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The Effect of E-Learning Platform Utilization and Digital Literacy on Elementary Students' Critical Thinking Skills

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Abstract

This study examines the effect of e-learning platform utilization and digital literacy on elementary students' critical thinking skills. The study responds to the need for enhancing 21st-century learning by strengthening higher-order thinking skills. A quantitative survey method was employed at SDN Bugih 1 Pamekasan, involving 137 upper-grade elementary students (Grades IV–VI), and the data were analyzed using multiple linear regression to test both simultaneous and partial effects. The results show that e-learning platform utilization and digital literacy simultaneously have a significant positive effect on students' critical thinking skills ($R^2 = 0.524$). Partially, both e-learning platform utilization and digital literacy also demonstrate significant positive effects, with e-learning showing a stronger contribution. Practically, these findings suggest that elementary teachers should move beyond using e-learning merely for material distribution by integrating inquiry-based online tasks and explicit digital literacy instruction to foster students' critical thinking.
Keywords: *Critical Thinking, Digital Literacy, E-Learning, Elementary Students*

Introduction

Twenty-first-century education requires students not only to master subject knowledge but also to develop higher-order thinking skills, including critical thinking, problem-solving, and collaboration (Asri et al., 2023; Miterianifa et al., 2021; Sholihah & Lastariwati, 2020). At the elementary school level, critical thinking plays a crucial role in enabling students to analyze information, evaluate arguments, and connect concepts with real-life phenomena (Franco et al., 2018; Minott et al., 2020; Sellars et al., 2018). These competencies support students in solving problems systematically and preparing for future global challenges.

Despite the increasing integration of digital technology in schools, initial observations and interviews conducted at SDN Bugih 1 Pamekasan indicate that students' critical thinking skills remain underdeveloped. Many students experience difficulties in analyzing information critically, tend to accept content without questioning its validity, and rely on immediate or surface-level solutions. In addition, students' participation in classroom discussions is limited, and they often struggle to relate scientific and social concepts to real-life contexts. These findings suggest that current learning practices, although supported by e-learning platforms, have not yet been optimally designed to stimulate higher-order thinking skills.

E-learning platforms such as Google Classroom offer flexible access to learning materials and provide opportunities for interactive engagement beyond traditional classroom settings (Alojaiman, 2021; Bandung et al., 2020; Garcia, 2020). When effectively utilized, e-learning platforms can promote critical thinking through the use of quizzes, discussion forums, collaborative tasks, and automated feedback mechanisms (Guo et al., 2024; Rajaram, 2021; Yaacob et al., 2020). Alongside e-learning, digital literacy is a key factor in ensuring the effectiveness of technology-based learning. Digital literacy encompasses students' abilities to

access, evaluate, manage, and communicate information ethically and responsibly (Jordan et al., 2025). Students with higher levels of digital literacy are more capable of critically evaluating information sources, selecting credible evidence, and constructing well-reasoned arguments.

However, several challenges continue to hinder the effective implementation of digital learning in elementary schools. At SDN Bugih 1 Pamekasan, the use of e-learning platforms is often limited to uploading learning materials, with minimal integration of interactive or inquiry-based activities. Moreover, unequal access to digital devices and unstable internet connectivity further restrict students' participation in online learning activities (De Guzman, 2022; Meridha, 2024). Teachers also face challenges related to pedagogical readiness, as effective integration of technology requires continuous professional development and alignment between instructional strategies and digital tools (Erwin & Mohammed, 2022).

While previous studies have reported positive effects of e-learning and digital literacy on student engagement and learning outcomes (Bachtiar, 2024; Susanti et al., 2023), empirical research examining the combined effect of e-learning platform utilization and digital literacy on critical thinking skills at the elementary school level remains limited. Most existing studies tend to investigate these variables separately or focus on secondary and higher education contexts. Therefore, this study seeks to address this research gap by empirically examining the simultaneous influence of e-learning platform utilization and digital literacy on elementary students' critical thinking skills within a real-school context.

Based on these considerations, this study aims to investigate the effect of e-learning platform utilization and digital literacy on students' critical thinking skills. The findings of this study are expected to provide evidence-based insights and practical strategies for integrating digital technology with instructional practices to strengthen higher-order thinking skills and enhance the quality of elementary education in the digital era.

