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From Growth Mindset and Social Media Influence to Learning Outcomes: A PLS-SEM Study in Indonesian Higher Education

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Abstract

This study examines how growth mindsets and social media influence shape learning outcomes through student engagement and digital literacy in digitally mediated higher education. Survey data were collected from 478 undergraduate students enrolled at higher education institutions in Indonesia and analyzed using partial least squares structural equation modeling (PLS-SEM) with SmartPLS 4. The measurement model demonstrated satisfactory reliability, convergent validity, and discriminant validity. The structural model explained 67.3% of the variance in learning outcomes, 60.5% in student engagement, and 40.7% in digital literacy, indicating a substantial explanatory power. Growth mindset positively predicted learning outcomes, student engagement, and digital literacy, with the strongest substantive effect observed on student engagement. Social media influence positively predicted student engagement and digital literacy but did not have a significant direct effect on the learning outcomes. Student engagement and digital literacy both positively predicted learning outcomes, and indirect-effect analysis confirmed several mediating pathways linking growth mindset and social media influence to learning outcomes. These findings indicate that the academic benefits of digital higher education are not produced by mindset or social media exposure alone. Learning outcomes improve when psychological dispositions and social-digital interactions are translated into active engagement and effective digital literacy.

Keywords: Digital literacy; Growth mindset; Higher education; Learning outcomes; Social media influence; Student engagement

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1. Introduction

The accelerated digitalization of higher education has transformed not only the delivery of instruction but also the psychological, behavioral, and digital conditions under which students participate in academic work. In digitally mediated learning environments, students are expected to regulate their motivation, evaluate information, interact through online platforms, and convert digital access into meaningful learning outcomes. This issue is particularly relevant in Indonesia, where internet penetration reached 79.5% in 2024 (APJII, 2024), while official telecommunications statistics reported that 72.78% of the population accessed the internet and 68.65% owned a mobile cellular telephone in 2024 (BPS, 2025). However, wider access to digital technologies does not automatically lead to better learning outcomes. Its educational value depends on whether students are motivated to persist in learning tasks, actively engage in academic activities, and possess the digital competence required to use technology productively.

This study argues that higher education research should move beyond technology access explanations and examine how psychological dispositions and social-digital influences interact with learning mechanisms. Growth mindset, defined as the belief that intellectual ability can be developed rather than fixed, provides a motivational lens for understanding how students respond to academic difficulties, feedback, and failure (Dweck, 2006; Dweck & Yeager, 2019). Although a growth mindset has been associated with persistence and achievement, recent debates caution against treating it as a universally strong or context-free predictor of academic success. Meta-analytic evidence suggests that the effects of a growth mindset vary across populations, learning contexts, and implementation conditions (Burnette et al., 2023;

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Macnamara & Burgoyne, 2023). Therefore, a growth mindset may be more useful when examined as an antecedent of engagement and adaptive learning behavior rather than as a stand-alone explanation of learning outcomes.

Social media adds another layer of complexity to contemporary higher education. When used for academic communication, peer interaction, knowledge sharing, and access to learning resources, social media can extend learning beyond formal classroom boundaries and support collaborative learning. Recent evidence shows that social media use can be associated with academic performance and engagement among higher education students, particularly when platforms are used for learning-related interactions and knowledge sharing (Shafiq & Parveen, 2023). However, social media can also create distractions, fragmented attention, multitasking, and passive content consumption. This mixed role suggests that social media influence should not be treated as a simple, direct predictor of learning outcomes. Its academic value depends on whether students can transform digital interactions into meaningful engagement and productive digital learning practices.

Two mechanisms are particularly important in explaining how psychological and social-digital factors may translate into learning outcomes: student engagement and digital literacy (DL). Student engagement captures students' behavioral participation, emotional involvement, cognitive investment, and social interaction in learning environments. Recent higher education research emphasizes that engagement is multidimensional and context-sensitive, especially in digital and learning analytics environments, where participation cannot be reduced to behavioral indicators alone (Bergdahl et al., 2024). Digital literacy, meanwhile, refers to students' ability to access, evaluate, manage, create, and communicate information responsibly across digital platforms. Evidence from higher education indicates that digital competence can predict academic success and shape students' learning behavior in digitalized learning contexts (Cabero-Almenara et al., 2023; Pan et al., 2024). Thus, engagement and digital literacy may explain why some students benefit academically from digital learning environments while others do not.

Despite growing scholarship on growth mindset, social media influence, student engagement, and digital literacy, prior studies have often examined these constructs in fragmented models. Growth mindset research frequently emphasizes achievement effects, social media studies often contrast benefits with distraction, engagement research commonly focuses on participation and outcomes, and digital literacy studies often treat competence as an isolated predictor of performance. Less is known about how growth mindset and social media influence jointly shape learning outcomes through parallel and sequential mediation involving student engagement and digital literacy, particularly in Indonesian higher education. This gap is important because Indonesia's expanding digital ecosystem creates both opportunities for technology-supported learning and risks of unequal academic benefit across students.

This study aims to examine the direct and indirect relationships among growth mindset, social media influence, student engagement, digital literacy, and learning outcomes among undergraduate students enrolled at higher education institutions in Indonesia. Specifically, it tests whether student engagement and digital literacy mediate the relationships between growth mindset and learning outcomes and between social media influence and learning outcomes. The study contributes to the literature by integrating psychological, behavioral, social-digital, and competence-based perspectives within a single structural model. It further clarifies whether learning outcomes are shaped mainly by direct effects or by sequential learning mechanisms through which students' beliefs and digital interactions are translated into engagement, digital literacy, and academic benefit.

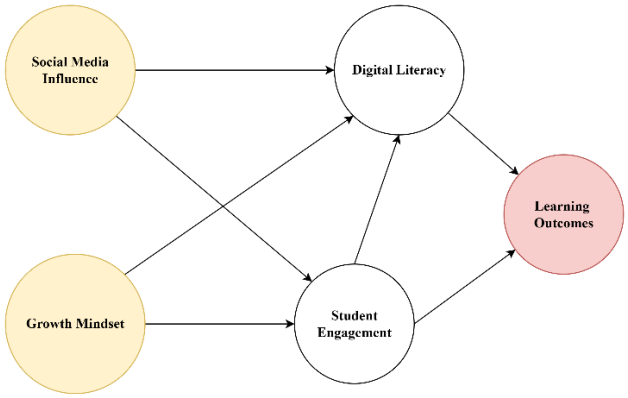

Figure 1. Conceptual framework of the proposed mediation model.

