-being. This is supported by Ramdhani's research, which shows that an independent curriculum not tailored to students' needs can reduce learning

effectiveness (Program et al., 2024).

Learning motivation is a key factor in student achievement. High levels of motivation encourage students to actively and consistently participate in the learning process. This research aligns with Dhea Ramdhani's statement that strong learning motivation can improve students' focus and persistence in understanding subject matter. Furthermore, a persistent attitude also influences student motivation (Ramadhani & Suriani, 2024). Other research has shown that a persistent attitude increases students' motivation to learn. This creates a positive learning spirit, where students feel motivated to strive for excellence, ultimately contributing to improved overall learning achievement.

However, this is inconsistent with Nurjanah's research, which shows that while students have high motivation, other factors, such as ineffective teaching methods and curriculum inconsistencies, can hinder learning achievement (Kewarganegaraan et al., 2023). Furthermore, a comfortable classroom atmosphere does not always guarantee improved learning quality. Without appropriate learning strategies, a comfortable classroom alone is insufficient to encourage student achievement. In other words, learning motivation and the classroom environment must be supported by effective methods and approaches to positively impact student achievement.

Digital literacy has a significant positive influence on student achievement. With strong digital literacy skills, students can access broader, more accurate information, thereby supporting an effective, efficient learning process. This research aligns with Riries Ernie's statement that digital literacy helps students develop critical thinking and problem-solving skills, which are key to successful learning (Cynthia & Sihotang, 2023) Furthermore, digital literacy facilitates student collaboration and communication during the learning process, creating a more dynamic and interactive learning environment. Therefore, improving students' digital literacy is a crucial factor in promoting optimal learning achievement.

However, digital literacy does not always positively impact student achievement. Even though students have extensive access to digital information, factors such as a lack of teacher guidance and distractions from social media can hinder effective learning. This research aligns with Yentri's statement that low digital literacy makes it difficult for students to distinguish accurate information, thereby reducing the quality of their understanding of the material. In addition, excessive dependence on digital devices without proper supervision can reduce focus and direct collaboration in the classroom (Anggeraini et al., 2019). Without good integration, digital literacy can become a major barrier to achieving optimal learning outcomes.

6. Conclusion

This study demonstrates that implementing the Independent Curriculum has a positive, significant impact on digital literacy and student academic achievement. Furthermore, digital literacy has been shown to act as a mediating variable, strengthening the relationship between the implementation of the Independent Curriculum and learning motivation and indirectly contributing to improved academic achievement. These findings suggest that the effectiveness of curriculum reform in improving learning outcomes depends heavily on strengthening students' digital literacy competencies. The developed structural model confirms that digital literacy is a key mechanism that bridges curriculum innovation and motivational factors to produce better academic performance. Therefore, strengthening digital literacy needs to be an integral part of curriculum implementation strategies to optimize learning outcomes in the era of technology-based education. Although this research model adequately explains a proportion of the variance in academic achievement, future research is recommended to expand the sample size, add other contextual variables, and test the model longitudinally to gain a more comprehensive understanding of the impact of curriculum reform on student learning outcomes.

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