

Learning satisfaction as a mediator of the effects of teachers' digital competence and blended learning on student academic achievement in public junior high schools in Rangkasbitung Sub-district, Banten Province

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Article information	ABSTRACT
Keywords: teachers' digital competence; blended learning; learning satisfaction; academic achievement; PLS-SEM	Objective: This study aims to examine the direct and indirect effects of teachers' digital competence and blended learning on student academic achievement, with learning satisfaction as a mediating variable, at the public junior high school level in areas with technological infrastructure disparities. Research methodology: This study employed a quantitative associative approach with a cross-sectional design. The respondents comprised 143 teachers and 143 eighth-grade students from six public junior high schools in Rangkasbitung Sub-district, Lebak Regency, Banten Province, selected through proportionate stratified random sampling based on Slovin's formula. Data were collected using a Likert-scale questionnaire, triangulated with academic report card records, and subsequently analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS version 3. Results: All eighty indicators were found to be valid and reliable. Teachers' digital competence and blended learning each had positive and significant effects on learning satisfaction and academic achievement, while learning satisfaction was shown to be a partial mediator in both pathways. The structural model explained 66.8% of the variance in learning satisfaction and 71.2% of the variance in student academic achievement. Conclusion: Student academic achievement is influenced more indirectly through enhanced learning satisfaction than through the direct effects of teachers' digital competence or blended learning alone. Therefore, learning satisfaction serves as an important linking mechanism within the hybrid learning ecosystem at the public junior high school level. Limitations: This study used a cross-sectional design, relied partly on self-reported data, and was limited to six schools in one sub-district; therefore, generalizability to other contexts should be approached cautiously. Contribution: These findings contribute to the efforts of local education policymakers, school principals, and teachers to design digital competence enhancement and blended learning programs oriented toward strengthening students' learning satisfaction, while enriching the digital education literature in the context of developing regions with infrastructure constraints.
Article information	ABSTRAK
Keywords: kompetensi digital guru; blended learning; kepuasan belajar; prestasi belajar; SEM PLS	Tujuan: Penelitian ini bertujuan menguji pengaruh kompetensi digital guru dan blended learning terhadap prestasi belajar siswa, baik secara langsung maupun melalui kepuasan belajar sebagai variabel mediator, pada jenjang sekolah menengah pertama di wilayah dengan kesenjangan infrastruktur teknologi. Metodologi Penelitian: Penelitian menggunakan pendekatan kuantitatif asosiatif dengan desain cross sectional. Responden terdiri atas 143 guru dan 143 siswa kelas VIII yang berasal dari enam Sekolah Menengah Pertama Negeri di Kecamatan Rangkasbitung, Kabupaten Lebak, Provinsi Banten, yang dipilih melalui proportionate stratified random sampling berdasarkan rumus Slovin. Data dikumpulkan melalui kuesioner berskala Likert yang ditriangulasi dengan dokumen nilai rapor, kemudian dianalisis menggunakan Structural Equation Modeling berbasis Partial Least Squares (SEM PLS) dengan bantuan perangkat lunak SmartPLS versi 3. Hasil: Seluruh delapan puluh indikator dinyatakan valid dan reliabel. Kompetensi digital guru dan blended learning masing-masing berpengaruh positif dan signifikan terhadap kepuasan belajar maupun prestasi belajar, sedangkan kepuasan belajar terbukti menjadi mediator parsial pada kedua jalur pengaruh tersebut. Model mampu menjelaskan 66,8 persen variasi kepuasan belajar dan 71,2 persen variasi prestasi belajar siswa. Simpulan: Prestasi belajar siswa lebih banyak ditentukan secara tidak langsung melalui peningkatan kepuasan belajar dibandingkan pengaruh langsung kompetensi digital guru maupun blended learning semata, sehingga kepuasan belajar berperan sebagai mekanisme penghubung yang penting dalam ekosistem pembelajaran hibrida di jenjang menengah pertama. Keterbatasan: Penelitian ini bersifat cross sectional, mengandalkan sebagian data persepsi diri, serta terbatas pada enam sekolah dalam satu kecamatan sehingga generalisasi ke konteks lain perlu dilakukan secara hati-hati. Kontribusi: Temuan ini memberikan kontribusi bagi pengembangan kebijakan pendidikan daerah, kepala sekolah, dan guru dalam merancang program peningkatan kompetensi digital dan blended learning yang berorientasi pada penguatan kepuasan belajar siswa, serta memperkaya literatur pendidikan digital pada konteks daerah berkembang dengan keterbatasan infrastruktur.
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1. Introduction