Method

This study employed a structured questionnaire as the primary research instrument to measure students' critical thinking skills, e-learning platform utilization, and digital literacy. The instrument was administered to upper-grade elementary students and was designed using a Likert scale to capture students' responses quantitatively.

The critical thinking instrument was developed by adapting established theoretical frameworks of critical thinking and higher-order thinking skills, particularly referring to Facione's critical thinking framework and the concept of Higher-Order Thinking Skills (HOTS). The instrument measured students' abilities to engage in reflective and analytical thinking processes appropriate to the elementary school context. The indicators of critical thinking assessed in this study included: (1) identifying and understanding problems, (2) analyzing information and relationships between concepts, (3) evaluating the credibility of information sources, and (4) drawing logical conclusions based on available evidence. Sample items required students to analyze simple problems, evaluate information presented in learning materials, and provide reasoned responses to contextual questions. The language and contextual examples used in the instrument were adjusted to suit the cognitive and developmental characteristics of elementary school students.

The e-learning platform utilization instrument measured the extent to which students used e-learning platforms, particularly Google Classroom, during the learning process. The indicators included the frequency of platform use, students' engagement with digital learning materials, participation in online discussions, and responsiveness to feedback provided through the

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platform. These indicators reflect both the functional and pedagogical use of e-learning platforms rather than mere access to digital content.

The digital literacy instrument assessed students' abilities to access, evaluate, manage, and communicate digital information responsibly. The indicators focused on students' skills in searching for information, distinguishing credible from non-credible sources, understanding the ethical use of digital content, and utilizing digital tools to support learning tasks. These indicators were also adapted to align with the developmental level of elementary school students.

All instruments used a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Prior to data collection, the instruments were reviewed by subject-matter experts to ensure content validity and clarity of language. Reliability testing indicated that all instruments met acceptable reliability standards, confirming their suitability for use in this study.

Results

Descriptive Test

This study examined three main variables: the utilization of e-learning platforms, digital literacy, and students' critical thinking skills. Data were collected from 137 elementary school students and analyzed using descriptive statistics, including minimum score, maximum score, mean, and standard deviation. This analysis provides an overview of students' score distribution and overall tendency for each variable.

Table 1. Descriptive Statistics

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
E-Learning Platform	137	43	57	49.07	2.832
Digital Literacy	137	41	60	50.75	3.086
Critical thinking	137	25	44	33.20	3.421
Valid N (listwise)	137				

Source: SPSS Output Version 26 (2025).

Table 1 shows that the utilization of e-learning platforms has a mean score of 49.07 (SD = 2.832), with scores ranging from 43 to 57. Based on the Likert scale range and score categorization, this mean score falls within the high category, indicating that students demonstrate relatively strong engagement with e-learning platforms and that the variability of scores is low.

Digital literacy has a mean score of 50.75 (SD = 3.086), with scores ranging from 41 to 60. This mean score is also classified in the high category, suggesting that students generally possess good digital literacy skills, including the ability to access and utilize digital information appropriately, with relatively consistent competence among students.

In contrast, students' critical thinking skills show a mean score of 33.20 (SD = 3.421), with scores ranging from 25 to 44. Based on the score categorization, this mean falls within the moderate category, indicating that while students demonstrate some level of critical thinking ability, these skills are not yet optimally developed and show slightly greater variability compared to e-learning utilization and digital literacy.

Overall, the descriptive results indicate that students exhibit high levels of engagement with e-learning platforms and relatively strong digital literacy skills. However, their critical thinking skills remain at a moderate level, suggesting a potential gap between students' access to digital learning and their ability to process information critically. This finding highlights the importance

of effectively integrating e-learning platforms and digital literacy instruction to better support the development of critical thinking skills in elementary education.

Normality Tests

Normality testing was conducted to assess whether the residuals of the regression model followed a normal distribution, which is a key assumption in multiple linear regression analysis. The normality of residuals was examined using the One-Sample Kolmogorov–Smirnov test and supported by a Normal P–P Plot of the standardized residuals. The residuals were considered normally distributed when the Asymp. Sig. value exceeded 0.05.

Table 2. Normality Test Results (One-Sample Kolmogorov-Smirnov Test)

One-Sample Kolmogorov-Smirnov Test		
		Standardized Residual
N		137
Normal Parameters[a,b]	Mean	.0000000
	Std. Deviation	.99261983
Most Extreme Differences	Absolute	.065
	Positive	.065
	Negative	-.037
Test Statistic		.065
Asymp. Sig. (2-tailed)		.200[c,d]
a. Test distribution is Normal.		
b. Calculated from data.		
c. Lilliefors Significance Correction.		
d. This is a lower bound of the true significance.		

