

Examining the role of blended learning in digital literacy and learning motivation

Muhammad Wildan Shohib^{1,*}, Anisa Fitri¹, Fauziyah Qurrota A'yun Tamami¹, Hamdan Chehdimae²

¹Universitas Muhammadiyah Surakarta, Indonesia

²University Malaya, Malaysia

Submitted:

16-06-2026

Accepted:

28-08-2026

Published:

07-09-2026

Abstract: Learning motivation and digital literacy have become essential factors in supporting effective learning in technology-integrated higher education environments. The increasing implementation of blended learning encourages universities to develop learning systems that can enhance students' motivation and digital competencies simultaneously. Thus, this research examines how much blended learning increases students' motivation to learn and how digital literacy helps university students adopt blended learning. Structural Equation Modeling–Partial Least Squares (SEM-PLS 4.1) was used to evaluate the data in an explanatory quantitative approach. 722 students from Universitas Muhammadiyah Surakarta's Faculty of Business Economics and Faculty of Islamic Studies participated in the study. They were chosen using a straightforward random selection technique. The findings show that students' enthusiasm for learning is greatly increased by blended learning in both faculties. Additionally, it has been demonstrated that digital literacy significantly influences how well blended learning is implemented. The outer loading, Average Variance Extracted (AVE), and composite reliability results showed that the measurement model verified that the research constructs attained appropriate levels of validity and reliability. These results imply that while digital literacy is a crucial requirement for students to participate successfully in technology-mediated learning environments, blended learning is a pertinent pedagogical strategy for encouraging students' learning motivation.

Keywords: Blended learning, digital literacy, higher education, learning motivation

Abstrak: Motivasi belajar dan literasi digital telah menjadi faktor penting dalam mendukung pembelajaran yang efektif di lingkungan pendidikan tinggi yang mengintegrasikan teknologi. Penerapan *blended learning* yang semakin meluas mendorong perguruan tinggi untuk mengembangkan sistem pembelajaran yang mampu meningkatkan motivasi sekaligus kompetensi digital mahasiswa. Oleh karena itu, penelitian ini mengkaji sejauh mana *blended learning* meningkatkan motivasi belajar mahasiswa dan bagaimana literasi digital membantu mahasiswa dalam mengadopsi metode *blended learning*. Metode *Structural Equation Modeling–Partial Least Squares* (SEM-PLS 4.1) digunakan untuk mengevaluasi data melalui pendekatan kuantitatif eksplanatori. Sebanyak 722 mahasiswa dari Fakultas Ekonomi dan Bisnis serta Fakultas Agama Islam Universitas Muhammadiyah Surakarta berpartisipasi dalam penelitian ini. Mereka dipilih menggunakan teknik pemilihan acak sederhana. Hasil penelitian menunjukkan bahwa antusiasme belajar mahasiswa meningkat secara signifikan berkat penerapan *blended learning* di kedua fakultas tersebut. Selain itu, terbukti pula bahwa literasi digital berpengaruh signifikan terhadap keberhasilan penerapan **blended learning**. Hasil analisis *outer loading*, *Average Variance Extracted* (AVE), dan reliabilitas komposit menunjukkan bahwa model pengukuran telah memverifikasi bahwa konstruk penelitian memenuhi tingkat validitas dan reliabilitas yang memadai. Temuan ini mengimplikasikan bahwa meskipun literasi digital merupakan syarat krusial bagi mahasiswa untuk dapat berpartisipasi secara sukses dalam lingkungan pembelajaran berbasis teknologi, *blended learning* merupakan strategi pedagogis yang relevan untuk mendorong motivasi belajar mahasiswa.

Kata kunci: Blended learning, literasi digital, pendidikan tinggi, motivasi belajar

This is an open access article under the CC-BY-SA license



*Corresponding author: mws543@ums.ac.id

INTRODUCTION

Digital technology has developed at such a rapid rate that it has impacted the framework of higher education and colleges have been forced to set up technology-supported methods of learning (Mohammadi et al., 2025; Ramdana et al., 2026). Yet, the accessibility of digital platforms does not promise effective learning results, given that students' preparation, psychological qualities, and technological abilities play a role in the engagement with learning instruments (Mohammadi et al., 2025; Ramdana et al., 2026, Syauqi et al., 2024). The problem of combining technological learning approaches, digital competence, and student motivation has become crucial in modern higher education.

One of the most important criteria for predicting students' academic achievement, participation, and retention in higher education is learning motivation. Students who are highly motivated to learn tend to actively participate in class activities, always finish assignments, and achieve better academic results (Damopolii, 2025). On the other hand, inadequate learning motivation generally leads to poor participation, less engagement, and inferior academic performance (Schunk et al., 1996). In the context of digital learning, motivation has become increasingly important since students are expected to manage their own learning in technologically advanced environments. In contemporary higher education, learning motivation has been found to be a crucial factor influencing students' engagement, tenacity, and academic success, particularly in the setting of technology-mediated learning environments. Self-Determination Theory states that because learning activities meet students' psychological requirements or competence, autonomy, and interpersonal interactions, students with more intrinsic motivation exhibit higher levels of engagement (Ryan & Deci, 2020).

According to the Expectancy-Value Theory, students' expectations of success and the value they place on the learning tasks influence their intention to participate in them (Eccles & Wigfield, 2020). Additionally, Self-Regulated Learning Theory emphasizes that, particularly in flexible digital learning environments, motivation plays a major role in encouraging students to plan, track, and control their learning processes (Panadero, 2017). These theoretical frameworks have been supported by recent empirical studies that suggest learning motivation is essential for promoting student engagement and academic performance in blended learning environments (Liu et al., 2024; Vo & Ho, 2024).

Furthermore, consistent evidence reveals that well-designed blended learning environments promote academic, behavioral, cognitive, and affective engagement when they are underpinned by suitable instructional design and student-motivating elements (De Bruijn-Smolters & Prinsen, 2024). In order to improve educational efficacy in contemporary higher education, it is increasingly crucial to comprehend the relationship between instructional motivation and student involvement. The importance of motivating elements in the educational process is empirically proven in empirical investigations of technology-supported learning environments. Digital learning treatments that incorporate interactive content, give learning autonomy, and create meaningful learning experiences have been shown to increase student motivation and engagement.

For example, a study of e-modules based on online literacy found that students have a high level of learning motivation (71.56%), meaning that digital resources designed properly can increase students' confidence, participation, and willingness to participate in learning activities (Kurniawan et al., 2021; Nirmala et al., 2024). Likewise, research on

blended learning environments has shown that technology integration has a beneficial impact on student engagement, where learning design and digital interaction are essential elements in determining students' active involvement (Sandjaja, 2025). The results show that the influence of technology-enhanced learning on academic performance depends not only on the availability of digital platforms but also on how technology helps students become more engaged, motivated and self-assured. Therefore, learning motivation is an important mediating factor for explaining why students may have different levels of engagement and learning efficiency in similar digital learning settings.

Besides Bibi and Jati (2015) also conducted a study of 156 university students and found that the use of blended learning considerably increased students' learning motivation compared with traditional learning. Likewise, recent empirical research including 656 engineering students demonstrated that learning motivation played a key role in student engagement in technology-supported learning environments (Ternovaya, 2025). These findings imply that motivation should not be treated as an additional supportive aspect, but as a core psychological process that affects students' learning behavior, persistence, and academic accomplishment in digitally mediated learning environments.