2. Literature Review

2.1. Growth Mindset and Learning Outcomes

Growth mindset refers to students' belief that intellectual ability and academic competence can be developed through sustained effort, adaptive strategies, and feedback utilization. In higher education, this belief is important because students are expected to manage complex academic tasks, respond to evaluative feedback, and persist despite failure or uncertainty. However, recent evidence cautions against treating growth mindset as a simple or universally strong predictor of academic achievement. Meta-analytic studies show that the effect of growth mindset interventions on achievement is heterogeneous and depends on methodological quality, student characteristics, and whether the learning context allows students to convert effort into improvement (Burnette et al., 2023; Macnamara & Burgoyne, 2023).

In digitally mediated higher education, growth mindset may influence learning outcomes more plausibly through motivational and behavioral mechanisms than through a direct effect alone. Students with a stronger growth mindset are more likely to interpret academic difficulty as a challenge that requires strategy adjustment, effort regulation, and feedback seeking. Recent evidence shows that growth mindset is closely related to self-regulated learning processes, including planning, monitoring, adaptive help-seeking, and effort regulation (Xu et al., 2025). Similarly, empirical work indicates that growth mindset can enhance academic performance through self-belief and effort regulation, suggesting that mindset becomes academically meaningful when it activates productive learning behaviors rather than remaining only a belief (Ba et al., 2025).

Therefore, this study positions growth mindset as a psychological antecedent of learning outcomes, student engagement, and digital literacy. Students who believe that ability can be developed are more likely to remain engaged in academic tasks, participate actively in learning activities, and persist when facing digital or academic challenges. This orientation may also support digital literacy because students with a growth mindset are more willing to explore unfamiliar digital tools, evaluate online resources, and improve their competence through repeated practice. Accordingly, growth mindset is expected to affect learning outcomes both directly and indirectly through student engagement and digital literacy.

H1a. Growth mindset positively predicts learning outcomes.
H1c. Growth mindset positively predicts student engagement.
H1e. Growth mindset positively predicts digital literacy.

2.2. Social Media Influence and Learning Outcomes

Social media influence in this study is conceptualized as students' perceived constructive academic use of social media, including academic communication, peer collaboration, access to learning resources, knowledge sharing, and interaction with learning communities. This conceptual boundary is necessary because social media use should not be treated as a uniform predictor of learning outcomes. Recent evidence suggests that its academic value depends less on the frequency of use and more on whether students use social media purposefully for academic exchange, resource access, and learning support. Shafiq and Parveen (2023), for example, found that social media use was linked to academic performance and engagement among higher education students, particularly when platforms were used for knowledge sharing and learning-related interaction.

However, the academic role of social media remains conditional. Social media platforms can support collaborative learning, peer feedback, informal academic discussion, and access to supplementary materials, but they can also encourage distraction, multitasking, fragmented attention, and passive content consumption. This dual nature means that social media influence should not be assumed to improve learning outcomes directly in all situations. Instead, its contribution is more plausible when social media interaction stimulates student engagement, such as participation in discussions, emotional connection with peers, and cognitive involvement in academic tasks. Recent work on smart learning also indicates that social media can contribute positively to academic performance when embedded in supportive digital learning processes rather than used as an isolated digital habit.

Social media influence is also closely related to digital literacy because constructive academic use of social media requires students to evaluate information credibility, manage digital communication, select relevant resources, and avoid unreliable or low-quality content. Undergraduate students increasingly recognize digital literacies as important for learning, especially in relation to social media, online communication, and information evaluation (Smith & Storrs, 2023). Therefore, in the present model, social media influence is expected to affect learning outcomes both directly and indirectly through student engagement and digital literacy. Students who use social media actively, critically, and

academically are more likely to become engaged learners and more competent digital users, which in turn can strengthen their learning outcomes.

H1b. Social media influence positively predicts learning outcomes.
H1d. Social media influence positively predicts student engagement.
H1f. Social media influence positively predicts digital literacy.

2.3. Student Engagement as a Learning Mechanism

Student engagement is widely understood as a multidimensional construct that reflects the energy, effort, and involvement students direct toward learning activities. Building on the classical framework of Fredricks et al. (2004), engagement commonly includes behavioral, emotional, and cognitive dimensions. Behavioral engagement refers to students' participation, effort, persistence, and involvement in academic tasks; emotional engagement reflects interest, enjoyment, belonging, and affective connection to learning; while cognitive engagement concerns strategic thinking, self-regulation, concentration, and investment in understanding complex materials. Recent higher education research further emphasizes that student engagement is a complex and context-sensitive construct, especially in digital learning environments where behavioral indicators alone cannot fully capture students' learning involvement (Bergdahl et al., 2024). Bergdahl et al.'s systematic review specifically highlights emotional, behavioral, cognitive, and social dimensions of engagement in digital higher education.

In the present study, student engagement is positioned as a learning mechanism that links growth mindset and social media influence to learning outcomes. Students with a stronger growth mindset are more likely to remain involved in academic tasks because they interpret difficulty as a reason to adjust strategies rather than withdraw from learning. Likewise, constructive academic use of social media may increase engagement by enabling peer interaction, resource sharing, discussion, and informal academic support. This mechanism is important because learning outcomes are not produced merely by positive beliefs or digital access, but by students' active participation in learning processes. A recent meta-analysis in online higher education found that learning engagement has a positive relationship with learning outcomes, although the effect size is small to medium, indicating that engagement matters but should not be overstated as a single explanatory factor (Doo & Kim, 2024). ERIC reports that this meta-analysis extracted effect sizes from 175 samples across 34 eligible studies and found a small-to-medium relationship between learning engagement and learning outcomes.