Source: SPSS Output Version 26, primary data processed (2025).

The Kolmogorov–Smirnov test yielded an Asymp. Sig. (2-tailed) value of 0.200, which exceeds the significance level of 0.05. This result indicates that the standardized residuals are normally distributed and do not significantly deviate from a normal distribution.

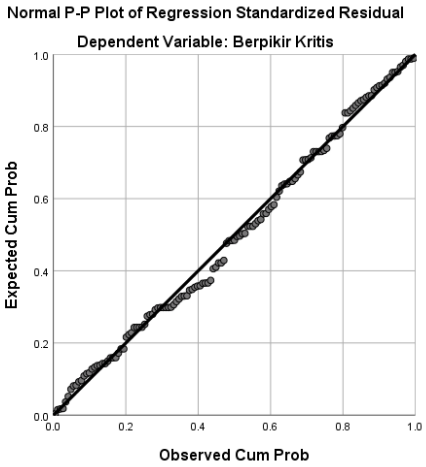


Figure 1. Normal P–P Plot of Regression Standardized Residual

The Normal P–P Plot (Figure 1) further supports this finding, as the plotted points closely follow the diagonal reference line with only minor deviations. Therefore, both the statistical test and graphical analysis confirm that the normality assumption is satisfied, allowing the data to be further analyzed using multiple linear regression.

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Linearity Test

Linearity testing was conducted to examine whether the relationships between the independent variables—e-learning platform utilization and digital literacy—and the dependent variable, critical thinking skills, followed a linear pattern. This assumption is essential for the application of multiple linear regression analysis.

Table 3. Linearity Test of Critical Thinking * E-Learning Platform

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Critical Thinking * E-Learning Platform	Between Groups	(Combined)	726.141	13	55.857	7.938	.000
		Linearity	581.412	1	581.412	82.623	.000
		Deviation from Linearity	144.730	12	12.061	1.714	.071
	Within Groups		865.537	123	7.037		
	Total		1591.679	136			

Source: SPSS Output Version 26, primary data processed (2025).

As shown in Table 3, the linearity component is statistically significant (Sig. = 0.000 < 0.05), while the deviation from linearity is not significant (Sig. = 0.071 > 0.05). These results indicate a significant linear relationship between e-learning platform utilization and students' critical thinking skills.

Table 4. Linearity Test of Critical Thinking * Digital Literacy

ANOVA Table

			Sum of Squares	df	Mean Square	F	Sig.
Critical Thinking * Digital Literacy	Between Groups	(Combined)	354.022	16	22.126	2.145	.010
		Linearity	264.785	1	264.785	25.673	.000
		Deviation from Linearity	89.237	15	5.949	.577	.888
	Within Groups		1237.657	120	10.314		
	Total		1591.679	136			

Source: SPSS Output Version 26, primary data processed (2025).

Similarly, Table 4 indicates that the relationship between digital literacy and critical thinking skills is linear. The linearity component is statistically significant (Sig. = 0.000 < 0.05), and the deviation from linearity is not significant (Sig. = 0.888 > 0.05), confirming that the relationship does not deviate from linearity.

Overall, the linearity test results demonstrate that both independent variables meet the linearity assumption. Therefore, the data are appropriate for further analysis using multiple linear regression to examine the effects of e-learning platform utilization and digital literacy on students' critical thinking skills.

Multicollinearity Test

The multicollinearity test was conducted to examine whether strong correlations existed among the independent variables in the regression model, which could affect the stability and interpretation of regression coefficients. Multicollinearity was assessed using Tolerance and Variance Inflation Factor (VIF) values. The regression model is considered free from multicollinearity when the Tolerance value exceeds 0.10 and the VIF value is less than 10.

Table 5. Multicollinearity Test Results

Coefficients[a]

Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.	Collinearity Statistics

		B	Std. Error	Beta			Tolerance	VIF
1	(Constant)	-24.649	4.837		-5.096	.000		
	E-Learning Platform	.722	.072	.598	10.029	.000	1.000	1.000
	Digital Literacy	.441	.066	.398	6.679	.000	1.000	1.000

a. Dependent Variable: Critical Thinking

Source: SPSS Output Version 26, primary data processed (2025).