Besides learning motivation, online literacy is identified as a basic competence for students' effective participation in technology-mediated higher education. The Digital Competence Framework (DigComp 2.2) defines digital competence as the ability to access digital information and the skills needed to critically, ethically, and responsibly evaluate, manage, develop, and distribute information (Vuorikari et al., 2022). This perspective demonstrates that online literacy is a multifaceted collection of abilities that encompasses not only the capacity to use technology but also cognitive abilities and suitable digital conduct.

According to the Technology Acceptance Model (TAM), students' perceptions of the value and ease of use of digital learning systems are influenced by their level of technological skill, which in turn influences their acceptance and use of technology for educational goals (Davis, 1989). Additionally, Self-Regulated Learning Theory contends that students who are proficient with technology are better equipped to manage learning resources, assess their own development, and choose the best digital strategies to independently accomplish academic objectives (Zimmerman, 2002). Thus, internet literacy is the main requirement for successful participation in today's learning contexts.

Furthermore, studies have demonstrated a favorable correlation between students' academic achievement, levels of engagement, and eagerness to learn in postsecondary educational environments. Technical literacy is essential for university students' independent learning practices and their readiness for online learning, according to recent study by Song et al. (2025). An et al. (2025) also showed that students' online literacy, digital competency, and informal digital learning activities significantly impacted their academic performance. The results show that online literacy is a cognitive and behavioral skill that allows students to successfully and autonomously navigate digital learning settings in addition to being a technology competency.

Thus, the goal of this study is to evaluate how blended learning impacts students' online literacy and learning motivation while also examining the mediating function of learning motivation in establishing the relationship between blended learning approaches and the improvement of online literacy in the context of higher education.

METHOD

The associations between the variables under examination were examined in this study using an explanatory quantitative approach. More specifically, the study that looked at the connection between students' enthusiasm for learning and online literacy positioned blended learning as a mediating variable (Creswell & Creswell, 2018). Data was gathered using a standardized questionnaire using a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). This scaling technique is used to systematically measure respondents' opinions and attitudes. Because the study instrument is based on previous studies that have shown adequate validity and reliability, the measuring procedure's accuracy and consistency may be taken into account (Likert, 1932).

$$n = \frac{N}{1+N(e)^2} \quad (1)$$

Where n is the required sample size, e is the allowed margin of error, and N is the total population. In accordance with Sekaran and Bougie (2016), a 5% margin of error was used to define the sample. This computation yielded a total of 722 respondents who satisfied the pre-established research criteria for the study. The respondents were 356 students from the Faculty of Islamic Studies and 366 students from the Faculty of Business Economics a fair foundation for comparing the patterns found in each academic setting is provided by the roughly equal distribution between the two faculties. The respondents were further characterized using a variety of demographic factors, including gender, age, academic standing, and educational history.

Table 1. Respondent characteristics

No.	Variables	Classification	Frequency	Percentage	Total
1.	Gender	1. Women	410	56.8%	722
		2. Man	312	43.2%	(100%)
2.	Age	1. 18 – 21	428	59.3%	722
		2. 22 – 24	214	29.6%	(100%)
		3. 25 – 27	58	8.0%	
		4. More than 27	22	3.1%	
3.	Study Program	1. Faculty of Business Economics	366	50.7%	722
		2. Faculty of Islamic Studies	356	49.3%	(100%)
4.	Level Education	1. 1 st Semester	82	11.4%	722
		2. 2 nd Semester	96	13.3%	(100%)
		3. 3 rd Semester	88	12.2%	
		4. 4 th Semester	102	14.1%	
		5. 5 th Semester	91	12.6%	
		6. 6 th Semester	84	11.6%	
		7. 7 th Semester	79	10.9%	
		8. 8 th Semester	67	9.3%	
		9. > 8 th Semester	33	4.6%	

Prior to conducting any data analysis, each response was verified for accuracy and completeness. The reliability of the constructs, convergent validity, and the validity of the indicators were used to evaluate the measuring model. All indicators had values above the necessary threshold of 0.70 when the outer loading values were evaluated to determine the validity of each indicator. Composite Reliability (CR) was used to measure construct reliability. The CR score for each construct was greater than 0.70, indicating strong internal consistency. Furthermore, all constructs received values above 0.50, and convergent validity was attained with the Average Variance Extracted (AVE). SmartPLS was then used to evaluate the collected data using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method. Because it can analyze intricate structural relationships, including both direct and indirect effects between latent variables, this analytical method was selected.

RESULTS AND DISCUSSION

Measurement model assessment

The measurement model was evaluated before the structural relationships between Digital Literacy (DL), Blended Learning (BL), and Learning Motivation (LM) were examined. The assessment focused on indicator reliability, convergent validity, discriminant validity, and concept reliability. This procedure was required because only when the latent constructs are represented by indicators with adequate measurement quality can structural relationships be meaningfully interpreted. Because the analysis was done separately for the Faculty of Business Economics (FEB) and the Faculty of Islamic Studies (FAI), the results can be evaluated within the multiple academic contexts represented in the sample.

Confirmatory factor analysis

Confirmatory factor analysis was used to evaluate the assessment quality of the constructs that represent learning motivation (LM), blended learning (BL), and digital literacy (DL). Among the several evaluation criteria were convergent validity, discriminant validity, outer loading, and item dependability. These criteria were used to evaluate whether the indicators appropriately reflected their corresponding theoretical entities and whether the measurement instruments demonstrated adequate psychometric quality.

The outer loading values for each variable related to learning motivation, blended learning, and digital literacy among students in the Faculty of Economics and Business are shown in Figure 1. The degree to which each observed indicator reflects its corresponding latent construct is indicated by the loading coefficients. Because their contributions to construction measurement were deemed sufficient, indicators that met the suggested criterion were kept. Digital Literacy (DL), Blended Learning (BL), and Learning Motivation (LM). The outer loadings show the extent to which each measurement item reflects and captures the respective latent component. The higher the values of the outer loadings, the stronger the indicators are related to the constructs they are meant to measure, and the more robust is the measurement model.

According to the guidelines set forth by Hair et al. (2019), an outer loading estimate greater than 0.70 indicates a high degree of indicator reliability and validates the degree of correlation between the observed indicators and the related latent variables. All indicators had good loading values, according to the SEM-PLS study. This indicates that the indicators adequately capture the underlying constructs they were designed to measure. Therefore,

these findings confirm satisfactory convergent validity and support the reliability and robustness of the proposed structural model.

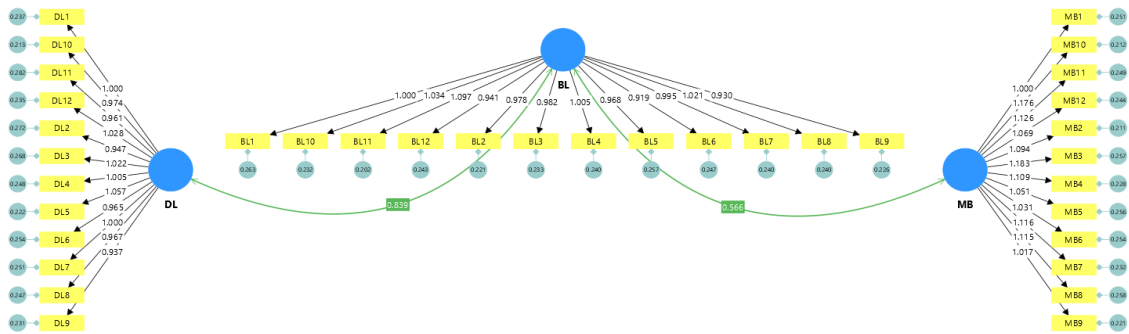


Fig.1. Confirmatory analysis generated model of the faculty of business economics

As presented in Table 2, the model fit assessment indicates that the obtained chi-square value (849.094) falls within the acceptable range, suggesting that the proposed model demonstrates an adequate level of fit. Meanwhile, the Normed Fit Index (NFI) value of 0.867 is in the marginal fit group because it is not above the cut-off value of 0.90. However, the overall results show that the developed model is compatible with the actual data at an acceptable level. Most fit indices satisfy universally accepted criteria for model fit, indicating that the structural model is well validated and robust enough for subsequent interpretation and hypothesis testing.