Student engagement is also theoretically relevant for digital literacy because engaged students are more likely to interact with digital platforms, search for learning resources, participate in online discussions, complete digital assignments, and regulate their learning behavior in technology-mediated environments. In online and blended learning, behavioral engagement includes observable actions such as accessing materials, participating in forums, submitting assignments, completing quizzes, and sustaining attention during digital learning activities. Wang et al. (2025) argue that online learning behavioral engagement is a significant factor for academic performance because it reflects students' active participation, persistence, and interaction with digital learning resources. Similarly, Pan et al. (2024) found that digital competence strongly influences students' learning behavior in higher education, suggesting that engagement and digital competence are closely connected in digitalized learning contexts. Therefore, student engagement is expected to positively predict both learning outcomes and digital literacy in the proposed model. Wang et al. describe behavioral engagement as a key factor affecting online academic performance, while Pan et al. report a strong positive effect of digital competence on students' learning behavior.

H1g. Student engagement positively predicts learning outcomes.
H1i. Student engagement positively predicts digital literacy.

2.4. Digital Literacy and Learning Outcomes

Digital literacy extends beyond the technical ability to operate digital devices. It refers to students' capacity to access, evaluate, manage, create, and communicate information effectively and responsibly in digital environments. Although Eshet-Alkalai's (2004) framework remains useful for explaining digital literacy as a combination of photo-visual, reproduction, branching, information, and socio-emotional literacies, recent higher education literature emphasizes that digital literacy should be understood as an integrated academic competence rather than a purely technical skill. In digitally mediated learning environments, students are required not only to use platforms and devices, but also to judge information credibility, synthesize digital resources, communicate through online channels, and participate ethically in

academic digital spaces. Cabero-Almenara et al. (2023) specifically examined digital competence among higher education students and positioned it as a predictor of academic success.

In higher education, digital literacy is increasingly important because academic work is now deeply embedded in digital ecosystems. Students search for scholarly materials online, submit assignments through learning management systems, participate in online discussions, collaborate through cloud-based tools, and use digital media to produce academic outputs. However, digital access alone does not guarantee better learning outcomes. Students who lack digital literacy may struggle with unreliable information, superficial reading, poor source evaluation, ineffective digital communication, and unproductive use of online resources. Recent evidence supports this concern: Zakir et al. (2025) found that digital literacy affects academic performance both directly and indirectly through digital informal learning, self-efficacy, and students' digital competence.

Therefore, digital literacy is positioned in this study as a competence-based mechanism that helps students transform digital access and digital engagement into meaningful learning outcomes. Students with stronger digital literacy are more capable of selecting relevant resources, evaluating information quality, managing digital learning tasks, and using technology strategically for academic purposes. This logic is consistent with recent research showing that digital competence contributes to students' digital learning behavior in higher education (Pan et al., 2024). Because learning outcomes depend not only on motivation and engagement but also on students' ability to use digital resources effectively, digital literacy is expected to positively predict learning outcomes in the proposed model.

H1h. Digital literacy positively predicts learning outcomes.

2.5. Mediating Roles of Student Engagement and Digital Literacy

The proposed model assumes that growth mindset and social media influence affect learning outcomes not only through direct pathways but also through student engagement and digital literacy as mediating mechanisms. This assumption is theoretically justified because growth mindset and social media influence represent antecedent factors, whereas learning outcomes are more likely to emerge through students' active participation, effort regulation, academic interaction, and strategic use of learning resources. Students with a stronger growth mindset tend to respond to academic difficulty through persistence, feedback seeking, and strategy adjustment, which can strengthen their engagement in learning activities. Similarly, constructive academic use of social media may enhance engagement by supporting peer interaction, knowledge sharing, resource exchange, and informal academic support. Recent evidence supports this logic, as learning engagement has been shown to relate positively to learning outcomes in online higher education, while social media use has been linked to both academic performance and engagement among higher education students (Doo & Kim, 2024; Shafiq & Parveen, 2023). The Doo and Kim meta-analysis reports a small-to-medium positive relationship between engagement and learning outcomes in online higher education, and Shafiq and Parveen specifically examined social media influence on academic performance and engagement among higher education students.

Digital literacy is also positioned as a mediator because students' ability to benefit from digital learning environments depends on their competence in accessing, evaluating, managing, and applying digital information. Engagement may increase students' exposure to digital learning activities, but digital literacy determines whether that exposure becomes academically productive. In this sense, student engagement and digital literacy may operate both as parallel mediators and as a sequential mechanism: growth mindset and constructive social media influence can encourage students to become more engaged; engaged students are then more likely to use digital tools actively; and stronger digital literacy helps them convert digital participation into meaningful learning outcomes. Recent studies support this mediation logic by showing that digital literacy is associated with academic performance through mediating mechanisms such as digital informal learning, self-efficacy, and digital competence, while digital competence contributes to students' learning behavior in higher education (Zakir et al., 2025; Pan et al., 2024). Therefore, this study positions student engagement and digital literacy as complementary mechanisms that explain how psychological and social-digital factors are translated into learning outcomes. Zakir et al. model digital literacy as directly and indirectly related to academic performance through digital learning-related mediators, while Pan et al. report that digital competence influences students' learning behavior in higher education.

H2a. Student engagement mediates the relationship between growth mindset and learning outcomes.
H2b. Digital literacy mediates the relationship between growth mindset and learning outcomes.
H2c. Student engagement mediates the relationship between social media influence and learning outcomes.
H2d. Digital literacy mediates the relationship between social media influence and learning outcomes.

H2e. Student engagement and digital literacy sequentially mediate the relationship between growth mindset and learning outcomes.
H2f. Student engagement and digital literacy sequentially mediate the relationship between social media influence and learning outcomes.

3. Research Method and Materials

3.1. Research Design

This study employed a quantitative cross-sectional research design to examine the structural relationships among growth mindset, social media influence, student engagement, digital literacy, and learning outcomes. Partial Least Squares Structural Equation Modeling (PLS-SEM) was selected as the primary analytical framework, given its suitability for testing complex mediation models with reflective constructs and its robustness when distributional assumptions are violated (Hair et al., 2022). All analyses were conducted using SmartPLS version 4 (Ringle et al., 2024).

3.2. Participants and Sampling

The study population comprised undergraduate students enrolled at higher education institutions in Indonesia during the 2024–2025 academic year. The final usable sample consisted of 478 students. As summarized in Table 1, most respondents were female (n = 347, 72.59%), while male respondents accounted for 131 students (27.41%). Respondents came from STEM and non-STEM majors and represented several semester levels; most reported using digital technology for learning every day (n = 317, 66.32%).