The results show that both independent variables have Tolerance values of 1.000 and VIF values of 1.000, which meet the accepted criteria for the absence of multicollinearity. A VIF value of 1.000 indicates that there is no correlation between the independent variables, suggesting that each predictor contributes uniquely to the regression model without overlapping explanatory power.

Therefore, the regression model satisfies the multicollinearity assumption, and the regression coefficients can be interpreted reliably without distortion caused by intercorrelations among the predictors.

Hypothesis Testing

Hypothesis testing was conducted using multiple linear regression analysis to examine the effect of e-learning platform utilization and digital literacy on students' critical thinking skills, both simultaneously and partially.

Table 6. Results of Multiple Linear Regression Analysis

Variable	B	Std. Error	Beta	t	Sig.
(Constant)	-24.649	4.837	-	-5.096	0.000
E-Learning Platform Utilization	0.722	0.072	0.598	10.029	0.000
Digital Literacy	0.441	0.066	0.398	6.679	0.000

Model Fit Statistics: F = 73.696; Sig. = 0.000; R = 0.724; R^2 = 0.524; Adjusted R^2 = 0.517
Dependent Variable: Critical Thinking Skills

Source: SPSS Output Version 26, primary data processed (2025).

The results of the F-test indicate that the regression model is statistically significant ($F = 73.696$, $p < 0.05$). This finding demonstrates that e-learning platform utilization and digital literacy simultaneously have a significant effect on students' critical thinking skills. Therefore, H1 is accepted.

Partially, both independent variables show statistically significant positive effects on students' critical thinking skills. E-learning platform utilization has a regression coefficient of B = 0.722 ($\beta = 0.598$, $p < 0.05$), indicating that increased utilization of e-learning platforms is associated with higher levels of students' critical thinking skills. Digital literacy also shows a significant positive effect with a coefficient of B = 0.441 ($\beta = 0.398$, $p < 0.05$). The standardized beta values indicate that e-learning platform utilization has a stronger influence on critical thinking skills compared to digital literacy. Therefore, H2 and H3 are accepted.

The coefficient of determination indicates that the regression model explains 52.4% of the variance in students' critical thinking skills ($R^2 = 0.524$). The remaining 47.6% of the variance may be influenced by other factors not included in the model, such as instructional strategies, students' prior knowledge, learning motivation, teacher support, and parental involvement.

The regression constant is negative (-24.649), indicating that in the absence of e-learning platform utilization and digital literacy, students' critical thinking skills tend to be substantially lower. This result highlights the crucial role of both e-learning platforms and digital literacy as key supporting factors in fostering students' critical thinking skills in elementary education.

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Discussion

Effect of E-Learning Platform Utilization and Digital Literacy on Critical Thinking

The results of the simultaneous regression analysis indicate that e-learning platform utilization and students' digital literacy significantly influence critical thinking skills ($F = 73.696$, $p < 0.05$; $R^2 = 0.524$). This finding demonstrates that 52.4% of the variance in students' critical thinking abilities can be explained by the combined contribution of these two variables, while the remaining variance is attributable to other factors such as instructional strategies, learning motivation, classroom climate, and students' cognitive and social characteristics.

These findings are particularly relevant to the learning context at SDN Bugih 1 Pamekasan, where preliminary observations revealed that e-learning platforms were primarily used for uploading materials and administrative purposes, with limited emphasis on interactive or inquiry-based learning activities. The significant combined effect found in this study suggests that when e-learning platforms are utilized more meaningfully and supported by adequate digital literacy skills, they can function as effective tools for fostering critical thinking, even within schools facing infrastructural and pedagogical constraints.

From a theoretical perspective, this result aligns with cognitivist learning theory, which emphasizes that learning occurs through active mental processes involving information organization, analysis, and reflection (Mahbub & Beedle, 2025; Misman et al., 2021; Raturi, 2023; Wilson, 2016; Xiaohui, 2024). E-learning platforms provide structured access to diverse learning resources, asynchronous materials, and formative feedback, allowing students to engage in deeper cognitive processing and independent knowledge construction (Baanqud et al., 2020). Through these processes, learners are encouraged to analyze information, evaluate evidence, and synthesize concepts—core components of critical thinking.