Table 2. Fit model results of the faculty of business economics

Parameter	Estimated Model	Description
Chi-Square	849.094 < 3.000	Good Fit
NFI	0.867 > 0.90	Fit Marginal

The measurement model of the Faculty of Islamic Studies is presented in Figure 2, displaying the outer loading values for the constructs of Digital Literacy (DL), Blended Learning (BL), and Learning Motivation (LM). The results reveal that all indicators loaded above the suggested cut-off value of 0.70, implying that the construct was appropriately measured. The results confirm that the model has good convergent validity and reliability to continue with SEM-PLS analysis.

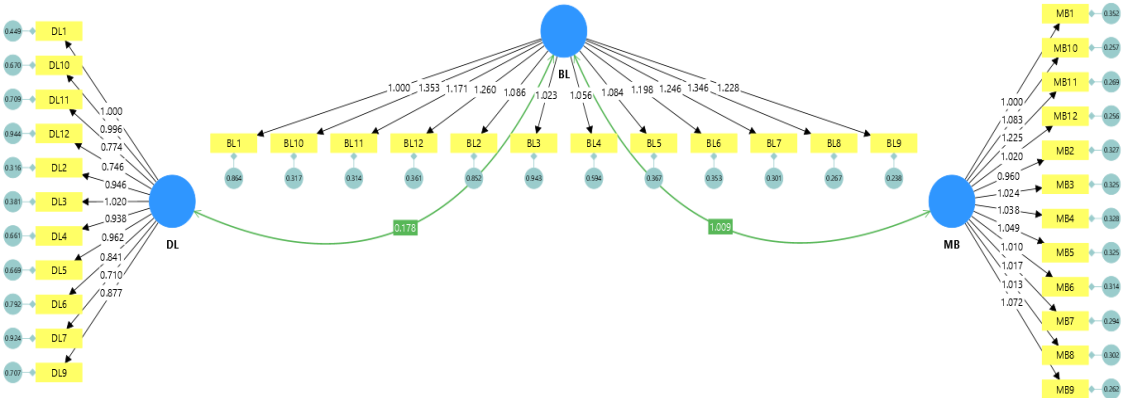


Fig. 2. Confirmatory analysis generated model of the faculty of Islamic studies

Table 3's findings show that the acquired chi-square statistic from the model fit findings reveals that the chi-square value of 2346.996 indicates a strong model fit, and the marginal fit range is occupied by the NFI value of 0.864. The suggested model appears to be appropriate and sufficiently reliable for further hypothesis testing, according to the overall fit indices.

Table 3. Fit model results of the faculty of Islamic studies

Parameter	Estimated Model	Description
Chi-Square	2356.996 < 3.000	Good Fit
NFI	0.864 > 0.90	Fit Marginal

The measurement model has high dependability, with all indicator loadings exceeding the suggested cut-off of 0.70, varying between 0.882 and 0.931. These results show that the measurement markers are reliable indicators of their respective constructs. Moreover, the high R^2 values indicate significant explanatory power, showing that the predictor variables jointly explain much of the dependent construct's variance. The findings show that the incorporation of digital literacy competencies has a major effect on how well students are prepared for blended learning.

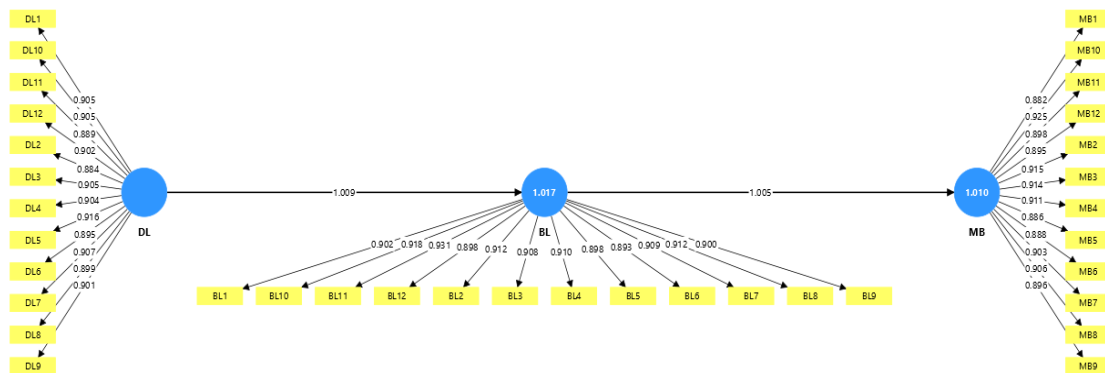


Fig. 3. Outer weight of the faculty of business economics

The loading factor values explained in Table 4 after all the data were processed by SmartPLS 4.1.0 indicate that all indicators exceeded the required threshold of 0.7, with an average value of 0.882–0.931. The results also show the outer loading values of the Partial Least Squares Structural Equation Modeling (PLS-SEM) technique. The outer loading values indicate the extent to which each indicator reflects and represents its corresponding latent variable. Therefore, these data provide support for the validity of all the indicators simultaneously and meet the established requirements for convergent validity.

Table 4. Outer loading value of the faculty of business economics

Variable	Indicator	Outer Loading Value	Description
Blended Learning	BL1	0.902	Valid > 0.70
	BL10	0.918	Valid > 0.70
	BL11	0.931	Valid > 0.70
	BL12	0.898	Valid > 0.70
	BL2	0.912	Valid > 0.70
	BL3	0.908	Valid > 0.70

	BL4	0.910	Valid > 0.70
	BL5	0.898	Valid > 0.70
	BL6	0.893	Valid > 0.70
	BL7	0.909	Valid > 0.70
	BL8	0.912	Valid > 0.70
	BL9	0.900	Valid > 0.70
Digital Learning	DL1	0.905	Valid > 0.70
	DL10	0.905	Valid > 0.70
	DL11	0.889	Valid > 0.70
	DL12	0.902	Valid > 0.70
	DL2	0.884	Valid > 0.70
	DL3	0.905	Valid > 0.70
	DL4	0.904	Valid > 0.70
	DL5	0.916	Valid > 0.70
	DL6	0.895	Valid > 0.70
	DL7	0.907	Valid > 0.70
	DL8	0.899	Valid > 0.70
	DL9	0.901	Valid > 0.70
Learning Motivation	MB1	0.882	Valid > 0.70
	MB10	0.925	Valid > 0.70
	MB11	0.898	Valid > 0.70
	MB12	0.895	Valid > 0.70
	MB2	0.915	Valid > 0.70
	MB3	0.914	Valid > 0.70
	MB4	0.911	Valid > 0.70
	MB5	0.886	Valid > 0.70
	MB6	0.888	Valid > 0.70
	MB7	0.903	Valid > 0.70
	MB8	0.906	Valid > 0.70
	MB9	0.896	Valid > 0.70

Figure 4 shows the initial measurement model with acceptable reliability, where most of the indicator loadings were over the suggested threshold of 0.70, ranging from 0.613 to 0.914. These results suggest that most of the indicators were able to appropriately represent their respective hidden structures. Furthermore, the strong R2 values indicate that the model is, to a large extent, explaining the variation of the dependent variables.

