Digital Transformation in Education: Efforts to Improve Teacher Professionalism Through Innovative Learning

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Abstract. The objective of this study emphasises the exploration of innovative digital learning applications and provides a tangible contribution to improving teachers' competencies. We used a quantitative approach with an explanatory survey method to answer the research questions. Random sampling was used as the sample collection method, and the Cohran method was used as the technique for determining the number of respondents, resulting in 237 respondents. The analysis technique used was multiple linear regression, and it was found that the integration of digital-based learning media (Canva) and other interactive applications can increase the creativity, effectiveness, and collaboration of students during the learning process in the classroom. The findings from this study confirm that innovative learning integrated with various digital devices can play a very important role in supporting the continuous development of teachers' professional competencies, as well as supporting a more adaptive, inclusive and relevant education ecosystem. In addition, this study also provides significant implications regarding the improvement of teachers' professionalism in creating and enhancing learning experiences that are tailored to the needs of students in the digital era.

Keywords: Digital Transformation; Innovative Learning; Teacher Professionalism.

1 Introduction

Digitalisation has played a significant role in bringing about change in various sectors [1], one of which is the education sector [2]. This can be seen from the development of the education sector, which has been able to adapt to the challenges of the 4.0 and 5.0 industrial revolution era by ensuring that educators are able to adapt quickly and effectively to digital technology changes that can be applied in the learning process [3]. However, other studies reveal that there are still challenges that require effective solutions in the education sector related to technological developments, namely the continuing digital literacy gap, limitations in the infrastructure supporting digitalisation in some regions, and the mental readiness and pedagogical competence of teachers in adopting technology-based learning [4]. This means that improving teacher professionalism cannot be delayed, as this action is crucial to ensure that the implementation of digital transformation in education is no longer merely theoretical but must have tangible implications for the quality and outcomes of student learning.

Furthermore, we have conducted preliminary studies on several research projects, which show that most teachers have used various digital devices in the classroom learning process, such as presentations using interactive media, online learning applications, or learning management systems (LMS) owned by schools [5], [6], [7]. However, the results of these studies also show that the use of technology in the learning process is still technical in nature, meaning that it has not been fully integrated into innovative learning strategies oriented towards improving student learning outcomes. This is in line with the results of other studies which show that many teachers still find it difficult to deal with and design digital-based learning that is tailored to the needs and characteristics of students [8]. In addition, the suboptimal use of digital devices in the learning process is also influenced by pedagogical and digital competencies [9], as well as teachers' ability to operate technology [10]. Additionally, challenges are also faced from the institutional support side, as it is known that there are still obstacles in providing digital infrastructure and equitable internet access across all schools [11].

Here, it is evident that digital transformation in education is not merely about the use of technological devices, but encompasses a paradigm shift in teaching, learning, and assessment methods [2]. The creation of innovative digital-based learning will enable a more interactive, collaborative, and personalized learning process tailored to the needs of students [12]. This means that teachers play a crucial role in designing and implementing relevant, creative, and technology-based learning strategies to ensure that the teaching and learning process is effective and optimal. On the other hand, technology will not be useful in the learning process if it is not integrated with teachers' ability to apply it. Therefore, enhancing teachers' professionalism, particularly in mastering technology, is one of the key indicators of the success of digital transformation in education [13].

The emphasis on teachers' mastery of subject matter in the digital age should not be used as a benchmark for optimizing knowledge transfer to students, but must be balanced with teachers' ability to effectively integrate technology into learning activities [14]. This is because students of this generation are part of the digital-native generation who have grown up in a highly connected, fast-paced, and technology-driven environment, and they tend to have a visual, interactive, and more responsive learning style toward digital stimuli compared to conventional approaches [15]. Therefore, teachers need to possess pedagogical skills, particularly in the digital domain, to create adaptive, engaging, and relevant learning experiences that meet the current needs of students. Mastering these skills enables teachers to design learning strategies that not only convey material but also encourage active student participation through the use of various digital platforms [16]. This means that with these abilities, teachers can develop learning models that combine technology with appropriate pedagogical approaches, thereby accommodating diverse learning styles and increasing student motivation to learn.