In addition, the findings are consistent with social constructivist theory, which posits that learning is socially mediated through interaction and collaboration (Çibukçiu, 2025; Wibowo et al., 2025; Zajda, 2021). E-learning environments facilitate online discussions, peer feedback, and collaborative problem-solving, enabling students to co-construct knowledge within their zone of proximal development (Bautista Alcaine et al., 2024). Previous studies have shown that digitally supported collaborative learning significantly enhances students' higher-order thinking and reasoning skills (Hussin et al., 2019; Qinxue, 2025; P. Sharma et al., 2024).

Overall, these results confirm that e-learning platform utilization and digital literacy function as complementary constructs. Access to digital learning environments alone is insufficient; students must also possess the skills to critically evaluate and use digital information effectively. The interaction between these two variables creates a learning ecosystem that supports the development of critical thinking skills in elementary education.

The Effect of Utilizing E-Learning Platforms on Critical Thinking

The partial regression analysis reveals that e-learning platform utilization has a significant positive effect on students' critical thinking skills ($B = 0.722$, $\beta = 0.598$, $p < 0.05$). This finding indicates that increased use of e-learning platforms is associated with higher levels of critical thinking after controlling for digital literacy.

Notably, the standardized coefficient shows that e-learning platform utilization exerts a stronger influence on critical thinking than digital literacy. This may be explained by the fact that e-learning platforms directly shape learning experiences by structuring tasks, interactions, and feedback processes. In elementary education contexts, students tend to respond more immediately to learning environments that provide guided activities, interactive tasks, and clear learning scaffolds than to abstract digital literacy skills alone.

This finding supports the principles of technology-enhanced, learner-centered education, which emphasize students' active engagement in constructing knowledge through exploration, inquiry, and reflection (Kerimbayev et al., 2023). It is also consistent with Biggs' constructive alignment theory, which argues that meaningful learning occurs when instructional activities and assessments are aligned with higher-order learning objectives (Biggs, 2003). E-learning platforms such as Google Classroom enable this alignment by integrating learning materials, interactive tasks, discussion forums, and formative assessments that target analytical and evaluative thinking (Khadka et al., 2025; Piaw et al., 2025).

Within the context of IPAS (Integrated Natural and Social Sciences) learning, e-learning platforms allow teachers to design inquiry-based online tasks, such as analyzing environmental issues, examining social phenomena through digital data, and drawing evidence-based conclusions. These activities encourage students to move beyond memorization toward deeper conceptual understanding. Similar findings have been reported in previous studies demonstrating that e-learning enhances reflective engagement, metacognitive awareness, and analytical reasoning among elementary school students (D. Sharma & Verma, 2024).

The Effect of Digital Literacy on Critical Thinking

The results also indicate that digital literacy significantly affects students' critical thinking skills ($B = 0.441$, $\beta = 0.398$, $p < 0.05$). This finding suggests that students with higher levels of digital literacy are better equipped to engage in analytical, evaluative, and reflective thinking processes.

Digital literacy extends beyond basic technical skills to include cognitive and ethical competencies, such as evaluating information credibility, identifying bias, and synthesizing information from multiple sources (Chang & Kuo, 2025). In IPAS learning, digital literacy enables students to interpret data, assess evidence, and apply concepts to real-life problem-solving situations. This finding aligns with the 21st Century Learning framework, which positions digital literacy as a foundational element supporting critical thinking (Thornhill-Miller et al., 2023).

Empirical studies have consistently shown that students with strong digital literacy skills demonstrate higher levels of reflective engagement, more sophisticated argumentation, and stronger evidence-based reasoning (Jordan et al., 2025). Thus, digital literacy acts as a cognitive enabler that allows students to maximize the benefits of e-learning environments and supports the development of critical thinking skills.

Implications

The findings of this study highlight that the development of critical thinking skills in the digital era depends on the integration of e-learning platforms and students' digital literacy. Elementary schools are encouraged to design inquiry-based online learning activities, particularly in IPAS subjects, such as problem-based investigations, digital data analysis tasks, and guided online discussions that promote reasoning and reflection.

However, practical challenges such as limited internet connectivity and unequal access to digital devices—identified at SDN Bugih 1 Pamekasan—must be addressed to ensure effective implementation. Schools and policymakers should therefore consider improving digital infrastructure and providing pedagogical support for teachers to integrate technology meaningfully. Without addressing these contextual constraints, the potential of e-learning platforms to foster critical thinking may not be fully realized.