However, a number of indicators (BL1, BL2, BL3, DL7, DL8, DL11, and DL12) had loading values below the recommended threshold of 0.70 and were therefore dropped from the model. These indicators were omitted for the purpose of improving the construct reliability, convergent validity, and general stability of the measurement model. Indicators with low loading values can reduce the correlation between the construct and the measurement items, which can impair the accuracy and reliability of the estimation results of SEM-PLS. The modified model showed that validity and reliability were enhanced after

the elimination procedure, which indicates that the remaining indicators were better suited to represent the underlying constructs of the study.

The study using SmartPLS 4.1.0 shows that most of the indicators have loading factor values over the suggested cut-off point of 0.70. The loading factor values found range from 0.613 to 0.914. In the PLS-SEM context, the outer loading values reflect the extent to which the observable indicator may explain and represent the latent construct. The results indicate that most of the measurement items had an appropriate relationship with their respective constructs.

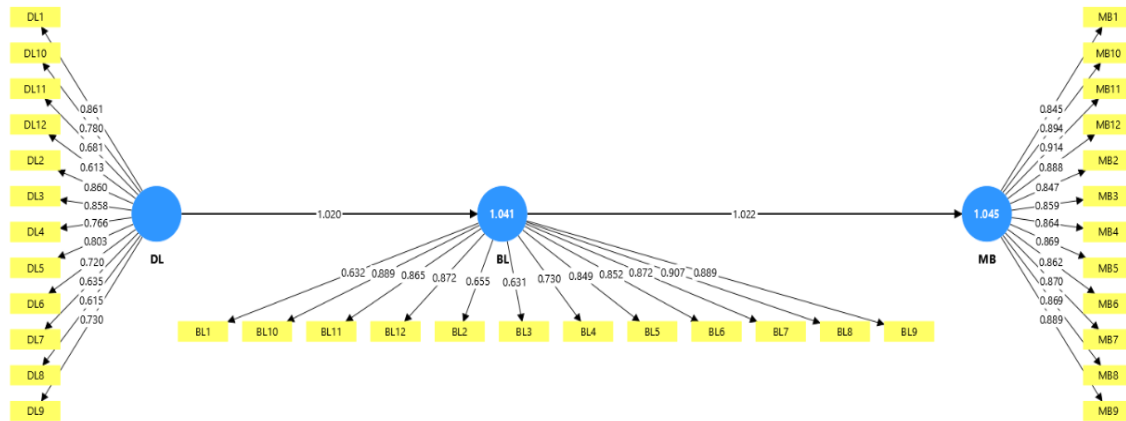


Fig. 4. Outer weight of the faculty of Islamic studies

However, numerous indicators in Table 5, i.e., BL1, BL2, BL3, DL7, DL8, DL11, and DL12, have loading values below the permissible threshold of 0.70 and were removed from the measurement model. These indicators had to be deleted to increase the convergent validity and the overall dependability of the constructs. The remaining indicators after the elimination procedure showed higher correlations with their respective constructs, suggesting that the improved measurement model met the requirements for convergent validity and construct dependability.

Table 5. Outer loading value of the faculty of Islamic studies

Variable	Indicator	Outer Loading Value	Description
Blended Learning	BL1	0.632	Invalid > 0.70
	BL10	0.889	Valid > 0.70
	BL11	0.865	Valid > 0.70
	BL12	0.872	Valid > 0.70
	BL2	0.655	Invalid > 0.70
	BL3	0.631	Invalid > 0.70
	BL4	0.730	Valid > 0.70
	BL5	0.849	Valid > 0.70
	BL6	0.852	Valid > 0.70
	BL7	0.872	Valid > 0.70
	BL8	0.907	Valid > 0.70
	BL9	0.889	Valid > 0.70

Digital Learning	DL1	0.861	Valid > 0.70
	DL10	0.780	Valid > 0.70
	DL11	0.681	Invalid < 0.70
	DL12	0.613	Invalid < 0.70
	DL2	0.860	Valid > 0.70
	DL3	0.858	Valid > 0.70
	DL4	0.766	Valid > 0.70
	DL5	0.803	Valid > 0.70
	DL6	0.720	Valid > 0.70
	DL7	0.635	Invalid < 0.70
	DL8	0.615	Invalid < 0.70
Learning Motivation	DL9	0.730	Valid > 0.70
	MB1	0.845	Valid > 0.70
	MB10	0.894	Valid > 0.70
	MB11	0.914	Valid > 0.70
	MB12	0.888	Valid > 0.70
	MB2	0.847	Valid > 0.70
	MB3	0.859	Valid > 0.70
	MB4	0.864	Valid > 0.70
	MB5	0.869	Valid > 0.70
	MB6	0.862	Valid > 0.70
	MB7	0.870	Valid > 0.70
	MB8	0.869	Valid > 0.70
	MB9	0.889	Valid > 0.70

The revised outer weight after the removal of some indicators with loading levels below the required threshold is shown in Figure 5. The modified measurement model shows that all remaining indicators had outer loading values higher than 0.70, suggesting that indicator reliability and convergent validity were sufficient. The results show that each indicator is appropriate for its latent construct: Digital Literacy (DL), Blended Learning (BL), and Learning Motivation (LM).

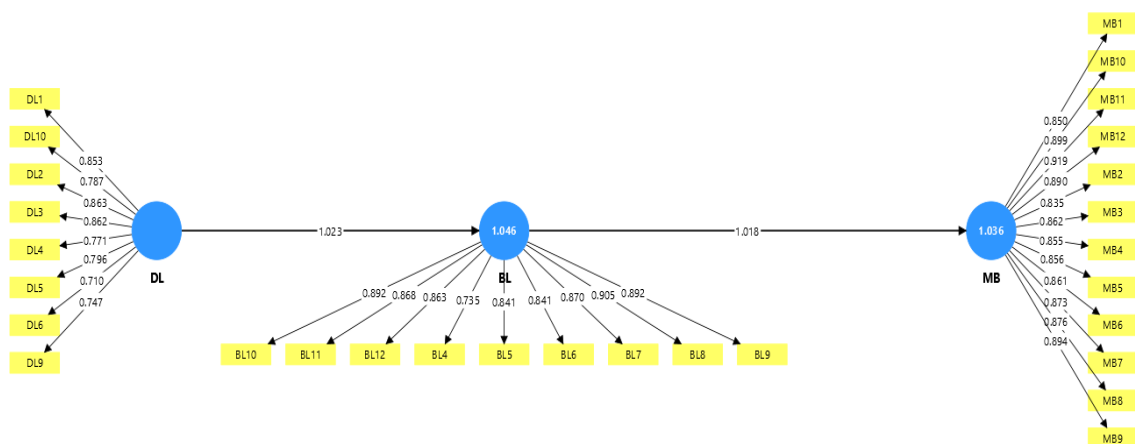


Fig. 5. Outer weight revised of the faculty of Islamic studies

Table 6 provides the recalculated outer loading results after removing some indicators that did not meet the threshold value of 0.70. These indicators are BL1, BL2, BL3, DL7, DL8, DL11, and DL12. After the refinement process, all remaining indicators had loadings of more than 0.70, which shows strong convergent validity and construct reliability of the measurement model of PLS-SEM.