Digital transformation has changed the ways in which teachers teach and students learn across nearly all levels of education. The DigCompEdu framework developed by Redecker and Punie (2017) outlines six areas of digital competence that educators should ideally master, including professional engagement, digital resources, teaching and learning; assessment, empowering learners, and facilitating learners' digital competence. This framework was subsequently updated through DigComp 2.2 by Vuorikari, Kluzer, and Punie (2022), which emphasizes digital competence as a fundamental necessity for every citizen in the digital era, including educators. Through a systematic review of the higher education literature, Basilotta Gomez Pablos, Matarranz, Casado Aranda, and Otto (2022) found that teachers' digital competence was strongly correlated with the quality of the learning designs they produced. Consistent with this finding, Ghomi and Redecker (2019) developed a self-assessment instrument to empirically measure teachers' digital competence, which has subsequently been widely adapted across diverse national contexts.

In the Indonesian context, Mahyudin (2022) stated that teachers' roles in the digital era have shifted from merely serving as sources of information to acting as facilitators who meaningfully manage technology in the learning process. Habibah (2022) added that limitations in teachers' digital competence directly contribute to the declining quality of learning interactions. Data from Pusdatin Kemendikbudristek (2022) indicate that conditions remain far from ideal: approximately sixty-five percent of teachers are still at the basic level of digital literacy, twenty-five percent are at the intermediate level, and only ten percent have reached the advanced level. This situation is reinforced by the findings of Ningsih and Akhyar (2024), who mapped the digital competence profiles of junior high school teachers based on the DigCompEdu framework and found that most teachers remained at the awareness level, with only a small proportion reaching the leadership and innovation levels.

The COVID-19 pandemic accelerated the adoption of blended learning models across various levels of education. Hrastinski (2019) defined blended learning as a planned combination of face-to-face and online learning designed to complement one another, whereas Garrison and Kanuka (2004) emphasized that the transformative potential of blended learning lies in the thoughtful integration of synchronous and asynchronous learning experiences, rather than merely adding technology to conventional methods. Cao's (2023) meta-analysis of sixty-two studies concluded that blended learning consistently improves student performance, attitudes, and engagement compared with conventional learning alone. Similar findings were reported by Han (2023), who evaluated the effectiveness of blended learning using a structural equation modeling approach and found positive effects on student academic achievement. At the

national level, Batubara, Riyanda, Rahmawati, Ambiyar, and Samala (2022), through a meta-analysis of blended learning implementation during the pandemic, found that this model created more flexible and efficient learning experiences, whereas Wiyono, Kusumawardani, and Maisyaroh (2021) documented various challenges in implementing blended learning in Indonesian secondary schools, ranging from infrastructure readiness to teachers' pedagogical readiness.

Several studies have emphasized the relationship between teachers' digital competence and the success of blended learning. Howard and Tondeur (2023) concluded that teachers' digital competence is a primary prerequisite for the sustainability of hybrid learning in the future. Ng, Leung, Chu, and Qiao (2023) found that teachers' digital competence in the post-pandemic era was significantly correlated with the successful fostering of twenty-first-century skills among students. Conversely, Made, Yadnya, and Dewi (2023) noted that limitations in teachers' digital competence constituted a major barrier to student engagement during online learning, whereas Syahid, Mustofa, and Rahayu (2022) found a significant effect of teachers' digital competence on students' learning satisfaction in the secondary school context.

In Lebak Regency, Banten Province, this disparity is clearly evident. Data from the Ministry of Communication and Informatics and Katadata Insight Center (2023) show that the national digital literacy index has reached only 3.54 on a scale of 1 to 5, with an uneven distribution across regions. Physical infrastructure conditions further reinforce this picture, as reported in the Neraca Pendidikan Daerah Kemendikbudristek (2023), which indicated that only approximately 44% of public junior high school classrooms in Lebak Regency were in good condition. The disparity between urban and rural schools in sub-districts such as Rangkasbitung makes this context relevant for more in-depth investigation, given that variations in digital infrastructure readiness across regions may affect the effectiveness of both teachers' digital competence and blended learning implementation in relation to student academic achievement.