Research Limitations and Future Research Directions

This study was limited by its sample size, which involved 137 students from a single elementary school, potentially restricting the generalizability of the findings. The use of self-reported instruments may also limit the depth of measurement of critical thinking skills. Additionally, the cross-sectional design does not allow for causal inference over time.

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Future research is recommended to involve multiple schools and grade levels to enhance external validity. Longitudinal studies could further examine the long-term impact of e-learning and digital literacy on critical thinking development. Further investigations may also explore mediating and moderating variables such as learning motivation, engagement, instructional strategies, and teacher digital competence. Mixed-method approaches could provide richer insights into how critical thinking skills are developed within digital learning environments.

Conclusion

This study concludes that e-learning platform utilization and digital literacy play a significant role in enhancing elementary students' critical thinking skills. The findings indicate that the meaningful integration of e-learning platforms, supported by adequate digital literacy, contributes substantially to students' ability to analyze information, evaluate evidence, and draw logical conclusions in learning activities.

The results further show that e-learning platform utilization exerts a stronger influence on critical thinking compared to digital literacy. This suggests that well-designed digital learning environments—featuring structured tasks, interactive activities, and formative feedback—can directly shape students' learning experiences and stimulate higher-order thinking processes. Nevertheless, digital literacy remains a crucial supporting factor that enables students to critically evaluate and use digital information effectively, thereby maximizing the benefits of e-learning.

From a practical perspective, these findings imply that elementary schools should not limit the use of e-learning platforms to material distribution. Instead, teachers are encouraged to design inquiry-based and problem-oriented online learning activities, particularly in IPAS subjects, that promote analysis, reflection, and evidence-based reasoning. At the same time, explicit digital literacy instruction should be integrated into the curriculum to strengthen students' critical engagement with digital content.

However, the effectiveness of e-learning integration is closely linked to contextual factors such as internet connectivity and access to digital devices. As identified in this study, limitations in infrastructure may hinder students' participation and learning outcomes. Therefore, schools and policymakers should prioritize improving digital infrastructure and providing continuous pedagogical support for teachers to ensure that technology-based learning can be implemented effectively and equitably.

Overall, this study contributes to the literature by providing empirical evidence on the combined effect of e-learning platform utilization and digital literacy on critical thinking skills at the elementary school level. The findings highlight the importance of coherent instructional design, technological support, and digital competence development in fostering higher-order thinking skills in elementary education within the digital era.

References

Alojaiman, B. (2021). Toward Selection of Trustworthy and Efficient E-Learning Platform. *IEEE Access*, *9*, 133889–133901. https://doi.org/10.1109/ACCESS.2021.3114150

Asri, I. H., Lasmawan, I. W., & Suharta, I. G. P. (2023). Kompetensi Abad 21 Sebagai Bekal Menghadapi Tantangan Masa Depan. *Kappa Journal*, *7*(1), 97–107. https://doi.org/10.29408/kpj.v7i1.12999

Baanqud, N. S., Al-Samarraie, H., Alzahrani, A. I., & Alfarraj, O. (2020). Engagement in cloud-supported collaborative learning and student knowledge construction: a modeling study. *International Journal of Educational Technology in Higher Education*, *17*(1).

https://doi.org/10.1186/s41239-020-00232-z

Bachtiar. (2024). Strategies and Challenges in Encouraging Students' Critical Thinking Skills in Online Learning: A Literature Review. *International Journal For Multidisciplinary Research*, *6*(2), 1–14. https://doi.org/10.36948/ijfmr.2024.v06i02.14527

Bandung, M., Rifani, M. F., & Fitriani, Y. (2020). an Analysis of an Innovation E-Learning on Modern Platform. *Inovish Journal*, *5*(2), 194. https://doi.org/10.35314/inovish.v5i2.1685

Bautista Alcaine, P., Vicente Sánchez, E., Orejudo Hernández, S., & Cano Escoriaza, J. (2024). Training pre-service teachers to deal with cyberbullying: Collective intelligence as a mode of learning. *Computers & Education*, *220*, 105123. https://doi.org/https://doi.org/10.1016/j.compedu.2024.105123

Chang, C.-Y., & Kuo, H.-C. (2025). The development and validation of the digital literacy questionnaire and the evaluation of students' digital literacy. *Education and Information Technologies*, *30*(9), 11549–11581. https://doi.org/10.1007/s10639-024-13216-7

Çibukçiu, B. (2025). The relationship between constructivist approach and inclusive education in primary. *Frontiers in Education*, *25*(June), 1–6. https://doi.org/10.3389/feduc.2025.1600711

De Guzman, F. I. (2022). Education Students' Challenges in Using Digital Tech-nologies for Online Learning: Basis for Institutionalization Plan. *Journal of Education Www.Scholarum.Dlsl.Edu.Ph*, *2*(1), 87–94.