Table 6. Outer loading value revised of the faculty of Islamic studies

Variabel	Indicator	Outer Loading Value	Description
Blended Learning	BL10	0.892	Valid > 0.70
	BL11	0.868	Valid > 0.70
	BL12	0.863	Valid > 0.70
	BL4	0.735	Valid > 0.70
	BL5	0.841	Valid > 0.70
	BL6	0.841	Valid > 0.70
	BL7	0.870	Valid > 0.70
	BL8	0.905	Valid > 0.70
	BL9	0.892	Valid > 0.70
Digital Learning	DL1	0.853	Valid > 0.70
	DL10	0.787	Valid > 0.70
	DL2	0.863	Valid > 0.70
	DL3	0.862	Valid > 0.70
	DL4	0.771	Valid > 0.70
	DL5	0.796	Valid > 0.70
	DL6	0.710	Valid > 0.70
	DL9	0.747	Valid > 0.70
Learning Motivation	MB1	0.845	Valid > 0.70
	MB10	0.894	Valid > 0.70
	MB11	0.914	Valid > 0.70
	MB12	0.888	Valid > 0.70
	MB2	0.847	Valid > 0.70
	MB3	0.859	Valid > 0.70
	MB4	0.864	Valid > 0.70
	MB5	0.869	Valid > 0.70
	MB6	0.862	Valid > 0.70
	MB7	0.870	Valid > 0.70
	MB8	0.869	Valid > 0.70
	MB9	0.889	Valid > 0.70

Discriminant validity

As shown in Table 7, all variables in this study have AVE values more than the Faculty of Business Economics' recommended cutoff point of 0.50, demonstrating outstanding discriminant validity across the dimensions. The results demonstrate that the latent variables of learning motivation, blended learning, and digital literacy were consistently and reliably quantified. Additionally, the AVE results demonstrate the measuring model's

sufficient validity and reliability, bolstering the appropriateness of proceeding with further structural model analysis (inner model).

Table 7. Discriminant validity of the faculty of business economics

Variables	AVE	Descriptions
Digital Literacy	0.824 > 0.50	Valid
Blended Learning	0.812 > 0.50	Valid
Learning Motivation	0.813 > 0.50	Valid

From Table 8, the AVEs for all constructs of the Faculty of Islamic Studies dataset were above the minimum threshold of 0.50. This shows that the variables had sufficient discriminant validity. The results indicate that the constructs of Digital Literacy, Blended Learning, and Learning Motivation are measured with a good level of consistency and accuracy. Moreover, these data confirm the sufficiency of the measurement model and suggest that the model is dependable enough for the upcoming evaluation of the inner model.

Table 8. Discriminant validity of the faculty of Islamic studies

Variables	AVE	Descriptions
Digital Literacy	0.735 > 0.50	Valid
Blended Learning	0.640 > 0.50	Valid
Learning Motivation	0.762 > 0.50	Valid

Reliability test

The reliability test was performed to verify the consistency and stability of the measurement device for each construct. For this investigation, reliability testing utilized Composite Reliability and Cronbach's Alpha on the PLS-SEM model. Table 9 presents the composite reliability of the measurement model in the dataset of the Faculty of Economics and Business. In SEM analysis, Composite Reliability is regarded a more robust measure of reliability since it compensates for the different outer loadings of indicators in reflecting latent constructs. A construct is considered reliable when the Composite Reliability score surpasses the standard cutoff of 0.70 and Cronbach's Alpha values are above 0.60, indicating satisfactory internal consistency of indicators.

The results indicate that all constructs achieved Composite Reliability values ranging from 0.981 to 0.982, significantly exceeding the minimum recommended threshold. The results show very good internal consistency and suggest that the indicators are measuring their latent constructs consistently. The model did not show any reliability problems, which means that the measurement model is statistically stable and is eligible for further assessment of the structural model.

Table 9. Construct reliability of the faculty of business economics

Construct	Composite Reliability	Descriptions
Digital Literacy	0.982 > 0.70	Valid
Blended Learning	0.981 > 0.70	Valid
Learning Motivation	0.981 > 0.70	Valid

The findings of the reliability assessment for the dataset of the Faculty of Islamic Studies are shown in Table 10. All constructs had Composite Reliability and Cronbach's Alpha values above the suggested level, indicating excellent internal consistency and measurement reliability. These results validate the reliability of the measures of the constructs and the suitability of the model to proceed to further structural analysis in the PLS-SEM framework.

Table 10. Construct reliability of the faculty of Islamic studies

Construct	Composite Reliability	Descriptions
Digital Literacy	0.961 > 0.70	Valid
Blended Learning	0.934 > 0.70	Valid
Learning Motivation	0.975 > 0.70	Valid

Hypothesis testing

Figure 6 examines the direct and indirect relationship between Digital Literacy, Blended Learning, and Learning Motivation in the structural model of the Faculty of Business Economics. Hypothesis testing, direct, and specific indirect effects were investigated by route coefficient analysis in the PLS-SEM with the bootstrapping process. The importance of the associations was evaluated using t-statistic and p-value criteria, where p-values < 0.05 and t-statistics > 1.96 indicate statistically significant effects.

The structural model has strong explanatory power, as seen by the strong R² values for both Blended Learning and Learning Motivation. Moreover, all the constructs were properly represented by their indicators, with outer loading values greater than 0.80. The results imply that integrating digital literacy competencies is important for improving students' motivation in blended learning contexts.

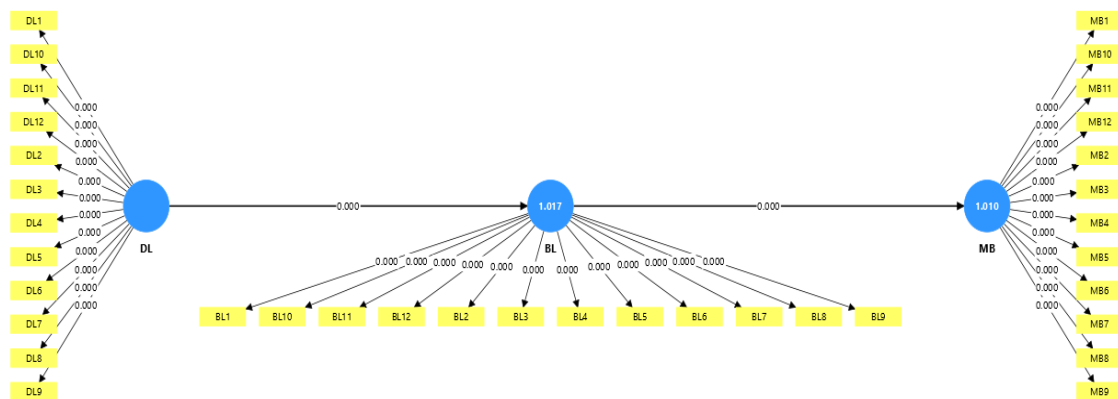


Fig. 6. Inner model of the faculty of business economics

The results in Table 11 reveal that Blended Learning has a positive and substantial effect on Learning Motivation, with a t-statistic value of 404.011 and a p-value of 0.000. Similar results are obtained from the research of (Crew & Martins, 2023), which also shows that the technology-based learning medium significantly and positively influences students' motivation and academic achievement. It may be concluded that the deployment of blended

learning is helpful in increasing the learning motivation of students in the Faculty of Economics and Business.