An equally important variable in this chain of relationships is learning satisfaction. Topala and Tomozii (2014) define learning satisfaction as students' affective evaluation of their learning experiences, reflecting the extent to which their needs and expectations regarding the learning process are fulfilled. Drawing on self-determination theory, Chiu (2022) explains that learning satisfaction is closely associated with the fulfillment of students' basic psychological needs for autonomy, competence, and social relatedness throughout the learning process. Efriani, Randayani, and Husna (2021) found that university students' learning satisfaction during online learning was strongly influenced by the quality of interaction and the clarity of instructors' directions. Cheng, Mo, and Duan (2023) identified teaching quality, content design, and interaction as the primary

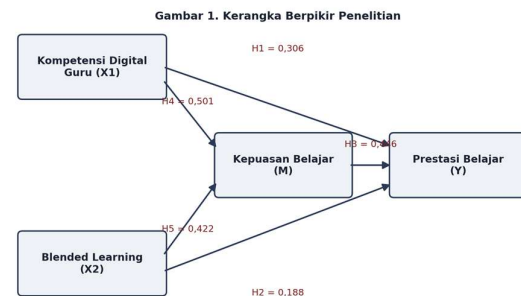
determinants of learning satisfaction in blended learning. Kobicheva, Moskvina, and Tokareva (2022) further found that levels of learning satisfaction could predict students' academic achievement in blended learning contexts, whereas Suliyanthini, Farida, and Fauziah (2024) confirmed the significant effects of online blended learning on vocational education students' learning outcomes and satisfaction.

The direct relationships of teachers' digital competence and blended learning with academic achievement have also been extensively examined. Reyes (2025) found that teachers' digital competence significantly affected student academic achievement in higher education, whereas Boyraz (2024) reported that digital competence contributed to preservice teachers' e-learning satisfaction. Sari and Nugroho (2022) found that a blended learning approach using a classroom demonstration model effectively addressed learning difficulties while improving students' mathematics academic achievement, whereas Sulthoniyah, Nur Afianah, Afifah, and Lailiyah (2022) found that hybrid learning and blended learning models enhanced elementary school students' learning motivation. Through a meta-analysis of presence in the community of inquiry, Martin, Wu, Wan, and Xie (2022) affirmed that the quality of cognitive, social, and teaching interactions in online and blended environments significantly affects learning outcomes. Rohman (2023) revealed that technology serves as a medium for emotional connection in blended learning, with teachers playing a central role in facilitating such connections. Sitompul (2022) emphasized that technology-based learning innovation requires cross-sectoral collaboration as a driver of sustainable educational change, and Sulianta (2023) highlighted the importance of digital literacy as a foundation supporting the successful transformation of technology-based learning. Cahyani, Hanafi, and Nulhakim (2022) also found that Android-based interactive learning media significantly improved junior high school students' learning outcomes, and Rahmi and Azrul (2022) emphasized the importance of carefully integrating technology and pedagogy into blended learning design to produce tangible effects on academic achievement.

Although the literature examining the partial relationships among these variables is relatively extensive, studies that simultaneously examine all four variables within a single structural model remain relatively scarce, particularly those that position learning satisfaction as a mediator between teachers' digital competence and blended learning, on the one hand, and academic achievement, on the other. This is especially the case at the junior high school level in areas with diverse infrastructure characteristics, such as Lebak Regency. Ngongo, Nubatonis, and Benu (2023) examined the role of an intervening variable in the relationship between digital learning facilities, teachers' digital competence, and teacher performance; however, they did not address student academic achievement or the role of learning satisfaction as a mediator. Firdaus and Syah (2025) also

examined the mediating role of learning satisfaction in the relationship among learning motivation, the learning environment, and parental support but did not simultaneously relate it to teachers' digital competence and blended learning. This empirical gap, together with the contextual gap in developing regions with technological infrastructure disparities, provides the basis for this study to examine a mediation model integrating teachers' digital competence and blended learning as predictors, learning satisfaction as a mediator, and student academic achievement as the outcome variable, using a PLS-SEM approach that enables the simultaneous testing of all effect pathways with greater precision than conventional multiple regression analysis (Hair, Risher, Sarstedt, & Ringle, 2019).

Based on the foregoing, this study was designed to address seven research questions: the extent to which teachers' digital competence affects student academic achievement; the extent to which blended learning affects student academic achievement; the extent to which learning satisfaction affects student academic achievement; the extent to which teachers' digital competence and blended learning each affect learning satisfaction; and whether learning satisfaction mediates the effects of teachers' digital competence and blended learning on student academic achievement. Based on the theoretical review and previous studies described above, the research hypotheses are formulated as follows. H1: Teachers' digital competence has a positive and significant effect on student academic achievement. H2: Blended learning has a positive and significant effect on student academic achievement. H3: Learning satisfaction has a positive and significant effect on student academic achievement. H4: Teachers' digital competence has a positive and significant effect on learning satisfaction. H5: Blended learning has a positive and significant effect on learning satisfaction. H6: Learning satisfaction mediates the effect of teachers' digital competence on student academic achievement. H7: Learning satisfaction mediates the effect of blended learning on student academic achievement. These seven hypotheses are depicted in the conceptual framework presented in Figure 1.



