

Teachers' Digital Literacy as a Catalyst for Joyful and Meaningful Technology-Based Learning

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Abstract: *The rapid advancement of digital technology demand that teachers possess strong digital literacy skills to create joyful and meaningful learning. This study examines the influence of teachers' digital literacy on their ability to design technology-assisted joyful and meaningful learning. Using a quantitative approach, data were collected from 16 teachers through questionnaires. Teachers' digital literacy was assessed across six competency areas, while their self-reported abilities in developing joyful and meaningful technology-based learning were measured using Likert-scale items. The results indicate that teachers demonstrated strong foundational and communication-related digital competencies, particularly in browsing and interacting through digital technologies. However, weaker performance was observed in digital content creation, programming, and cybersecurity awareness. Regression analysis revealed that teachers' digital literacy significantly influenced their ability to develop both joyful and meaningful technology-based learning, with coefficients of determination ($R^2 = 0.673$ and $R^2 = 0.541$) indicate that digital literacy explains a substantial proportion of the variance in teachers' pedagogical competence. These findings underscore the critical role of digital literacy as a key predictor of technology integrated joyful and meaningful learning in education.*

Keywords: *teachers' digital literacy; joyful learning; meaningful learning*

Abstrak: Kemajuan pesat teknologi digital menuntut para guru untuk memiliki keterampilan literasi digital yang kuat guna menciptakan pembelajaran yang menyenangkan dan bermakna. Penelitian ini mengkaji pengaruh literasi digital guru terhadap kemampuan mereka dalam merancang pembelajaran menyenangkan dan bermakna berbantuan teknologi. Dengan menggunakan pendekatan kuantitatif, data dikumpulkan dari 16 guru melalui kuesioner. Literasi digital guru dinilai berdasarkan enam area kompetensi, sementara kemampuan mereka yang dilaporkan sendiri dalam mengembangkan pembelajaran menyenangkan dan bermakna berbasis teknologi diukur menggunakan item skala Likert. Hasil penelitian menunjukkan bahwa guru memiliki kompetensi digital yang kuat pada aspek dasar dan komunikasi, khususnya dalam menjelajah dan berinteraksi melalui teknologi digital. Namun, kinerja yang lebih lemah diamati pada aspek pembuatan konten digital, pemrograman, dan kesadaran keamanan siber. Analisis regresi menunjukkan bahwa literasi digital guru berpengaruh signifikan terhadap kemampuan mereka dalam mengembangkan pembelajaran menyenangkan dan bermakna berbasis teknologi, dengan koefisien determinasi ($R^2 = 0,673$ dan $R^2 = 0,541$) yang menunjukkan bahwa literasi digital menjelaskan proporsi yang substansial terhadap variansi kompetensi pedagogik guru. Temuan ini menegaskan peran penting literasi digital sebagai prediktor utama dalam integrasi teknologi terhadap pembelajaran yang menyenangkan dan bermakna di bidang pendidikan.

Kata kunci: literasi digital guru; pembelajaran menyenangkan; pembelajaran bermakna

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INTRODUCTION

The rapid advancement of digital technology has fundamentally transformed the landscape of education, ushering in an era marked by digital transformation and the emergence of paradigms such as Society 5.0. These changes demand that teachers not only adapt to new technological tools but also develop robust digital literacy to meet the expectations of 21st-century education and prepare students for a knowledge-based, innovation-driven society (Angkarini et al., 2025; Dermawan & Sumarni, 2024; Eliwatis et al., 2022; Fedorova et al., 2021; González-Pérez & Ramírez-Montoya, 2022). In this context, teachers are increasingly required to possess digital competencies that go beyond basic technical skills, encompassing the ability to access, evaluate, and effectively utilize educational technologies to create engaging, student-centered learning environments (Falloon, 2020; Fernández-Batanero et al., 2022; Lin et al., 2023; Marnita et al., 2023).