From preliminary studies conducted through interviews and literature reviews, it has been confirmed that digital transformation in education has not yet fully addressed the comprehensive improvement of teacher professionalism. This has created a significant gap between the potential offered by digital transformation and actual practices in the field, particularly in terms of developing innovative learning models that can sustainably promote teacher professionalism. Therefore, the primary objective of this activity is to explore the application of innovative digital-based learning that contributes to enhancing teachers' competencies, particularly in the areas of pedagogy, technology proficiency, and reflective practice in teaching.

2 Literature Review

2.1 Digital Transformation

Digital transformation is a strategic process that involves the comprehensive use of digital technology to change the way organizations operate, create value, and provide services to stakeholders [17]. This change is not limited to the application of information technology, but also includes changes in learning culture, learning models, and patterns of interaction between individuals and systems [2]. This transformation not only involves the integration of digital devices into the teaching and learning process but also reflects a paradigm shift in the role of teachers as adaptive, reflective, and technology-based learning facilitators [12]. On the other hand, the development of pedagogical competencies and digital skills of teachers in the application of innovative learning has significant implications in designing meaningful and more contextual learning experiences for students during the learning process [14]. This is evident from research findings showing that teachers who are actively involved in the implementation of digital transformation in education tend to demonstrate increased professionalism, particularly in mastery of learning materials and technology-based classroom management [18]. This means that in applying digitalisation to the education sector, particularly to the learning process, a holistic and sustainable approach is needed, so that this approach does not only emphasise the use of technology, but also considers organisational and cultural factors.

2.2 Innovative Learning

Innovative learning here is an approach to learning that emphasises creating meaningful and contextual learning experiences through a collaboration between creativity, collaboration, problem solving and the use of technology. In the context of digital transformation itself, the emphasis is more on a paradigm shift towards learning activities that are more flexible, adaptive and student-centred [19]. Therefore, from the teachers' perspective, technology-based innovative learning not only improves their professional capacity, but also includes how they master digital technology, design technology-integrated project-based learning activities, and their ability to manage classes collaboratively and dynamically [20]. This means that the digital transformation in the education sector has positive implications for teachers in terms of expanding their knowledge and promoting better learning, particularly pedagogical skills through online platforms, interactive content, and virtual learning communities. This is also in line with research findings which state that teacher involvement in learning that combines innovative learning with technology not only has an effect on improving teaching quality, but can also encourage personal identity and commitment to self-development [21]. Thus, innovative learning is essential in supporting collaboration with digital transformation, so that it can be used as a means to enhance the sustainability of teacher professionalism.

2.3 Teacher Professionalism

Teacher professionalism is one of the competencies that teachers must master, especially in terms of mastery of learning materials, skills in the learning process (pedagogy), having ethical integrity, and the ability to adapt to scientific developments [22]. One of the challenges of teacher professionalism is the ability to adapt quickly in an era of technological transformation, as teachers are required to respond quickly to changes in learning approaches, methods and media that are more dynamic and use technology, thereby enabling students to adopt these changes in line with learning objectives [23]. His means that professional teachers today are not only expected to master content and teaching strategies but also to apply innovative approaches relevant to technological advancements and the needs of the 21st century. This enables the creation of more meaningful, adaptive, and contextual learning experiences for

students [24], particularly in terms of developing global competencies, fostering resilient character, and preparing them to face the challenges of the workplace and life in the digital age [25]. Thus, digital transformation not only provides various opportunities for teachers to expand their understanding of the importance of digital literacy but also focuses on enhancing digital competencies and building professional networks through online training, virtual learning communities, and other educational platforms [26]. Therefore, a teacher's professionalism in the digital age is not only determined by mastery of subject matter and methods but also by the ability to continuously innovate in designing contextual, participatory, and transformative learning experiences.

3 Methodology

This study uses a quantitative approach with an explanatory survey method to examine the influence of digital transformation and innovative learning on teacher professionalism. The research population consists of all vocational school teachers, particularly those who actively teach using technology-based learning media in the teaching process, as they are directly involved in the implementation of curricula and learning strategies relevant to technological developments and the needs of business and industry in the digital era. The sampling technique used was random sampling using the Cochran method [1997], resulting in a sample size of 237 from a population of 621 registered in Blitar City [28].