2. Research methods

This study employed a quantitative approach with a causal-associative, cross-sectional design, in which data were collected

at a single point in time to examine causal relationships among latent variables. The study was conducted at six public junior high schools in Rangkasbitung Sub-district, Lebak Regency, Banten Province: SMPN 1, SMPN 2, SMPN 3, SMPN 4, SMPN 5, and SMPN 6 Rangkasbitung. These six schools were selected because they had progressively implemented blended learning since the pandemic and exhibited diverse infrastructure characteristics, ranging from urban schools with relatively well-equipped computer laboratories to semi-urban and rural schools with limited facilities. Field data collection was conducted from April to July 2026.

The study population comprised all permanent and nonpermanent teachers at the six schools, totaling 221 individuals. The sample size was determined using Slovin's formula with a five percent margin of error, yielding a minimum sample size of 142.38, which was rounded to 143 teachers. Proportionate stratified random sampling was used to ensure that each school was proportionally represented. As matched respondents, learning satisfaction and student academic achievement were measured through the perceptions of 143 eighth-grade students at the same six schools. Thus, the study employed a dyadic design, involving teachers' assessments of their digital competence and blended learning on the one hand and students' assessments of their learning satisfaction and student academic achievement on the other. The sample distribution by school is presented in Table 1.

Table 1. Distribution of teacher samples by school

No.	School name	Sample size	Proportion
1	SMPN 1 Rangkasbitung	33	23,08 %
2	SMPN 2 Rangkasbitung	28	19,58 %
3	SMPN 3 Rangkasbitung	22	15,38 %
4	SMPN 4 Rangkasbitung	24	16,78 %
5	SMPN 5 Rangkasbitung	17	11,89 %
6	SMPN 6 Rangkasbitung	19	13,29 %
	Total	143	100%

Source: Processed primary data (2026)

The research data consisted of primary data obtained from a five-point Likert-scale questionnaire administered to teachers and students, as well as secondary data in the form of second-semester academic report card records for the 2024/2025 academic year, which were used to triangulate the academic

achievement variable. The teachers' digital competence variable was measured using twenty items representing five dimensions: professional engagement, digital resources, digital teaching and learning, technology-based assessment, and facilitating learners' digital competence, adapted from the DigCompEdu framework (Redecker & Punie, 2017; Vuorikari, Kluzer, & Punie, 2022). The blended learning variable was measured using twenty items representing five dimensions: integrated curriculum design, blended classroom management, technology integration, learning support and facilitation, and blended evaluation, based on the conceptualizations of Hrastinski (2019) and Garrison and Kanuka (2004). The learning satisfaction variable was measured using twenty items representing five dimensions: satisfaction with teaching quality, content and materials, interaction and engagement, environment and facilities, and learning outcomes, adapted from the instrument developed by Topala and Tomozii (2014) and the self-determination theory framework described by Chiu (2022). The academic achievement variable was measured through twenty student self-report items representing four dimensions: daily examination scores, mid-semester examination scores, final-semester examination scores, and second-semester report card scores, which were subsequently triangulated with actual report card documentation.

Before the instrument was administered to the main respondents, the content validity of each item was assessed by two experts in education and learning technology using a scale of one to four. The assessment results indicated that all items fell within the relevant to highly relevant categories, and several wording revisions were made to ensure that the language was more readily understood by respondents. Data were collected through the direct administration of questionnaires with researcher assistance; consequently, all returned questionnaires were eligible for analysis, with no missing data.

Data analysis was conducted in two stages using the PLS-SEM approach with SmartPLS version 3 software. The first stage involved evaluating the measurement model, or outer model, including convergent validity testing based on outer loading values required to be greater than or equal to 0,70 and average variance extracted values greater than or equal to 0,50; discriminant validity testing using the Fornell-Larcker criterion and the heterotrait-monotrait ratio; and construct reliability testing using composite reliability and Cronbach's alpha values required to be greater than or equal to 0,70 (Hair, Risher, Sarstedt, & Ringle, 2019). The second stage involved evaluating the structural model, or inner model, including R Square values to determine the model's predictive strength for endogenous variables, with values above 0,75 interpreted as strong, values from 0,50 to 0,74 as moderate, and values from 0,25 to 0,49 as weak; and F Square values to determine the relative contribution of each exogenous construct, with values above 0,35 interpreted as large, values from 0,15 to 0,35 as medium, and values from 0,02 to 0,15 as small.