The shift towards student-centered learning emphasizes the importance of joyful and meaningful educational experiences, where technology serves as a catalyst for active, collaborative, and personalized learning (Acuña, 2024; González-Pérez & Ramírez-Montoya, 2022; Otto et al., 2024). However, despite the recognized potential of digital tools, many teachers still face challenges in integrating technology optimally into classroom practice, often due to limited digital literacy or insufficient professional development opportunities (Chan et al., 2025; ElSayary, 2023; Fernández-Batanero et al., 2022; Marnita et al., 2023; Rahmandani et al., 2025; Zimmer & Matthews, 2022). This gap can hinder the creation of learning environments that are both enjoyable and meaningful for students. Given these challenges, it is crucial to examine the extent to which teachers' digital literacy influences their competence in designing and implementing high-quality, technology-enhanced learning.

This study focuses on teachers and investigates their digital literacy in terms of access, evaluation, and utilization of technology. It also explores how these competencies relate to teachers' abilities to design and implement joyful, meaningful, and technology-supported learning experiences. The research aims to analyze: (1) the level of teachers' digital literacy; (2) their competence in developing joyful and meaningful technology-assisted learning; and (3) the influence of digital literacy on teaching competence. The findings are expected to contribute theoretically to the field of educational science and provide practical insights for teachers, schools, and future researchers in developing effective digital literacy and professional development strategies.

METHODS

This study employs a quantitative research approach using a linear regression method to analyze the influence of teachers' digital literacy on their ability to develop technology assisted joyful learning and meaningful learning. The research is designed to determine the extent to which digital literacy predicts teachers' capacity to create engaging and meaningful learning experiences with the support of technology.

The target sample size will include approximately 16 teachers. The sample selection process utilizes random sampling. Participants are invited to complete the questionnaires electronically. Responses are anonymized to ensure confidentiality.

Data were obtained through validated questionnaires designed to assess teachers' digital literacy, following established frameworks such as UNESCO's DigComp 2.0. This framework evaluates five competencies related to the use of digital tools, creation of

digital content, and integration of technology into teaching practices, along with one competency in Hardware and Software Fundamentals and another in Career-Related Competencies. Meanwhile, teachers' self-perceived abilities to design and implement joyful and meaningful technology-assisted learning were measured using Likert-scale items adapted from relevant literature and pilot-tested for reliability.

The main analysis employs linear regression to investigate the influence of teachers' digital literacy (independent variable) on their ability to design joyful and meaningful technology-assisted learning (two dependent variables). Data analysis is conducted with the assistance of SPSS version 27.

RESULT AND DISCUSSION

Teacher digital literacy

The following section presents a detailed overview of the results of teachers' digital literacy assessment, highlighting their competencies across various digital skill domains.

Table 1. Teachers' Digital Literacy Scores for Each Indicator

Competences	Sub Competencies	Score
Fundamentals of Hardware and Software	0.1. Basic knowledge of hardware and software	86,89
	Information and data literacy	
	1.1. Browsing, searching and filtering data, information and digital content	88,24
	1.2. Evaluating data, information and digital content	82,06
	1.3. Managing data, information and digital content	81,47
Communication and collaboration	2.1. Interacting through digital technologies	88,24
	2.2. Sharing through digital technologies	87,65
	2.3. Engaging in citizenship through digital technologies	83,14
	2.4. Collaborating through digital technologies	78,82
	2.5. Netiquette	83,14
	2.6. Managing digital identity	83,14
Digital content creation	3.1. Developing digital content	80
	3.2. Integrating and re-elaborating digital content	74,51
	3.3. Copyright and licenses	63,53
	3.4. Programming	56,86
Safety	4.1. Protecting devices	62,59
	4.2. Protecting personal data and privacy	73,82
	4.3. Protecting health and well-being	82,35
	4.4. Protecting the environment	75,29
Problem Solving	5.1. Solving technical problems	69,41
	5.2. Identifying needs and technological responses	71,18
	5.3. Creatively using digital technologies	72,55
	5.4. Identifying digital competence gaps	71,47
Career related competences	6. Career-related competences	72,55

Based on the data in the table, it can be seen that, in general, participants demonstrated good abilities, with the highest scores found in the aspects of Browsing, searching, and filtering data, information, and digital content and interacting through digital technologies, both at 88.24. Overall, participants also showed strong mastery in fundamental and communication-related competencies.