Furthermore, Digital Literacy has a significant and favorable impact on blended learning, with a p-value of 0.000 and t-statistic value of 662.474 above the critical value of 1/967. according to the research, students' digital literacy skills greatly increased the effectiveness of blended learning implementation. The findings support Hendriyani et al. (2022) assertion that digital literacy significantly affect the effectiveness of online learning by 66.3%.

Table 11. Hypothesis results of the faculty of business economics

Hypothesis	Magnitude of Influence	t-Statistic	t-Table	Results	P	Description
BL -> MB	1.005	404.011	1.967	ts > tt	0.000	Positively Significant
DL -> BL	1.009	662.474	1.967	ts > tt	0.000	Positively Significant

The findings of this research are consistent with Shoukat et al. (2024) the implementation of blended learning markedly enhances students' willingness to study and their academic performance by combining online and traditional classroom training. This result implies that technology-enhanced learning environments may encourage more autonomous and active learning behaviors in university students.

Figure 7 presents the structural correlations between Digital Literacy, Blended Learning, and Learning Motivation in the Faculty of Islamic Studies. The results of the hypothesis testing from the bootstrapping technique reveal that the proposed relationships are statistically significant based on the criteria of t-statistic and p-value. Moreover, the model also has a good explanatory power, which means that digital literacy has an essential role in improving students' learning motivation through the deployment of blended learning.

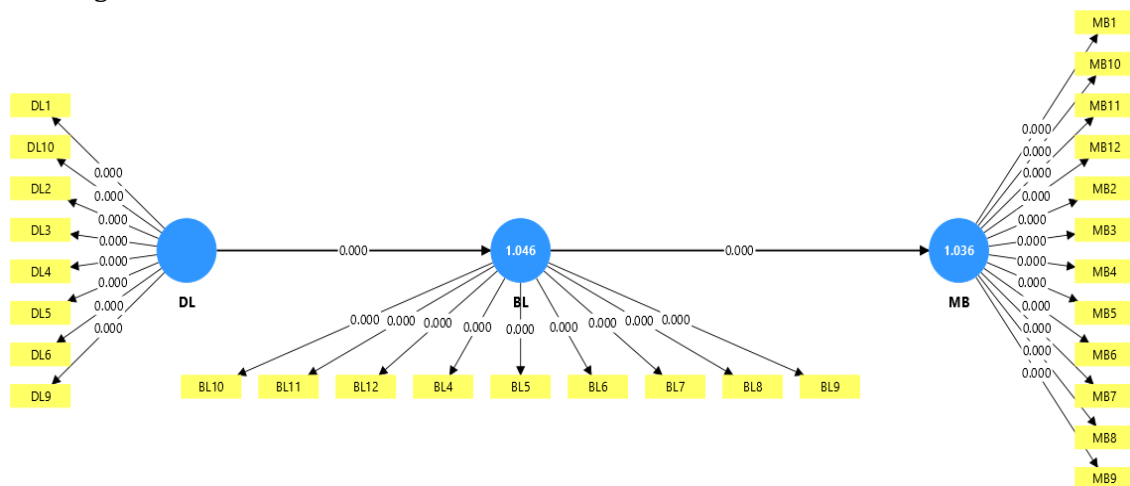


Fig. 7. Inner model of the faculty of Islamic studies

The findings confirmed in Table 12 show that Blended Learning has a positive and significant impact on the Learning Motivation of students in the Faculty of Islamic Studies, as indicated by the statistical significance values derived from the PLS-SEM analysis. The

conclusion of this research shows that the combination of face-to-face instruction and a digital learning environment boosts the level of involvement, participation, and motivation of the students during the learning process. Blended learning is flexible and interactive in nature; therefore, it has a greater potential to assist students in accessing learning resources and promoting independent learning behavior (Nasution et al., 2025).

This discovery aligns with the research carried out by Diana et al. 2024, and Putra and Sujalwo (2019), which showed that blended learning environments based on Moodle are helpful for increasing students' learning motivation through interactive digital learning activities and flexible access to instructional content. In addition, it has been established that digital literacy plays a crucial role in the uptake of blended learning (Nariswari et al., 2024). This shows that students with higher digital competences are likely to adapt better to technology-enhanced learning environments (Rifa'i et al., 2024). The findings are in line with the earlier study by Tang and Chaw (2016), which underscored the significance of digital literacy as a prerequisite for effective learning within the framework of blended education. The study is available at ERIC digital literacy and blended learning Study.

These results also support the research of Rasheed et al. (2020), who argued that students' technology preparedness and digital skills have a major influence on their learning experiences and motivation in blended and online learning situations. Similar results were also found by Nissa and Inayati (2025) in the area of higher education, which noted that the favorable effect of mobile learning technology on students' passion to study and participate. The study also demonstrated that students with more experience with digital technologies are more engaged and better equipped to learn in technology-based learning environments.

Table 12. Hypothesis results of the faculty of Islamic studies

Hypothesis	Magnitude of Influence	t-Statistic	t-Table	Results	P	Description
BL -> MB	1.018	341.730	1.967	ts > tt	0.000	Positively Significant
DL -> BL	1.023	227.201	1.967	ts > tt	0.000	Positively Significant

The effect of blended learning on learning motivation

This finding shows that students' learning motivation in both the Faculty of Business Economics and the Faculty of Islamic Studies is positively and statistically significantly impacted by blended learning. According to this research, a learning environment that encourages students' motivated involvement can be created by combining in-person and virtual instruction. The increased flexibility that blended learning offers in terms of accessing learning resources, engaging in learning activities, and managing learning relationships across physical and digital contexts may be linked to its impact on motivation. Therefore, the motivational value of Blended learning ought to be regarded as an outcome of the pedagogical integration of digital and in-person learning experiences rather than just an outcome of using digital technology.

In a similar vein Fap and Hardini (2021) discovered that the implementation of blended learning was associated with improvements in students' learning motivation and learning outcomes. Furthermore, teacher presence and meeting students' basic psychological needs were linked to autonomous motivation, according to studies involving

higher education students in blended learning. The ability of blended learning to give students more opportunities for interaction, autonomy, and long-term engagement may therefore be reflected in the substantial association found in this study by Adam et al. (2023). These results support the idea that, rather than simply offering a different way to deliver knowledge, blended learning can foster learning environments that motivate students to continue participating in academic activities.

The effect of digital literacy on blended learning

The results also show that blended learning in both faculties is positively and statistically significantly impacted by digital literacy. This finding suggests that a key prerequisite for engagement in blended learning is students' capacity to access, comprehend, assess, and utilize digital technology. Students must manage technology-mediated academic assignments, communicate via digital platforms, move between physical and digital learning environments, and access online learning resources in order to take part in blended learning. Students who are more digitally literate will therefore likely face less difficulties when dealing with the digital components of blended learning.

Le et al. (2022) specifically looked at students' perceptions of their own knowledge of digital technologies in STEM hybrid academic and educational settings and emphasized how important it is for students to have access to and use digital resources in postsecondary blended learning. These results offer a solid foundation for comprehending the current study's robust correlation between blended learning and digital literacy. However, this correlation does not imply that digital literacy is just a technical skill. The ability of students to engage meaningfully with digital information and technologies in certain academic contexts is referred to as "digital literacy" in higher education. According to a systematic review by Farias-Gaytan et al. (2023), because digital literacy is closely related to the broader process of digital transformation in higher education, institutions must develop students' knowledge and abilities in tandem with technological innovation.