Participants were recruited using a non-probability purposive sampling approach. Eligible participants were active undergraduate students enrolled at a higher education institution in Indonesia and used at least one digital platform or digital technology for academic activities. An a priori power analysis for multiple regression using G*Power 3.1.9.7 indicated that a minimum of 129 cases was required for four predictors at $f^2 = 0.15$, $\alpha = .05$, and statistical power = .95 (Cohen, 1988; Faul et al., 2009). The obtained sample therefore exceeded the minimum requirement for PLS-SEM estimation and bootstrap-based hypothesis testing.

Table 1. Respondent Demographic Profile

Background	Full sample	
	n	%
Gender		
Female	347	72.59
Male	131	27.41
Major		
STEM	148	30.96
Non STEM	330	69.04
Semester		
Second	104	21.76
Fourth	99	20.71
Sixth	217	45.3
Eight or Higher	58	12.13
Frequency of Digital Technology Usage		
Every Day	317	66.32
3–5 times per week	93	19.46
1–2 times per week	42	8.79
Rarely	26	5.44

Note. N = 478

3.3. Procedure

Data were collected in May 2025 through an online survey administered via Google Forms. The questionnaire link was distributed through student group chats and direct messages involving undergraduate students from higher education institutions in Indonesia. Before completing the questionnaire, participants received an introductory statement

explaining the study purpose, eligibility criteria, voluntary participation, anonymity, and confidentiality. Electronic informed consent was obtained before respondents accessed the survey items. The form did not collect personally identifiable information, was configured to limit duplicate submissions, and required responses to all substantive items. The exported data were stored in password-protected cloud files accessible only to the research team.

3.4. Data Analysis

Data analysis was conducted in SmartPLS 4 using the standard two-stage PLS-SEM procedure. First, the reflective measurement model was evaluated through indicator loadings, internal consistency reliability, convergent validity, and discriminant validity. Internal consistency was assessed using Cronbach's alpha, rho_A, and composite reliability (rho_C). Convergent validity was assessed using the Average Variance Extracted (AVE), with values above .50 indicating acceptable convergence. Indicator loadings were interpreted using the .708 guideline, while retained indicators were evaluated in relation to construct reliability and AVE. Discriminant validity was examined using the Fornell-Larcker criterion and the Heterotrait-Monotrait ratio (HTMT), with HTMT values below .85 used as the decision rule (Hair et al., 2022; Henseler et al., 2015).

Second, the structural model was evaluated by examining path coefficients, t-statistics, p-values, 95% bootstrap confidence intervals, coefficient of determination (R2), adjusted R2, predictive relevance (Q2), and effect sizes (f2). Direct hypotheses were assessed using the path coefficients reported in the direct-effect table, while mediation and sequential mediation hypotheses were evaluated from the specific indirect effects. Bootstrapping with 10,000 subsamples was used to test the significance of direct and indirect effects. Statistical significance was interpreted using the reported p-values and confidence intervals.

4. Results and Discussion

4.1. Results

The evaluation of the Partial Least Squares Structural Equation Modeling (PLS-SEM) was conducted in two distinct stages to ensure methodological rigor. The first stage focused on assessing the validity and reliability of the measurement model. The second stage involved the assessment of the structural model, which included the analysis of regression coefficients, direct and indirect path coefficients, and relevant quality criteria to validate the proposed hypotheses.

Prior to the assessment of the measurement model, common method bias was assessed using the full collinearity VIF approach. The VIF values ranged from 2.547 to 3.347. Although most values were below 3.3, the values for Growth Mindset and Social Media Influence slightly exceeded the conservative 3.3 threshold. Therefore, common method bias cannot be fully ruled out and should be interpreted cautiously.

Table 2. Full collinearity VIF Values

Construct	VIF
Digital Literacy (DL)	2.976
Growth Mindset (GM)	3.347
Learning Outcomes (LO)	2.836
Student Engagement (SE)	2.547
Social Media Influence (SMI)	3.336

4.1.1. Analysis of the Measurement Model

The reflective measurement model was evaluated to determine whether the indicators measured their intended constructs consistently and distinctly. The assessment covered outer loadings, Cronbach’s alpha, composite reliability, average variance extracted (AVE), the Fornell-Larcker criterion, and the heterotrait-monotrait ratio (HTMT).

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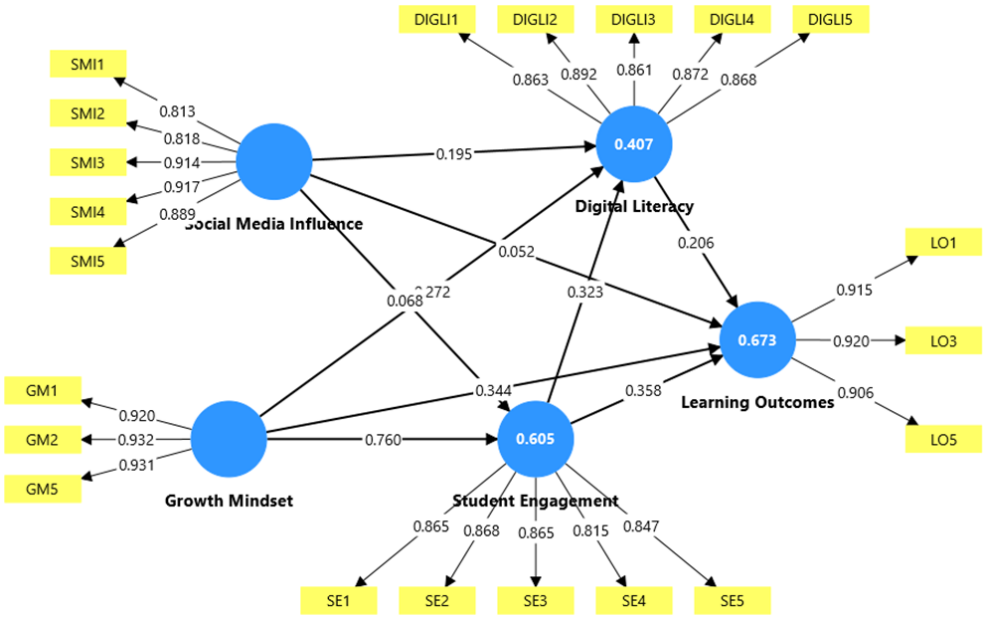

Figure 2. PLS-SEM measurement model output**.**

Table 3 shows that all retained indicators exceeded the recommended loading threshold of 0.70, with loadings ranging from 0.813 to 0.932. Internal consistency was also satisfactory: Cronbach's alpha ranged from 0.901 to 0.921, composite reliability (rho_c) ranged from 0.930 to 0.949, and AVE ranged from 0.726 to 0.860. These results indicate that all constructs met the requirements for indicator reliability, internal consistency reliability, and convergent validity.