Hypotheses were tested using a bootstrapping procedure with five thousand subsamples to generate estimates of path coefficients, t statistics, and p values. A hypothesis was accepted when the t-statistic value was greater than or equal to 1,645 and the p value was less than 0,05 in a one-tailed test at a five percent significance level. Mediation effects were tested through specific indirect effect analysis, with mediation status determined based on the simultaneous significance of the direct and indirect effects: partial mediation was indicated when both paths were significant, whereas full mediation was indicated when only the indirect path was significant and the direct path became nonsignificant after the mediator was included in the model.

3. Results and discussion

3.1 Respondent characteristics and descriptive statistics

The study respondents comprised two complementary groups: one hundred forty-three teachers who assessed the teachers' digital competence and blended learning variables and one hundred forty-three eighth-grade students from the same six schools who assessed the learning satisfaction and academic achievement variables. The largest proportion of respondents came from SMPN 1 Rangkasbitung, the school with the largest number of teachers and the most comprehensive technological facilities, whereas the fewest respondents came from SMPN 5 Rangkasbitung, which is located in an area with limited facilities. This distribution confirms that the research data encompassed diverse school characteristics in terms of both geographic location and digital infrastructure readiness.

The descriptive statistical analysis showed that all four research variables were in the moderate category, with mean values of 3,330 for teachers' digital competence, 3,292 for blended learning, 3,097 for learning satisfaction, and 3,308 for academic achievement. Learning satisfaction had the lowest mean value among the four variables, indicating that students' affective responses to their learning experiences remain weaker than teachers' competence and learning design. The mean values for each dimension are presented in Table 2.

Table 2. Descriptive statistics for the research variables

No.	Variable	Number of indicators	Mean	Category
1	Teachers' Digital Competence (X1)	20	3,330	Moderate
2	Blended Learning (X2)	20	3,292	Moderate
3	Learning Satisfaction (M)	20	3,097	Moderate
4	Academic	20	3,308	Moderate

No.	Variable	Number of indicators	Mean	Category
	Achievement (Y)		8	ate

Source: Processed primary data (2026)

For teachers' digital competence, the management of digital resources dimension obtained the highest mean, whereas the facilitating learners' digital competence dimension obtained the lowest mean, indicating that teachers were relatively more proficient in selecting and modifying digital resources than in guiding students to develop their own digital competence. For blended learning, the blended evaluation dimension obtained the highest mean, whereas the integrated curriculum design dimension obtained the lowest mean, indicating that structured hybrid learning planning remains a particular challenge for schools with infrastructure constraints. For learning satisfaction, the satisfaction with content and materials dimension obtained the highest mean, whereas the satisfaction with interaction and engagement dimension obtained the lowest mean, which is relevant to disparities in internet access in nonurban areas that also limit the intensity of digital interaction between teachers and students. For academic achievement, the midsemester examination score dimension obtained the highest mean, whereas the final semester examination score dimension obtained the lowest mean.

3.2 Measurement model evaluation

The measurement model was evaluated to ensure that the indicators used were valid and reliable for measuring their latent constructs. The outer loading results for the 80 indicators across the four study variables showed that all indicators had values above 0.70, with the lowest value being 0.777 and the highest being 0.912; thus, all indicators were considered convergently valid. The average variance extracted values for the four variables were also above the 0.50 threshold, strengthening the evidence for the model's convergent validity. Discriminant validity testing using the Fornell–Larcker criterion and the heterotrait–monotrait ratio showed that each construct had an adequate level of distinctiveness relative to the other constructs, indicating that the four study variables measured genuinely distinct concepts. Construct reliability testing using composite reliability and Cronbach's alpha showed that all variables exceeded the 0.70 threshold; therefore, the research instrument was considered reliable and internally consistent. A summary of the measurement model evaluation results is presented in Table 3.

Table 3. Summary of measurement model evaluation

Construct	Outer loading range	AVE	Cronbach's Alpha	Composite Reliability	Description
Teachers' Digital Competence	0,70 - 0,91	0,739	0,981	0,983	Valid and reliable
Blended Learning	0,70 - 0,91	0,698	0,977	0,979	Valid and reliable
Learning satisfaction	0,70 - 0,91	0,734	0,981	0,982	Valid and reliable
Academic achievement	0,70 - 0,91	0,753	0,983	0,984	Valid and reliable

Source: SmartPLS 3 output (2026)

3.3 Structural model evaluation

After the measurement model was deemed valid and reliable, the structural model was evaluated using R-squared, f-squared, and hypothesis testing. The R-squared value for the learning satisfaction variable was 0.668, indicating that 66.8% of the variance in learning satisfaction could be simultaneously explained by teachers' digital competence and blended learning. The R-squared value for the academic achievement variable was 0.712, indicating that 71.2% of the variance in student academic achievement could be simultaneously explained by teachers' digital competence, blended learning, and learning satisfaction. Both values fell within the moderate category, with the R-squared value for academic achievement approaching the strong category, indicating that the structural model had good predictive power. The results of the R-squared test are presented in Table 4.