Erwin, K., & Mohammed, S. (2022). Digital Literacy Skills Instruction and Increased Skills Proficiency. *International Journal of Technology in Education and Science*, *6*(2), 323–332. https://doi.org/10.46328/ijtes.364

Franco, A., Marques Vieira, R., & Tenreiro-Vieira, C. (2018). Educating for critical thinking in university: The criticality of critical thinking in education and everyday life. *ESSACHESS - Journal for Communication Studies*, *11*(2), 131–144.

Garcia, M. (2020). An Overview of Innovations in Online Learning. *Education in the Asia-Pacific Region*, *55*, 191–198. https://doi.org/10.1007/978-981-15-7018-6_23

Guo, R., Jantharajit, N., & Thongpanit, P. (2024). Enhancing Analytical and Critical Thinking Skills through Reflective and Collaborative Learning: A Quasi-Experimental Study. *International Journal of Education and Social Development*, *1*(1), 15–18. https://doi.org/10.54097/8jk07y86

Hussin, W. N. T. W., Harun, J., & Shukor, N. A. (2019). Online interaction in social learning environment towards critical thinking skill: A framework. *Journal of Technology and Science Education*, *9*(1), 4–12. https://doi.org/10.3926/jotse.544

Jordan, A., Julianto, A., & Firmansyah, M. A. (2025). Integrating Digital Literacy into Curriculum Design a Framework for 21st Century Learning. *Journal of Technology, Education & Teaching (J-Tech)*, *1*(2), 79–85. https://doi.org/10.62734/jtech.v1i2.418

Kerimbayev, N., Umirzakova, Z., Shadiev, R., & Jotsov, V. (2023). A student-centered approach using modern technologies in distance learning: a systematic review of the literature. *Smart Learning Environments*, *10*(1). https://doi.org/10.1186/s40561-023-00280-8

Khadka, J., Dahal, N., Acharya, U., Puri, G., Subedi, N., & Hasan, M. K. (2025). Higher-order thinking skills in e-learning contexts in higher education: a phenomenological study. *Frontiers in Education*, *10*(April), 1–13. https://doi.org/10.3389/feduc.2025.1555541

Mahbub, A., & Beedle, J. (2025). Behaviorists, Cognitivists, and Constructivists Learning Theories: a Comparison and Application in Instructional Design. *European Journal of Education Studies*, *12*(6), 271–281. https://doi.org/10.46827/ejes.v12i6.6047

Meridha, J. M. (2024). The causes of poor digital literacy in educational practice, and possible solutions among the stakeholders: a systematic literature review. *SN Social Sciences*,

Copyright © 2026 The Author(s)

4(11), 210. https://doi.org/10.1007/s43545-024-01010-8

Minott, D., Ferguson, T., & Minott, G. (2020). *Critical Thinking and Sustainable Development BT - Encyclopedia of Sustainability in Higher Education* (W. Leal Filho (ed.); pp. 1–6). Springer International Publishing. https://doi.org/10.1007/978-3-319-63951-2_529-1

Misman, F. N., Jaini, A., Abdul Kadir, J. M., Mahmood, C. F. C., Abdul Rashid, N. R., & Dzulkifli, M. R. (2021). Cognitive Constructivism in the Classroom: The Case for Online Distance Learning. *International Journal of Academic Research in Business and Social Sciences*, *11*(11). https://doi.org/10.6007/ijarbss/v11-i11/11596

Miterianifa, M., Ashadi, A., Saputro, S., & Suciati, S. (2021). Higher Order Thinking Skills in the 21st Century: Critical Thinking. *Natural Science Education Department*. https://doi.org/10.4108/eai.30-11-2020.2303766