Despite these strengths, several research efforts highlight persistent gaps in technical skills, digital security awareness, and the application of technology for career development. Digital content creation, including programming and multimedia integration, remains a weak area for many teachers. Safety and cybersecurity skills are also underdeveloped, with teachers often lacking the ability to protect their digital identity, manage privacy, and understand digital copyright and licensing. These gaps are consistent across educational levels and are not significantly influenced by demographic factors such as age or gender (Guevara-Otero et al., 2023; Tzafilkou et al., 2022).

Teachers’ ability to develop technology-based joyful and meaningful learning

The following presents the results of assessing teachers’ skills in developing joyful and meaningful technology-based learning.

Table 2. Average Scores of Teachers’ Skills in Developing Joyful and Meaningful Technology-Based Learning.

Aspect	Average Score
Teachers’ Skills in Developing Technology-Based Joyful Learning	77,26
Teachers’ Skills in Developing Technology-Based Meaningful Learning	77,80

Based on the data in the table, it can be seen that teachers’ skills in developing technology-based learning show fairly good results in both assessed aspects. The aspect of teachers’ skills in developing technology-based Joyful Learning obtained an average score of 77.26, while the skills in developing technology-based Meaningful Learning were slightly higher at 77.80. These results indicate that teachers already possess adequate abilities in creating both joyful and meaningful learning experiences by utilizing technology as a support in the learning process.

Nevertheless, since the scores remain within the 70s range, there is still room for improvement. Therefore, continuous training and mentoring on innovative technology-based learning should be conducted to further strengthen teachers’ competencies in realizing learning experiences that are both joyful and meaningful.

The Influence of Teachers’ Digital Literacy on Their Ability to Develop Joyful and Meaningful Technology-Based Learning

The following presents the results of data analysis regarding the influence of teachers’ digital literacy on their competencies in developing joyful and meaningful technology-assisted learning. The data analysis was conducted with the assistance of SPSS 27.

Table 3. The Influence of Teachers’ Digital Literacy on Their Ability to Develop Joyful and Meaningful Technology-Based Learning

Aspect	R	R Square	Constant	Regression Coefficient	Calculated t Value	Sig
Teachers’ Skills in Developing Technology-Based Joyful Learning	.820	.673	3.300	.967	5.555	.000
Teachers’ Skills in Developing Technology-Based Meaningful Learning	.736	.541	5.738	.943	4.206	.001

Based on the analysis results, the calculated t value was 5.555, which is greater than the t table value of 2.145 and with a significance level of $0.000 < 0.05$. This indicates that teachers’ digital literacy has a significant effect on their ability to develop technology-based joyful learning. This aligns with some research that has found that teachers with strong digital skills are more likely to implement diverse digital tools and strategies, resulting in more interactive and joyful learning experiences for students (Chan et al., 2025; Sondari et al., 2025).

The correlation value (R) of 0.820 shows a very strong relationship between the two variables, while the coefficient of determination (R Square) of 0.673 means that 67.3% of the variation in teachers’ ability to create joyful technology-based learning can be explained by digital literacy. This is consistent with research showing that digital competence is a primary driver of effective technology integration and student engagement (Fitrah et al., 2025; Joshi et al., 2023; Lin et al., 2023; Sailer et al., 2021). Digital literacy has been linked to teachers’ ability to adapt pedagogical approaches, personalize learning, and foster collaborative and creative classroom environments—all of which contribute to joyful learning experiences (Joshi et al., 2023; Reisoğlu, 2022; Sondari et al., 2025).