Table 3. Measurement model assessment: indicator loadings, reliability, and convergent validity

Construct	Item	Loading	Cronbach's Alpha	Composite Reliability (Rho_a)	Composite Reliability (Rho_c)	Average Variance Extracted (AVE)
Digital Literacy (DL)	DL1	0.863	0.921	0.921	0.940	0.759
	DL2	0.892				
	DL3	0.861				
	DL4	0.872				
	DL5	0.868				
Growth Mindset (GM)	GM1	0.920	0.919	0.919	0.949	0.860
	GM2	0.932				
	GM5	0.931				
Learning Outcomes (LO)	LO1	0.915	0.901	0.903	0.938	0.835
	LO3	0.920				
	LO5	0.906				
Student Engagement (SE)	SE1	0.865	0.906	0.909	0.930	0.726
	SE2	0.868				
	SE3	0.865				
	SE4	0.815				
	SE5	0.847				
Social Media Influence (SMI)	SMI1	0.813	0.921	0.932	0.940	0.760
	SMI2	0.818				
	SMI3	0.914				
	SMI4	0.917				
	SMI5	0.889				

Discriminant validity was first assessed using the Fornell-Larcker criterion. As shown in Table 4, the square roots of AVE on the diagonal ranged from 0.852 to 0.927 and were higher than the corresponding inter-construct correlations. This indicates that each construct shares more variance with its own indicators than with other constructs in the model.

Table 4. Discriminant validity based on Fornell-Larcker criterion

	Digital Literacy	Growth Mindset	Learning Outcomes	Social Media Influence	Student Engagement
Digital Literacy	0.871				
Growth Mindset	0.567	0.927			
Learning Outcomes	0.626	0.750	0.914		
Social Media Influence	0.333	0.225	0.284	0.872	
Student Engagement	0.581	0.775	0.757	0.239	0.852

Discriminant validity was further examined using the HTMT ratio. As presented in Table 5, all HTMT values were below the 0.85 threshold. The highest values appeared for Growth Mindset-Student Engagement (0.843) and Learning Outcomes-Student Engagement (0.837), indicating strong but still acceptable empirical proximity. Overall, the measurement model demonstrated adequate discriminant validity.

Table 5. Discriminant validity based on HTMT (0.85)

	Digital Literacy	Growth Mindset	Learning Outcomes	Social Media Influence	Student Engagement
Digital Literacy					
Growth Mindset	0.615				
Learning Outcomes	0.686	0.823			
Social Media Influence	0.359	0.235	0.307		
Student Engagement	0.633	0.843	0.837	0.258	

4.1.2. Analysis of the Structural Model & Hypothesis Testing

After the measurement model met the required criteria, the structural model was assessed to examine explanatory power, predictive relevance, effect size, and hypothesis support. Table 6 reports the R^2, adjusted R^2, and Q^2 values for the endogenous constructs.

Table 6. Structural model assessment: R^2, adjusted R^2, and Q^2

Construct	R^2	R^2 adjusted	Q^2
Digital Literacy (DL)	0.407	0.403	0.602
Learning Outcomes (LO)	0.673	0.670	0.356
Student Engagement (SE)	0.605	0.603	0.574

The model explained 40.7% of the variance in Digital Literacy, 67.3% of the variance in Learning Outcomes, and 60.5% of the variance in Student Engagement. The adjusted R^2 values were nearly identical to the R^2 values, suggesting that the model did not suffer from excessive predictor inflation. All Q^2 values were above zero, confirming predictive relevance for the endogenous constructs.

Table 7. Effect size assessment (f^2)

Construct	f-square
Digital Literacy -> Learning Outcomes	0.077
Growth Mindset -> Digital Literacy	0.050
Growth Mindset -> Learning Outcomes	0.137
Growth Mindset -> Student Engagement	1.387
Social Media Influence -> Digital Literacy	0.060
Social Media Influence -> Learning Outcomes	0.007
Social Media Influence -> Student Engagement	0.011
Student Engagement -> Digital Literacy	0.070
Student Engagement -> Learning Outcomes	0.145

Table 7 shows that Growth Mindset had the strongest substantive effect on Student Engagement ($f^2 = 1.387$). Student Engagement also had a meaningful effect on Learning Outcomes ($f^2 = 0.145$), while Growth Mindset had a small-to-moderate effect on Learning Outcomes ($f^2 = 0.137$). The remaining significant predictors produced small effects, whereas Social Media Influence had negligible effects on Learning Outcomes ($f^2 = 0.007$) and Student Engagement ($f^2 = 0.011$).

Table 8. Direct effects and hypothesis testing

Hypothesis	Path coefficient	T Statistics	p	Bias, 95% Confidence interval	Conclusion
Growth Mindset (GM)					
Growth Mindset → Learning Outcomes (H1a)	0.344	4.577	0.000	[0.199, 0.491]	Significant Positive
Growth Mindset → Student Engagement (H1c)	0.760	24.172	0.000	[0.692, 0.814]	Significant Positive
Growth Mindset → Digital Literacy (H1e)	0.272	4.676	0.000	[0.156, 0.385]	Significant Positive
Social Media Influence (SMI)					
Social Media Influence → Digital Literacy (H1f)	0.195	4.795	0.000	[0.114, 0.277]	Significant Positive
Social Media Influence → Learning Outcomes (H1b)	0.052	1.867	0.062	[-0.001, 0.108]	Not Significant
Social Media Influence → Student Engagement (H1d)	0.068	2.308	0.021	[0.011, 0.125]	Significant Positive
Student Engagement (SE)					
Student Engagement → Digital Literacy (H1i)	0.323	5.103	0.000	[0.195, 0.443]	Significant Positive
Student Engagement → Learning Outcomes (H1g)	0.358	4.955	0.000	[0.210, 0.493]	Significant Positive
Digital Literacy (DL)					
Digital Literacy → Learning Outcomes (H1h)	0.206	4.508	0.000	[0.124, 0.301]	Significant Positive

Table 8 shows that most direct hypotheses were supported. Growth Mindset significantly predicted Learning Outcomes ($\beta = 0.344$, $p < 0.001$), Student Engagement ($\beta = 0.760$, $p < 0.001$), and Digital Literacy ($\beta = 0.272$, $p < 0.001$). The strongest direct effect in the model was that of Growth Mindset on Student Engagement, indicating that students who believed that academic ability could be developed were more likely to report active learning involvement.