Table 4. R-Square test results

Endogenous variable	R Square	Adjusted R Square	Category
Learning satisfaction	0,668	0,663	Moderate
Academic achievement	0,712	0,706	Moderate

Source: SmartPLS 3 output (2026)

Subsequently, f-squared values were used to determine the relative contribution of each exogenous construct to the R-

squared value of the endogenous construct, as presented in Table 5.

Table 5. F-Square test results

Intervariable relationship	F Square	Category
Blended learning -> Learning satisfaction	0,365	Large
Blended learning -> Academic achievement	0,061	Small
Learning satisfaction -> Academic achievement	0,229	Moderate
Teachers' digital competence -> Learning satisfaction	0,516	Large
Teachers' digital competence -> Academic achievement	0,146	Small

Source: SmartPLS 3 Output (2026)

Table 5 shows that teachers' digital competence made the largest relative contribution to learning satisfaction, which was categorized as large, followed by the contribution of blended learning to learning satisfaction, which was also categorized as large. Conversely, the direct contributions of teachers' digital competence and blended learning to academic achievement were categorized as small, whereas the contribution of learning satisfaction to academic achievement was categorized as moderate. This pattern indicates that the two exogenous variables had substantially stronger indirect effects on academic achievement through learning satisfaction than direct effects, providing an important empirical basis for the discussion of the mediating role in the following section.

3.4 Hypothesis testing

Hypothesis testing was conducted using a bootstrapping procedure with 5,000 subsamples. The results of the direct-effects testing are presented in Table 6, whereas the results of the indirect-effects, or mediation, testing are presented in Table 7.

Table 6. Results of direct-effects testing (path coefficients)

Hypothesis	Relationship between variables	Path coefficient	T Statistics	P Values	Decision
H1	Teachers' digital competence ->	0,306	4,850	0,000	Accepted

Hypothesis	Relationship between variables	Path coefficient	T Statistics	P Values	Decision
	Academic achievement				
H2	Blended Learning -> Academic Achievement	0,188	2,710	0,007	Accepted
H3	Learning Satisfaction -> Academic Achievement	0,446	5,923	0,000	Accepted
H4	Teachers' Digital Competence -> Learning Satisfaction	0,501	8,955	0,000	Accepted
H5	Blended Learning -> Learning Satisfaction	0,422	7,660	0,000	Accepted

Source: SmartPLS version 3 output, bootstrapping procedure (2026)

Table 6 shows that all five direct relationships among the variables had t-statistics above 1.645 and p-values below 0.05; thus, all five hypotheses were accepted. The highest path coefficient was observed for the effect of teachers' digital competence on learning satisfaction, whereas the lowest path coefficient was observed for the effect of blended learning on academic achievement.

Table 7. Results of indirect effect testing (mediation)

Hypothesis	Mediation relationship	Path coefficient	T Statistics	P Values	Remarks
H6	Teachers' Digital Competence -> Learning Satisfaction	0,223	5,065	0,000	Accepted (partial)

Hypothesis	Mediation relationship	Path coefficient	T Statistics	P Values	Remarks
	n -> Academic Achievement				
H7	Blended Learning -> Learning Satisfaction -> Academic Achievement	0,188	4,367	0,000	Accepted (partial)

Source: SmartPLS version 3 output, bootstrapping procedure (2026)

Table 7 shows that the mediating effect of learning satisfaction on the relationship between teachers' digital competence and academic achievement was significant, with a coefficient of 0.223, and that the mediating effect of learning satisfaction on the relationship between blended learning and academic achievement was also significant, with a coefficient of 0.188. Because the direct effects of teachers' digital competence and blended learning on academic achievement remained significant after learning satisfaction was included in the model, the type of mediation in both pathways was partial mediation rather than full mediation. The variance accounted for calculation showed that 42.2% of the total effect of teachers' digital competence on academic achievement was transmitted through learning satisfaction, whereas for the blended learning pathway, this proportion reached 50%, meaning that half of the total effect of blended learning on academic achievement operated through an initial increase in students' learning satisfaction. A summary of the results of testing the seven hypotheses is presented in Table 8.