Piaw, C. Y., Ying, L. F., & Chiat, L. F. (2025). Unveiling key e-learning ingredients for enhancing higher-order thinking skills. *Discover Education*, *4*(1). https://doi.org/10.1007/s44217-025-00600-9

Qinxue, L. (2025). Sociocultural Theory. *The ECPH Encyclopedia of Psychology*, 1414–1414. https://doi.org/10.1007/978-981-97-7874-4_851

Rajaram, K. (2021). *Learning Interventions: Collaborative Learning, Critical Thinking and Assessing Participation Real-Time BT - Evidence-Based Teaching for the 21st Century Classroom and Beyond: Innovation-Driven Learning Strategies* (K. Rajaram (ed.); pp. 77–120). Springer Singapore. https://doi.org/10.1007/978-981-33-6804-0_3

Raturi, S. (2023). A Social Constructivist Approach to E-Learning: Methodologies and Challenges. *BSSS Journal of Education*, *12*(01), 78–90. https://doi.org/10.51767/je1206

Sellars, M., Fakirmohammad, R., Bui, L., Fishetti, J., Niyozov, S., Reynolds, R., Thapliyal, N., Liu-Smith, Y. L., & Ali, N. (2018). Conversations on critical thinking: Can critical thinking find its way forward as the skill set and mindset of the century? *Education Sciences*, *8*(4). https://doi.org/10.3390/educsci8040205

Sharma, D., & Verma, S. (2024). The Impact of eLearning on Self-Directed Learning and Critical Thinking Ability Development of Students. *International Journal For Multidisciplinary Research*, *6*(3), 1–6. https://doi.org/10.36948/ijfmr.2024.v06i03.23694

Sharma, P., Akgun, M., & Li, Q. (2024). Understanding student interaction and cognitive engagement in online discussions using social network and discourse analyses. *Educational Technology Research and Development*, *72*(5), 2631–2654. https://doi.org/10.1007/s11423-023-10261-w

Sholihah, T. M., & Lastariwati, B. (2020). Problem based learning to increase competence of critical thinking and problem solving. *Journal of Education and Learning (EduLearn)*, *14*(1), 148–154. https://doi.org/10.11591/edulearn.v14i1.13772

Susanti, E., Septiana, S., Meilinda, S., & Rosa, I. M. (2023). Effectiveness of Using Google Sites-Based E-Modules to Optimize Critical Thinking Skills: Student Perceptions Analysis. *Jurnal Penelitian Pendidikan IPA*, *9*(12), 10555–10561. https://doi.org/10.29303/jppipa.v9i12.5887

Thornhill-Miller, B., Camarda, A., Mercier, M., Burkhardt, J. M., Morisseau, T., Bourgeois-Bougrine, S., Vinchon, F., El Hayek, S., Augereau-Landais, M., Mourey, F., Feybesse, C., Sundquist, D., & Lubart, T. (2023). Creativity, Critical Thinking, Communication, and Collaboration: Assessment, Certification, and Promotion of 21st Century Skills for the Future of Work and Education. *Journal of Intelligence*, *11*(3). https://doi.org/10.3390/jintelligence11030054

Wibowo, S., Wangid, M. N., & Firdaus, F. M. (2025). The relevance of Vygotsky's constructivism learning theory with the differentiated learning primary schools. *Journal of Education and Learning*, *19*(1), 431–440. https://doi.org/10.11591/edulearn.v19i1.21197

Wilson, L. O. (2016). Blooms Taxonomy Revised - Understanding the New Version of Bloom's Taxonomy. *A Taxonomy for Learning, Teaching, and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives*, *1*(1), 1–8.

Xiaohui, M. (2024). *Cognitive Learning Theory BT-The ECPH Encyclopedia of Psychology*. Springer Nature Singapore. https://doi.org/10.1007/978-981-99-6000-2_1073-1

Yaacob, A., Mohd Asraf, R., Hussain, R. M. R., & Ismail, S. N. (2020). Empowering Learners' Reflective Thinking through Collaborative Reflective Learning. *International Journal of Instruction*, *14*(1), 709–726. https://doi.org/10.29333/IJI.2021.14143A

Zajda, J. (2021). *Constructivist Learning Theory and Creating Effective Learning Environments BT - Globalisation and Education Reforms: Creating Effective Learning Environments* (J. Zajda (ed.); pp. 35–50). Springer International Publishing. https://doi.org/10.1007/978-3-030-71575-5_3