The resulting regression equation is $[Y = 3.300 + 0.967X + e]$, with a constant of 3.300, meaning that if teachers’ digital literacy is assumed to be constant, their skill level is 3.300. The positive regression coefficient of 0.967 indicates that each one-unit increase in digital literacy will be followed by a 0.967 increase in teachers’ skills in developing joyful learning. This nearly one-to-one relationship is supported by research indicating that targeted digital literacy training leads to marked improvements in teachers’ instructional practices and student engagement (Fitrah et al., 2025; Reisoğlu, 2022; Sondari et al., 2025). Moreover, studies emphasize that as teachers’ digital literacy grows, so does their ability to design lessons that are not only effective but also enjoyable and motivating for students (Chan et al., 2025; Joshi et al., 2023; Sailer et al., 2021)

Next, the regression analysis results for meaningful learning show that the calculated t value is 4.206, which is greater than the t table value of 2.145 and a significance level of $0.001 < 0.05$, indicating that teachers’ digital literacy also has a significant effect on their ability to develop technology-based meaningful learning. This finding aligns with broader research demonstrating that teachers’ digital literacy is a

significant predictor of their effectiveness in integrating technology into learning environments. Studies consistently report that higher digital literacy among teachers correlates with improved teaching quality, student engagement, and the ability to implement innovative educational models, one of them is meaningful learning (Park & Kim, 2024; Sappaile et al., 2023; Yeşilyurt & Vezne, 2023). However, some research also highlights that digital literacy alone may not be sufficient; the creative and pedagogical application of technology is equally important for maximizing learning outcomes (Dagohoy & Hinacay, 2025; Yeşilyurt & Vezne, 2023).

The correlation value (R) of 0.736 indicates a strong relationship between the two variables, while the coefficient of determination (R Square) of 0.541 shows that 54.1% of the variation in teachers' ability to develop meaningful technology-based learning is explained by digital literacy. A strong correlation and substantial explanatory power suggest that digital literacy is a key driver in teachers' capacity to foster meaningful, technology-based learning. Similar studies have found comparable or even higher coefficients of determination, reinforcing the central role of digital skills in educational innovation (Akhyar et al., 2021; Sappaile et al., 2023; Setyaedhi & Pramana, 2025). Nevertheless, the remaining unexplained variance points to the influence of other factors, such as institutional support, access to resources, and teachers' attitudes toward technology, which are also critical for effective technology integration (Dagohoy & Hinacay, 2025; Michos et al., 2023; Sappaile et al., 2023).

The obtained regression equation is $[Y = 5.738 + 0.943X + e]$, with a constant of 5.738, meaning that if teachers' digital literacy remains constant, their skill level is at that value. The positive regression coefficient of 0.943 indicates that each one-unit increase in digital literacy will enhance teachers' skills in developing meaningful learning by 0.943. The positive and substantial regression coefficient underscores the practical impact of improving digital literacy: targeted professional development in digital skills can yield measurable gains in teachers' ability to design and deliver meaningful, technology-enhanced learning experiences.

CONCLUSSIONS

This study demonstrates that teachers' digital literacy plays a crucial role in shaping their ability to design and implement joyful and meaningful technology-based learning experiences. The findings reveal that teachers generally possess strong fundamental and communication-related digital competencies, particularly in browsing, searching, and interacting through digital technologies. However, challenges remain in more advanced areas such as digital content creation, programming, and cybersecurity awareness, indicating the need for continuous professional development.

The regression analysis further confirms that digital literacy significantly influences teachers' competencies in developing both joyful and meaningful learning, with high coefficients of determination ($R^2 = 0.673$ and $R^2 = 0.541$). These results suggest that improvements in digital literacy directly enhance teachers' capacity to create deep, joyful, and meaningful educational experiences supported by technology.

In practical terms, these findings emphasize the importance of strengthening teachers' digital competencies through targeted professional development. Building teachers' confidence and creativity in using digital tools will not only improve instructional quality but also foster more joyful and meaningful learning environments.

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