Social Media Influence significantly predicted Digital Literacy ($\beta = 0.195$, $p < 0.001$) and Student Engagement ($\beta = 0.068$, $p = 0.021$), but its direct effect on Learning Outcomes was not significant ($\beta = 0.052$, $p = 0.062$). Student Engagement significantly predicted both Digital Literacy ($\beta = 0.323$, $p < 0.001$) and Learning Outcomes ($\beta = 0.358$, $p < 0.001$), while Digital Literacy also significantly predicted Learning Outcomes ($\beta = 0.206$, $p < 0.001$). These findings indicate that Learning Outcomes were shaped more strongly by engagement and digital competence mechanisms than by social media influence alone.

The indirect effect results in Table 9 show that five of the six hypothesized mediation pathways were supported. Student Engagement significantly mediated the relationship between Growth Mindset and Learning Outcomes ($\beta = 0.272$, $p < 0.001$), supporting H2a. Digital Literacy also significantly mediated the relationship between Growth Mindset and Learning Outcomes ($\beta = 0.056$, $p = 0.003$), supporting H2b. For Social Media Influence, both indirect paths through Student Engagement ($\beta = 0.024$, $p = 0.040$) and Digital Literacy ($\beta = 0.040$, $p = 0.001$) were significant, supporting H2c and H2d.

The sequential mediation path from a Growth Mindset to Learning Outcomes through Student Engagement and Digital Literacy was significant ($\beta = 0.051$, $p = 0.001$), supporting H2e. In contrast, the sequential mediation path from Social Media Influence to Learning Outcomes through Student Engagement and Digital Literacy was not significant at the conventional 5% level based on the p-value ($\beta = 0.005$, $p = 0.064$), although the bootstrapped confidence interval was entirely positive. Therefore, H2f was not robustly supported and should be interpreted as borderline evidence rather than firm support.

Table 9. Indirect Effects and Mediation Testing

Hypothesis	Path coefficient	T Statistics	p	Bias, 95% Confidence interval	Conclusion
Growth Mindset (GM)					
Growth Mindset → Digital Literacy → Learning Outcomes (H2b)	0.056	2.958	**0.003**	[0.027, 0.103]	Significant Positive
Growth Mindset → Student Engagement → Digital Literacy → Learning Outcomes (H2e)	0.051	3.364	**0.001**	[0.027, 0.087]	Significant Positive
Growth Mindset -> Student Engagement -> Learning Outcomes (H2a)	0.272	4.585	**0.000**	[0.155, 0.387]	Significant Positive
Social Media Influence (SMI)					
Social Media Influence -> Student Engagement -> Digital Literacy -> Learning Outcomes (H2f)	0.005	1.854	**0.064**	[0.001, 0.011]	Not Significant / Borderline
Social Media Influence → Student Engagement → Learning Outcomes (H2c)	0.024	2.055	**0.040**	[0.005, 0.051]	Significant Positive
Social Media Influence → Digital Literacy → Learning Outcomes (H2d)	0.040	3.232	**0.001**	[0.021, 0.071]	Significant Positive

4.2. Discussion

This study examined the association between growth mindset and social media influence and learning outcomes among Indonesian university students, with student engagement and digital literacy as parallel and sequential mediating mechanisms. The model explained 67.3% of the variance in learning outcomes, 60.5% of the variance in student engagement, and 40.7% of the variance in digital literacy. These values indicate that the proposed model has substantial explanatory power and that learning outcomes in digitally mediated higher education are better explained by integrated psychological, behavioral, and competence-based mechanisms than by isolated motivational or technological factors. In other words, academic benefit does not emerge simply because students possess positive beliefs or use digital platforms; it emerges when these factors are converted into active engagement and effective digital learning competence.

Growth mindset was a major antecedent in the model. It significantly predicted learning outcomes, student engagement, and digital literacy. The strongest effect was observed on student engagement, suggesting that students who believe their academic ability can be developed are more likely to invest effort, persist in academic tasks, and remain involved in learning activities. This finding supports the argument that growth mindset should not be interpreted as a direct or automatic route to academic achievement. Recent meta-analytic evidence shows that growth mindset effects on academic performance are heterogeneous and depend on contextual and implementation conditions (Burnette et al., 2023; Macnamara & Burgoyne, 2023). Therefore, the present finding is theoretically meaningful because it shows that growth mindset contributes to learning outcomes mainly when it activates productive learning behavior.

The positive relationship between growth mindset and student engagement strengthens the motivational logic of the model. Students with a stronger growth mindset may interpret academic difficulty as a signal to increase effort, adjust strategies, and seek improvement rather than withdraw from learning. This interpretation is consistent with recent research linking growth mindset to self-regulated learning processes, including planning, monitoring, strategy adjustment, and effort regulation (Ba et al., 2025; Xu et al., 2025). In the context of Indonesian higher education, where students increasingly encounter digital learning platforms, online resources, and autonomous learning demands, growth mindset appears to function as a psychological resource that supports sustained engagement. Thus, the result extends previous mindset research by showing that mindset becomes academically useful when it is transformed into behavioral participation and learning persistence.

Social media influence showed a different pattern. Its direct effect on learning outcomes was not significant, whereas its effects on student engagement and digital literacy were significant. In addition, social media influence affected learning outcomes indirectly through student engagement and digital literacy. This is an important result because it prevents an exaggerated conclusion that social media use directly improves academic outcomes. The finding suggests that social media has academic value only when students use it constructively for learning-related interaction, information exchange, academic communication, and resource sharing. This interpretation aligns with Shafiq and Parveen (2023), who found that social media use can support academic performance and engagement among higher education students when it is connected to knowledge sharing and academic interaction. It is also consistent with Smith and Storrs (2023), who showed that undergraduate students perceive digital literacies and social media practices as relevant to academic learning.