Comparative Interpretation of the two faculties

Comparing the two faculties reveals a similar structural pattern: blended learning is positively connected with digital literacy, and blended learning motivation is positively correlated with blended learning. This consistency lends credence to the notion that digital competence is an essential foundation for technology-integrated learning and that students' motivational experiences are connected to the arrangement of learning through blended approaches. The measurement results, however, indicate a notable disparity. The FEB model retained all reported indications with high outer loadings, whereas the FAI model required the removal of seven indicators since their loadings were below 0.70. This suggests that depending on the academic context, the notions' conceptual coherence may change.

This finding has broader theoretical ramifications. Blended learning and digital literacy are not context-free technology phenomena. Students' interactions with institutional procedures, instructors' pedagogical approaches, the digital infrastructure that is accessible, and the particular academic culture in which learning occurs all contribute to the construction of its meaning. As a result, the success of blended learning depends not only on the availability of digital tools but also on whether students have the skills and learning environments necessary to make meaningful use of those resources. Therefore, the

results indicate that institutions should go beyond implementing blended learning in a technology-focused manner.

The organized cultivation of students' digital abilities and pedagogical strategies that encourage self-sufficiency, participation, and substantial involvement should be integrated with digital tools and online resources. This strategy is more likely to convert technology accessibility into long-term learning motivation.

Theoretical implications

By presenting digital literacy as a necessary skill for engaging in blended learning and blended learning as a crucial learning environment linked to learning motivation, the findings advance knowledge of technology-integrated higher education. Therefore, the results point to a relational understanding of the three notions rather than an independent one. Digital literacy is more than just a personal technology ability. Its importance in the current paradigm arises from students' ability to engage in a specific educational setting. In a similar vein, blended learning is more than just combining online and in-person training. Depending on how the combination is set up and how pupils experience it, it may have a motivating effect.

Practical implications

The results have a number of useful ramifications for institutes of higher learning. First, as a crucial part of implementing blended learning, colleges should improve students' digital literacy. The development of digital literacy should include the ability to access, assess, manage, and use digital information for academic objectives in addition to technical functioning. Second, rather than just moving classroom activities to digital platforms, blended learning should be planned as an integrated pedagogical approach. Learning activities should offer students opportunities to exercise autonomy in managing their learning activities, as well as meaningful interaction, clear instructional guidance, and easily accessible learning resources.

Third, the distinctions between FEB and FAI suggest that educational institutions should refrain from implementing an entirely consistent digital learning approach in all academic settings. The lower loading values of a number of FAI indicators imply that contextual adaptation may be necessary for some parts of blended learning and digital literacy. Therefore, variations in students' learning styles, technological exposure, and academic contexts should be taken into account in institutional interventions. Lastly, learning motivation should not only be viewed as an individual psychological trait but also as a significant result of learning design. Blended learning may foster conditions that enable long-term engagement and motivation when students are provided with easily accessible digital resources, suitable technology support, meaningful interaction, and flexible learning opportunities.

CONCLUSION

The results of this study show that digital literacy plays a vital role in boosting students' enthusiasm for learning in Surakarta through the mediation of blended learning among university students. The results demonstrate that students who are more adept at digital literacy generally play a crucial role in increasing students' motivation to learn

through the mediation of blended learning among Surakarta university students. The results indicate that students with higher levels of digital literacy are more likely to adjust to blended learning settings, which increases their motivation to learn. A more flexible, interesting, and student-centered learning environment process results from combining human instruction, which increases students' engagement and participation in their academic work.

Additionally, the study shows how blended learning might improve the relationship between digital literacy and learning motivation by acting as a mediator. Students can participate in cooperative learning activities, access learning materials more quickly, and develop independent learning habits by using technology-supported learning environments. In today's higher education environments, these factors are favorably supporting the durability of student motivation. Practically speaking, the findings indicate that higher education institutions should constantly improve the digital learning infrastructure and promote the development of students' digital competencies through the use of blended learning in order to optimize the impact of digital learning. Adequate technical facilities, digital platforms, and interactive learning materials that encourage students' active participation and academic preparation provide inclusive and encouraging learning environments.

This study also further contributes to the increasing discussion of technology-integrated learning in higher education, especially the mediating effect of blended learning in improving students' motivation. Future studies are recommended to include other psychological, pedagogical, and social variables, such as self-regulated learning, academic engagement, emotional intelligence, and lecturer-student interaction, to provide a more comprehensive understanding of the factors influencing learning motivation in digital learning environments.

REFERENCES

- Adam, M. S., Hamid, J. A., Khatibi, A., & Azam, S. M. F. (2023). Autonomous motivation in blended learning: Effects of teaching presence and basic psychological need satisfaction. *Learning and Motivation*, 83, 101908. <https://doi.org/10.1016/j.lmot.2023.101908>
- An, A. N., Amir, A. M., Husain, M. Z. Bin, Ismail, F. H., Sahimi, M. S. Bin, Fansuri, F., Amri, M., Arfan, F., & Rhain, A. (2025). Millennial era Islamic parenting studies: A bibliometric analysis utilizing the Scopus database. *Multidisciplinary Reviews*, 8(1), 1–12. <https://doi.org/10.31893/multirev.2025002>
- Bibi, S., & Jati, H. (2015). Efektivitas model blended learning terhadap motivasi dan tingkat pemahaman mahasiswa mata kuliah algoritma dan pemrograman. *Jurnal Pendidikan Vokasi*, 5(1), 74–87. <https://doi.org/https://doi.org/10.21831/jpv.v5i1.6074>
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches (5th ed.)*. SAGE Publications Inc.
- Crew, T., & Martins, T. (2023). Students' views and experiences of blended learning and employability in a post-pandemic context. *Social Science & Humanities Open*, 8(1), 100583. <https://doi.org/https://doi.org/10.1016/j.ssaho.2023.100583>