Table 8. Summary of research hypothesis testing results

Hypothesis	Hypothesis statement	Coefficient	T Stat	P value	Decision
H1	Teachers' digital competence has a positive and	0,306	4,850	0,000	Accepted

Hypot hesis	Hypothe sis statement	Co effici ent	T Stat	P value	Decisio n
	significant effect on academic achievemen t				
H2	Blended learning has a positive and significant effect on academic achievemen t	0,1 88	2, 710	0,0 07	Accepte d
H3	Learning satisfaction has a positive and significant effect on academic achievemen t	0,4 46	5, 923	0,0 00	Accepte d
H4	Teachers' digital competence has a positive and significant effect on learning satisfaction	0,5 01	8, 955	0,0 00	Accepte d
H5	Blended learning has a positive and significant effect on learning satisfaction	0,4 22	7, 660	0,0 00	Accepte d
H6	Learning satisfaction mediates the effect of teachers'	0,2 23	5, 065	0,0 00	Accepte d

Hypot hesis	Hypothe sis statement	Co effici ent	T Stat	P value	Decisio n
	digital competence on academic achievemen t				
H7	Learning satisfaction mediates the effect of blended learning on academic achievemen t	0,1 88	4, 367	0,0 00	Accepte d

Source: Processed primary data (2026)

3.5 Discussion

The results of the first hypothesis test indicate that teachers' digital competence had a positive and significant effect on student academic achievement, with a path coefficient of 0.306. This finding reinforces Reyes's (2025) conclusion that teachers who are proficient in using online learning platforms, interactive media, and digital assessment applications can directly improve student academic achievement. Digitally competent teachers tend to present material more diversely, provide timely feedback, and manage classrooms in ways that encourage students to engage more actively in the learning process. Nevertheless, the strength of this effect was moderate, consistent with the findings of Ng, Leung, Chu, and Qiao (2023), who emphasized that teachers' digital competence has a significant impact but does not operate independently; rather, it interacts with various other learning factors in influencing student learning outcomes.

The second hypothesis, which stated that blended learning had a positive and significant effect on student academic achievement, was also accepted, with a path coefficient of 0.188, the smallest coefficient among the three paths to academic achievement. This finding is consistent with the meta-analytic results of Cao (2023) and Han (2023), which demonstrated that blended learning consistently has a positive effect on learning outcomes, although the magnitude varies according to the implementation context. The relatively small effect observed in this study indicates that the effectiveness of blended learning on academic achievement most likely operates indirectly, for example, through an initial increase in learning satisfaction, as further discussed in the sixth and seventh hypotheses. This finding is also consistent with Wiyono, Kusumawardani, and

Maisyarah's (2021) observation that the success of blended learning in Indonesian secondary schools depends heavily on the quality of integrated curriculum design and infrastructure readiness, the two aspects that received the lowest scores among the dimensions of the blended learning variable in this study.

The third hypothesis showed that learning satisfaction had a positive and significant effect on academic achievement, with a path coefficient of 0.446, the largest coefficient among all paths to academic achievement. This finding underscores the importance of students' affective and psychological aspects in determining academic success, consistent with the findings of Kobicheva, Moskvina, and Tokareva (2022), who found that the level of learning satisfaction predicted students' academic achievement in blended learning contexts more strongly than other tested factors. Drawing on self-determination theory, Chiu (2022) explained that when students' basic psychological needs for autonomy, competence, and social relatedness are fulfilled during the learning process, their intrinsic motivation increases, which in turn promotes greater engagement and academic achievement. This finding also confirms the results of Suliyanthini, Farida, and Fauziah (2024), who found a significant relationship between learning satisfaction and learning outcomes in online and blended learning contexts.

The fourth and fifth hypotheses, which stated that teachers' digital competence and blended learning, respectively, had positive and significant effects on learning satisfaction, were both accepted, with path coefficients of 0.501 and 0.422, respectively, making them the paths with the highest coefficients in the overall model. This finding reinforces the conclusion of Syahid, Mustofa, and Rahayu (2022) that teachers' digital competence significantly affects secondary school students' learning satisfaction and is consistent with Cheng, Mo, and Duan (2023), who identified teaching quality and interaction as key determinants of learning satisfaction in blended modes. Efriani, Randayani, and Husna (2021) also found that the quality of interaction and clarity of instructor guidance strongly determine students' level of learning satisfaction during both online and blended learning. Digitally competent teachers can create more engaging, interactive, and personalized learning experiences, whereas well-designed blended learning offers time flexibility and a variety of methods that further enhance students' satisfaction with the learning process.

The sixth and seventh hypotheses tested the mediating role of learning satisfaction. The test results showed that learning satisfaction partially mediated the effects of both teachers' digital competence and blended learning on student academic achievement. For the teachers' digital competence path, the direct effect of 0.306 remained greater than the indirect effect of 0.223, indicating that the direct path remained the primary contributor, although the contribution of the mediated path was still substantial. For the blended learning path, the direct and indirect effects were equal, at 0.188 each, confirming that

learning satisfaction was as important as the direct effect in explaining how blended learning affects student academic achievement. These mediation findings extend the results of Ngongo, Nubatonis, and Benu (2023), who examined the role of an intervening variable in the relationship between teachers' digital competence and teacher performance, and reinforce the findings of Firdaus and Syah (2025) regarding the mediating role of learning satisfaction in learning ecosystems by extending their scope to the simultaneous context of teachers' digital competence and blended learning.