The non-significant direct effect of social media influence on learning outcomes should not be treated as a weak or failed finding. Instead, it clarifies the conditional nature of social media in higher education. Social media exposure alone is insufficient to generate academic benefit. Without engagement and digital literacy, social media may remain peripheral, fragmented, or distracting. This finding helps explain why previous studies often report mixed effects of social media on academic performance. Social media can support peer learning, informal academic discussion, and access to learning resources, but it can also encourage passive consumption, distraction, and multitasking. The present study shows that the productive academic route is indirect: social media contributes to learning outcomes when it stimulates engagement or strengthens digital literacy.

Student engagement emerged as the strongest direct predictor of learning outcomes among the mediating variables. This finding supports the view that engagement is a central mechanism in learning because it reflects students' behavioral participation, emotional involvement, cognitive investment, and social interaction. The result is consistent with the classical multidimensional framework of engagement proposed by Fredricks et al. (2004) and with recent digital higher education research emphasizing that engagement cannot be reduced to observable platform activity alone (Bergdahl et al., 2024). The finding also aligns with Doo and Kim's (2024) meta-analysis, which reported a positive relationship between learning engagement and learning outcomes in online higher education. Therefore, the present study reinforces the argument that learning outcomes are produced through students' active involvement in learning processes rather than through access to digital tools alone.

Student engagement also significantly predicted digital literacy. This result indicates that engaged students are more likely to interact with digital platforms, search for academic information, participate in online learning activities, evaluate resources, and use digital tools for academic purposes. In this sense, digital literacy is not only a prior skill that students bring into university learning; it can also develop through active engagement with academic tasks. This interpretation is supported by Wang et al. (2025), who showed that online learning behavioral engagement is related to academic performance, and by Pan et al. (2024), who found that digital competence is closely associated with students' learning behavior. The finding suggests that engagement and digital literacy are mutually reinforcing in digital higher education: engagement increases students' interaction with digital learning environments, while digital literacy improves the quality of that interaction.

Digital literacy significantly predicted learning outcomes and mediated the effects of both growth mindset and social media influence. This finding confirms that digital literacy is not merely technical ability but an academic competence. Students need to access, evaluate, manage, create, and communicate information responsibly in digital environments. The result is consistent with Cabero-Almenara et al. (2023), who identified digital competence as a predictor of academic success among higher education students. It also supports Zakir et al. (2025), who found that digital literacy affects academic performance both directly and indirectly through digital informal learning, self-efficacy, and digital competence. In the present study, digital literacy explains why students who are engaged or academically active in digital spaces are more likely to convert digital participation into meaningful learning outcomes.

The sequential mediation results provide a key contribution of this study. The path from growth mindset to learning outcomes through student engagement and digital literacy was significant, whereas the corresponding sequential path from social media influence was not significant. This contrast suggests that psychological readiness produces a more coherent learning chain than social-digital influence. Growth mindset appears to initiate a sequence in which students become more engaged, develop stronger digital literacy, and subsequently achieve better learning outcomes. Social media influence, by contrast, contributes through shorter indirect pathways, either through student engagement or through digital literacy separately, but not through the complete sequential mechanism. This finding refines the proposed model by showing that parallel and sequential mediation do not operate uniformly across antecedent variables.

Theoretically, this study contributes to higher education research by integrating growth mindset, social media influence, student engagement, and digital literacy within a single structural model. Previous studies often examined these constructs separately: mindset research focused on achievement, social media research focused on usage effects, engagement research focused on participation, and digital literacy research focused on competence. The present study demonstrates that these constructs are more meaningfully understood as parts of a mechanism-based model. Growth mindset and social media influence function as antecedents, student engagement operates as the behavioral mechanism, and digital literacy operates as the competence-based mechanism through which learning outcomes are shaped. This contribution is important because it moves the discussion beyond simple claims that technology use or positive beliefs improve academic performance.

Practically, the findings suggest that universities should avoid shallow interventions. Promoting growth mindset through motivational slogans is not enough. Encouraging students to use social media for learning is also not enough. Institutions need to design learning environments that convert mindset and digital interaction into engagement and competence. Growth mindset interventions should be embedded in feedback-rich learning activities, reflective assignments, strategy revision, and opportunities for academic recovery after failure. Social media should be structured around academic communication, peer discussion, curated resource sharing, and collaborative learning tasks. Digital literacy development should be linked to authentic academic practices, including evaluating online sources, managing digital information, communicating ethically, and producing academic outputs using digital tools.

Several limitations should be acknowledged. First, the cross-sectional design limits causal inference. Although the proposed mediation model is theoretically grounded, the temporal sequence among growth mindset, engagement, digital literacy, and learning outcomes cannot be confirmed without longitudinal or experimental research. Second, the study relied on self-report data, which may introduce common method bias and inflate relationships among constructs. Future studies should include objective indicators such as course grades, learning management system logs, assignment scores, or digital trace data. Third, the sample was drawn from a single Indonesian university, limiting the generalizability of the findings to other institutional, regional, or disciplinary contexts. Fourth, social media influence was measured as constructive academic use, while disruptive use, distraction, passive scrolling, and multitasking were not directly examined. Future research should model both productive and problematic dimensions of social media to capture its dual academic role more accurately.

Overall, this study shows that learning outcomes in digitally mediated higher education are produced through layered mechanisms. Growth mindset contributes most strongly when it promotes student engagement. Social media influence becomes academically useful when it supports engagement or digital literacy. Student engagement functions as the behavioral engine of learning, while digital literacy enables students to transform digital participation into academic benefit. The central implication is clear: digital higher education should not be designed around access, platform use, or motivation alone, but around the mechanisms that help students convert beliefs, interactions, and competencies into learning outcomes.