- Damopolii, I. (2025). Student Motivation in Biology Learning Using Augmented Reality and Comics. *Report of Biological Education*, 6(2), 76–86. <https://doi.org/10.37150/11vdyg02>
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly: Management Information Systems*, 13(3), 319–339. <https://doi.org/10.2307/249008>
- De Bruijn-Smolters, M., & Prinsen, F. R. (2024). Effective student engagement with blended learning: A systematic review. *Heliyon*, 10(23), e39439. <https://doi.org/10.1016/j.heliyon.2024.e39439>
- Diana, A., Azani, M. Z., & M, M. (2024). the Concept and Context of Islamic Education Learning in the Digital Era: Relevance and Integrative Studies. *Profetika: Jurnal Studi Islam*, 25(01), 33–44. <https://doi.org/10.23917/profetika.v25i01.4239>
- Eccles, J. S., & Wigfield, A. (2020). From expectancy-value theory to situated expectancy-value theory: A developmental, social cognitive, and sociocultural perspective on motivation. *Contemporary Educational Psychology*, 61(2), 0–60. <https://doi.org/https://doi.org/10.1016/j.cedpsych.2020.101859>
- Fap, A. M., & Hardini, A. T. A. (2021). Blended learning untuk meningkatkan hasil belajar dan motivasi belajar di masa pandemI Covid-19. *Jurnal Inovasi Teknologi Pendidikan*, 8(1), 17–25. <https://doi.org/https://doi.org/10.21831/jitp.v8i1.39680>
- Farias-Gaytan, S., Aguaded, I., & Ramirez-Montoya, M. S. (2023). Digital transformation and digital literacy in the context of complexity within higher education institutions: a systematic literature review. *Humanities and Social Sciences Communications*, 10(1), 1–11. <https://doi.org/https://doi.org/10.1057/s41599-023-01875-9>
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate Data Analysis*. Pearson.
- Hendriyani, Y., Ronaldo, R., Irfan, D., Budayawan, K., & Zulhendra, Z. (2022). Pengaruh Literasi Digital, Dan Internet Addiction Terhadap Online Learning, Dan Dampak Selanjutnya Terhadap Motivasi Belajar Mahasiswa Departemen Teknik Elektronika. *Voteteknika (Vocational Teknik Elektronika Dan Informatika)*, 10(4), 98–106. <https://doi.org/https://doi.org/10.24036/voteteknika.v10i4.119854>
- Kurniawan, R. P., Damopolii, I., & Sirait, S. H. K. (2021). The correlation between biology teacher learning strategies during the Covid-19 pandemic on student motivation. *AECON*, 299–305.
- Le, B., Lawrie, G. A., & Wang, J. T. H. (2022). Student Self-perception on Digital Literacy in STEM Blended Learning Environments. *Journal of Science Education and Technology*, 31(3), 303–321. <https://doi.org/10.1007/s10956-022-09956-1>
- Likert, R. (1932). *A technique for the measurement of attitudes*. Archives of Psychology.
- Liu, Y., Ma, S., & Chen, Y. (2024). The impacts of learning motivation, emotional engagement and psychological capital on academic performance in a blended learning university course. *Frontiers in Psychology*, 15(May), 1–12. <https://doi.org/10.3389/fpsyg.2024.1357936>
- Mohammadi, M., Paasivara, M., & Kasurinen, J. (2025). Blended learning in higher education: good practices in platforms and teachers support, enhancing students motivation. *Education and Information Technologies*, 30(18), 26001–26024. <https://doi.org/10.1007/s10639-025-13770-8>

- Nariswari, S. W., Azani, M. Z., & Surakarta, U. M. (2024). Islamic Learning Based on Digital Platforms. *Iseedu*, 8(1), 127–143. <https://doi.org/https://doi.org/10.23917/iseedu.v8i1.8856>
- Nasution, H., Napitupulu, E., & Sinaga, E. K. (2025). Student Engagement and Achievement with a Digital Literacy E-Module. *Academia Open*, 10(1), 1–18. <https://doi.org/10.21070/acopen.10.2025.11146>
- Nirmala, P., Suhardi, I., Kaswar, A. B., Surianto, D. F., & Lavicza, Z. (2024). Enhancing Computational Thinking Skills through Digital Literacy and Blended Learning: The Mediating Role of Learning Motivation. *Online Learning in Educational Research*, 5(1), 9–24. <https://doi.org/https://doi.org/10.58524/oler.v5i1.504>
- Nissa, I. K., & Inayati, N. L. (2025). Integration of Digital Technology in Learning as A Strategy to Strengthen Student Learning Independence. *Proceeding ISETH (International Summit on Science, Technology, and Humanity)*, 560–572. <https://doi.org/https://doi.org/10.23917/iseth.6852>
- Panadero, E. (2017). A review of self-regulated learning: Six models and four directions for research. *Frontiers in Psychology*, 8(APR), 1–28. <https://doi.org/10.3389/fpsyg.2017.00422>
- Putra, D. R., & Sujalwo, S. (2019). *Pengembangan Media Pembelajaran Menggunakan Metode Blended Learning Berbasis Moodle Untuk Meningkatkan Motivasi Belajar pada Mata Pelajaran Dasar Desain Grafis Kelas X di SMK Muhammadiyah 1 Klaten* [Undegraduate Thesis, Universitas Muhammadiyah Surakarta]. UMS Campus repository. https://eprints.ums.ac.id/78049/?utm_source=
- Ramdana, A. D., Munir, & Furqon, C. (2026). Advancing digital literacy in higher education through pedagogical innovations and institutional strategies between 2014 and 2025. *Discover Education*, 5(1). <https://doi.org/10.1007/s44217-026-01256-9>
- Rasheed, R. A., Kamsin, A., & Abdullah, N. A. (2020). Challenges in the online component of blended learning: A systematic review. *Computers & Education*, 144, 103701. <https://doi.org/https://doi.org/10.1016/j.compedu.2019.103701>
- Rifa'i, F. L., Mubarak, F. U. Al, Maksum, M. N. R., & Mustafa, T. A. (2024). From Mimbar to Mouse: Adapting Islamic Education to the Digital Age. *Iseedu*, 8(1), 1–9. <https://doi.org/https://doi.org/10.23917/iseedu.v8i1.8700>
- Ryan, R. M., & Deci, E. L. (2020). Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions. *Contemporary Educational Psychology*, 61. <https://doi.org/10.1016/j.cedpsych.2020.101860>
- Sandjaja, M. (2025). Blended Learning: Innovation in College Classrooms for Deeper Student Engagement. *Psikoborneo: Jurnal Ilmiah Psikologi*, 13(2), 182. <https://doi.org/10.30872/psikoborneo.v13i2.19644>
- Schunk, D. H., Pintrich, P. R., & Meece, J. L. (1996). *Motivation in education: Theory, research, and applications (3rd ed.)*. Prentice-Hall.
- Sekaran, U., & Bougie, R. (2016). *Research Methods for Business: A Skill-Building Approach*. Wiley.
- Shoukat, R., Ismayil, I., Huang, Q., Oubibi, M., Younas, M., & Munir, R. (2024). A comparative analysis of blended learning and traditional instruction: Effects on academic motivation and learning outcomes. *PLoS ONE*, 19(3), 1–18.

- <https://doi.org/10.1371/journal.pone.0298220>
- Song, Y., Lv, S., Wang, M., Wang, Z., & Dong, W. (2025). The Impact of Digital Learning Competence on the Academic Achievement of Undergraduate Students. *Behavioral Sciences*, 15(7). <https://doi.org/10.3390/bs15070840>
- Syauqi, S. K., Winarno, N., Samsudin, A., Damopolii, I., & Firdaus, R. A. (2024). From online to in-person: Students' motivation and self-regulation in science teaching activities during and after the Covid-19 pandemic. *INSECTA: Integrative Science Education and Teaching Activity Journal*, 5(1), 87–107. <https://doi.org/10.21154/insecta.v5i1.8689>
- Tang, C. M., & Chaw, L. Y. (2016). Digital literacy: A prerequisite for effective learning in a blended learning environment? *Electronic Journal of E-Learning*, 14(1), 54–65. <https://academic-publishing.org/index.php/ejel/article/view/1743>
- Ternovaya, L. (2025). Engineering pedagogy. *Engineering Pedagogy*, 16(1), 44–65. <https://doi.org/10.12737/2173834>
- Vo, H., & Ho, H. (2024). Online learning environment and student engagement: the mediating role of expectancy and task value beliefs. *Australian Educational Researcher*, 51(5), 2183–2207. <https://doi.org/10.1007/s13384-024-00689-1>
- Vuorikari, R., Kluzer, S., & Punie, Y. (2022). DigComp 2.2. *The Digital Competence Framework for Citizens. With new examples of knowledge, skills and attitudes*. Publications Office of the European Union. <https://doi.org/10.2760/115376>
- Zimmerman, B. J. (2002). Becoming a self-regulated learner: An overview. *Theory into Practice*, 41(2), 64–70. https://doi.org/10.1207/s15430421tip4102_2