3.6 General findings and research novelty

Overall, all seven hypotheses proposed in this study were supported, indicating that the proposed conceptual model received strong empirical support. The most prominent pattern of results was that teachers' digital competence and blended learning both had substantial effects on learning satisfaction but only small direct effects on student academic achievement, whereas learning satisfaction emerged as the strongest single predictor of academic achievement among the three variables examined. This pattern consistently demonstrates that learning satisfaction is not merely a supplementary variable but rather a central mechanism determining the extent to which the potential of teachers' digital competence and blended learning can be translated into tangible improvements in student academic achievement.

These findings address the study's proposed novelty, namely, testing a mediation model that simultaneously integrates teachers' digital competence and blended learning as predictors, learning satisfaction as a mediator, and academic achievement as the outcome variable in the context of public junior high schools in areas characterized by technological infrastructure disparities. The findings demonstrate that, although the descriptive levels of the four variables were in the moderate category and had not yet reached optimal levels, the hypothesized mediation relationships were nevertheless statistically significant. This indicates that policies aimed at improving educational quality in areas with characteristics similar to Lebak Regency would be more effective if programs to enhance teachers' digital competence and strengthen blended learning design were implemented simultaneously with efforts that directly target improvements in students' learning satisfaction, for example, by enhancing the quality of teacher–student interactions and providing more relevant and varied learning content.

4. Conclusion

4.1 Conclusion

This study draws several important conclusions. First, teachers' digital competence had a positive and significant effect on student academic achievement, confirming that digitally competent teachers are able to design high-quality learning

experiences and provide timely feedback. Second, blended learning had a positive and significant effect on student academic achievement, although its direct effect was relatively small compared with other pathways in the model. Third, learning satisfaction had a positive and significant effect on student academic achievement and was the strongest predictor among the three variables examined, underscoring the importance of affective aspects in determining students' academic success. Fourth and fifth, teachers' digital competence and blended learning each had positive and significant effects on students' learning satisfaction, with teachers' digital competence being the strongest determinant. Sixth and seventh, learning satisfaction was found to partially mediate the effects of both teachers' digital competence and blended learning on student academic achievement, meaning that part of the effects of these two exogenous variables was transmitted through improvements in learning satisfaction before affecting academic achievement.

Overall, this study confirms that improving student academic achievement in the era of digital learning cannot rely solely on enhancing teachers' digital competence or strengthening blended learning design independently; rather, it requires particular attention to creating satisfying and meaningful learning experiences for every student. Teachers' digital competence and blended learning make important contributions, but their effects on academic achievement will be maximized when they successfully foster greater learning satisfaction among students.

4.2 Limitations

This study has several limitations that should be acknowledged candidly. First, the cross-sectional design collected data at only one point in time and therefore could not capture changes in teachers' digital competence, blended learning implementation, learning satisfaction, or student academic achievement over time. Second, data on academic achievement were derived primarily from students' self-reported data, which, although triangulated with academic report card records, may still contain bias arising from respondents' subjectivity. Third, the scope of the study was limited to six public junior high schools in one sub-district; therefore, the generalizability of the findings to other areas with different infrastructure and sociocultural characteristics should be approached cautiously. Fourth, the research model included only four main variables; thus, other variables that theoretically contribute to academic achievement, such as learning motivation, students' digital literacy, parental support, and school climate, were not included in the model.

4.3 Recommendations

Based on the conclusions and limitations outlined above, several recommendations are proposed for relevant stakeholders. Regional education offices are advised to develop structured and sustainable teachers' digital competence training

programs based on the DigCompEdu framework, accompanied by adequate investment in digital infrastructure, particularly in schools located in areas with limited access. School principals are advised to make the development of teachers' digital competence and the strengthening of blended learning design strategic priorities in school work plans, while also integrating the measurement of student learning satisfaction as an indicator for evaluating instructional quality. Teachers are advised to proactively enhance their digital competence through both formal training and self-directed learning and to give greater attention to the quality of their interactions with students as a key factor in fostering learning satisfaction. Future researchers are advised to conduct replication studies in different contexts, explore additional moderating or mediating variables such as learning motivation and students' digital literacy, and consider longitudinal or mixed-methods research designs to deepen understanding of the causal mechanisms identified in this study.

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