5. Conclusion

This study examined how Growth Mindset and Social Media Influence relate to Learning Outcomes through Student Engagement and Digital Literacy among undergraduate students in Indonesian higher education. The findings show that Growth Mindset directly predicted Learning Outcomes, Student Engagement, and Digital Literacy, with its strongest effect observed on Student Engagement. Social Media Influence did not directly predict Learning Outcomes, but it significantly predicted Student Engagement and Digital Literacy. These results indicate that students' academic benefits from digital learning environments are not produced by social media exposure alone, but by the extent to which digital interaction is converted into engagement and digital learning competence.

The mediation analysis confirmed that Student Engagement and Digital Literacy function as important mechanisms linking Growth Mindset and Social Media Influence to Learning Outcomes. Growth Mindset influenced Learning Outcomes through both parallel and sequential pathways involving Student Engagement and Digital Literacy. Social Media Influence influenced Learning Outcomes through Student Engagement and Digital Literacy separately, but the full sequential pathway from Social Media Influence to Student Engagement, Digital Literacy, and Learning Outcomes was not robustly supported. This suggests that psychological dispositions may generate a stronger and more coherent learning mechanism than social-digital influence alone.

The study contributes to higher education research by integrating psychological, behavioral, social-digital, and competence-based perspectives within a single PLS-SEM model. Practically, the findings suggest that universities

should not rely only on technology access, motivational messages, or informal social media use. Instead, digital learning strategies should be designed to promote active engagement, structured academic interaction, feedback-based learning, and digital literacy development. Future studies should use longitudinal designs, objective academic performance indicators, and broader multi-institutional samples to strengthen causal inference and generalizability.

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References

APJII. (2024, February 7). *APJII jumlah pengguna internet Indonesia tembus 221 juta orang*. Asosiasi Penyelenggara Jasa Internet Indonesia. https://apjii.or.id/berita/d/apjii-jumlah-pengguna-internet-indonesia-tembus-221-juta-orang

Ba, Y., Ming, W., & Zhang, H. (2025). Unlocking academic success: How growth mindset interventions enhance student performance through self-belief and effort regulation. *Acta Psychologica, 256*, 104977. doi:10.1016/j.actpsy.2025.104977.

Badan Pusat Statistik. (2025). *Telecommunication statistics in Indonesia 2024*. BPS-Statistics Indonesia. https://www.bps.go.id

Bergdahl, N., Bond, M., Sjöberg, J., Dougherty, M., & Oxley, E. (2024). Unpacking student engagement in higher education learning analytics: A systematic review. *International Journal of Educational Technology in Higher Education, 21*, 63. doi:10.1186/s41239-024-00493-y

Burnette, J. L., Billingsley, J., Banks, G. C., Knouse, L. E., Hoyt, C. L., Pollack, J. M., & Simon, S. (2023). A systematic review and meta-analysis of growth mindset interventions: For whom, how, and why might such interventions work? *Psychological Bulletin, 149*(3–4), 174–205. doi:10.1037/bul0000368.

Cabero-Almenara, J., Gutiérrez-Castillo, J. J., Guillén-Gámez, F. D., & Gaete-Bravo, A. F. (2023). Digital competence of higher education students as a predictor of academic success. *Technology, Knowledge and Learning, 28*(2), 683–702. https://doi.org/10.1007/s10758-022-09624-8

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Lawrence Erlbaum Associates.

Doo, M. Y., & Kim, J. (2024). The relationship between learning engagement and learning outcomes in online learning in higher education: A meta-analysis study. *Distance Education, 45*(1), 60–82. doi:10.1080/01587919.2024.2303484

Dweck, C. S. (2006). *Mindset: The new psychology of success*. Random House.

Dweck, C. S., & Yeager, D. S. (2019). Mindsets: A view from two eras. *Perspectives on Psychological Science, 14*(3), 481–496. https://doi.org/10.1177/1745691618804166

Eshet-Alkalai, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia, 13*(1), 93–106.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. Behavior Research Methods, 41(4), 1149-1160. https://doi.org/10.3758/BRM.41.4.1149

Fredricks, J. A., Blumenfeld, P. C., & Paris, A. H. (2004). School engagement: Potential of the concept, state of the evidence. *Review of Educational Research, 74*(1), 59–109. https://doi.org/10.3102/00346543074001059

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2022). A primer on partial least squares structural equation modeling (PLS-SEM) (3rd ed.). Sage.

Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. Journal of the Academy of Marketing Science, 43, 115-135. https://doi.org/10.1007/s11747-014-0403-8

Macnamara, B. N., & Burgoyne, A. P. (2023). Do growth mindset interventions impact students' academic achievement? A systematic review and meta-analysis with recommendations for best practices. *Psychological Bulletin, 149*(3–4), 133–173. doi:10.1037/bul0000352.

Pan, L., Haq, S. U., Shi, X., & Nadeem, M. (2024). The impact of digital competence and personal innovativeness on the learning behavior of students: Exploring the moderating role of digitalization in higher education quality. *SAGE Open, 14*(3). doi:10.1177/21582440241265919

Ringle, C. M., Wende, S., & Becker, J.-M. (2024). SmartPLS 4. SmartPLS GmbH. https://www.smartpls.com

Shafiq, M., & Parveen, K. (2023). Social media usage: Analyzing its effect on academic performance and engagement of higher education students. *International Journal of Educational Development, 98*, 102738. https://doi.org/10.1016/j.ijedudev.2023.102738

Smith, E. E., & Storrs, H. (2023). Digital literacies, social media, and undergraduate learning: What do students think they need to know? *International Journal of Educational Technology in Higher Education, 20*, 29. https://doi.org/10.1186/s41239-023-00398-2

Wang, Y., Zuo, M., He, X., & Wang, Z. (2025). Exploring students online learning behavioral engagement in university: Factors, academic performance and their relationship. *Behavioral Sciences, 15*(1), 78. doi:10.3390/bs15010078

Xu, K. M., Leferink, J., & Wijnia, L. (2025). A review of the relationship between student growth mindset and self-regulated learning. *Frontiers in Education, 10*, 1539639. doi:10.3389/feduc.2025.1539639.

Zakir, S., Hoque, M. E., Susanto, P., Nisaa, V., Alam, M. K., Khatimah, H., & Mulyani, E. (2025). Digital literacy and academic performance: The mediating roles of digital informal learning, self-efficacy, and students' digital competence. *Frontiers in Education, 10*, 1590274. https://doi.org/10.3389/feduc.2025.1590274