Furthermore, this study uses a questionnaire as the main instrument, which is distributed to respondents using Google Forms. The questionnaire consists of 15 items spread across three variables, namely digital transformation [DT], innovative learning [IL], and teacher professionalism [TP]. A 7-point Likert scale will be used to measure respondents' perceptions and attitudes. For data analysis testing, the researcher will first conduct validity and reliability tests, with validity decisions based on Sig. < 0.05 and r-calculated $>$ r-table, while reliability decisions will use Cronbach's Alpha > 0.70. This will be followed by testing classical assumptions [data normality, multicollinearity, linearity, and heteroscedasticity] using standardized classical assumption testing values. Finally, data analysis testing will be conducted using multiple linear regression analysis with F-tests, t-tests, and R2, where the latter is used to address the research problem.

4 Results

4.1 Instrument Feasibility

Instrument validity testing consists of instrument validity and reliability, where it is known that the validity and reliability tests have met the testing requirements (Table 1).

Table 1. Summary of Instrument Validity and Reliability Tests

No.	Item Statement (Code)	r-calculated	r-table	Sig. < 0.05	Description r-cal > r-tab
1.	DT_1	.406	.235	.000	Valid
2.	DT_2	.421	.235	.000	Valid
3.	DT_3	.383	.235	.029	Valid
4.	DT_4	.311	.235	.009	Valid
5.	DT_5	.458	.235	.031	Valid
6.	IL_1	.381	.235	.035	Valid

7.	IL_2	.296	.235	.017	Valid
8.	IL_3	.312	.235	.009	Valid
9.	IL_4	.359	.235	.002	Valid
10.	IL_5	.409	.235	.000	Valid
11.	TP_1	.395	.235	.013	Valid
12.	TP_2	.323	.235	.006	Valid
13.	TP_3	.301	.235	.039	Valid
14.	TP_4	.281	.235	.013	Valid
15.	TP_5	.379	.235	.001	Valid

(Source: Primary data processed by researchers 2025)

From the table above, it can be seen that the validity test shows that all 15 items used in this study are valid. This is evident from the correlation values indicated by the calculated r-values (0.281–0.458), which are higher than the table r-values (0.235), and all items also have significance values less than 0.05 (0.000–0.039). Therefore, the results of the validity test can be concluded that each item of the research instrument used can significantly measure aspects relevant to the overall construct or research variable.

Furthermore, the reliability test results used to ensure the consistency and stability of the instrument show that Cronbach's Alpha is 0.875, which means it has a value greater than the reliability decision standard, which is 0.70. This means that all items in the questionnaire have a sufficiently high level of internal consistency and reliability. Therefore, the items in this study are suitable for measuring teachers' perceptions of digital transformation in education and its relationship to the use of innovative learning media as an effort to enhance teachers' professionalism in teaching..

4.2 Model Analysis Feasibility

The feasibility of the analysis model in this study was tested using classical assumption tests, and the results showed that all variables (DT, IL, and TP) using the Kolmogorov-Smirnov test had a normal data distribution (Table 2), with a significance value of 0.198, which is greater than 0.05.

Table 2. Summary of Normality, Multicollinearity, and Linearity Tests

		Normality			Multicollinearity		Linearity
		Kolmogorov-Smirnov[a]			Tolerance and VIF		Deviation from Linearity (dL)
		Statistic	df	Sig.	Tolerance	VIF	Sig.
Unstandardized Residual		.062	235	.198	-	-	-
Model 1							
	DT	-	-	-	.598	1.672	-
	IL	-	-	-	.742	1.347	-
	Between Groups	Deviation from Linierity					.578

(Source: Primary data processed by researchers 2025)

Furthermore, the table above also shows that the tolerance value is above 0.10 and the VIF value is below 10, indicating that there is *no indication of multicollinearity* in the regression model used. Additionally, in the linearity test using dL, it is known that the significance value is above 0.05, namely 0.578, which means that *there is no significant deviation from the linear*

relationship between variables. Furthermore, the heteroscedasticity test also shows that the data meets the requirements of the classical assumption test (Figure 1).
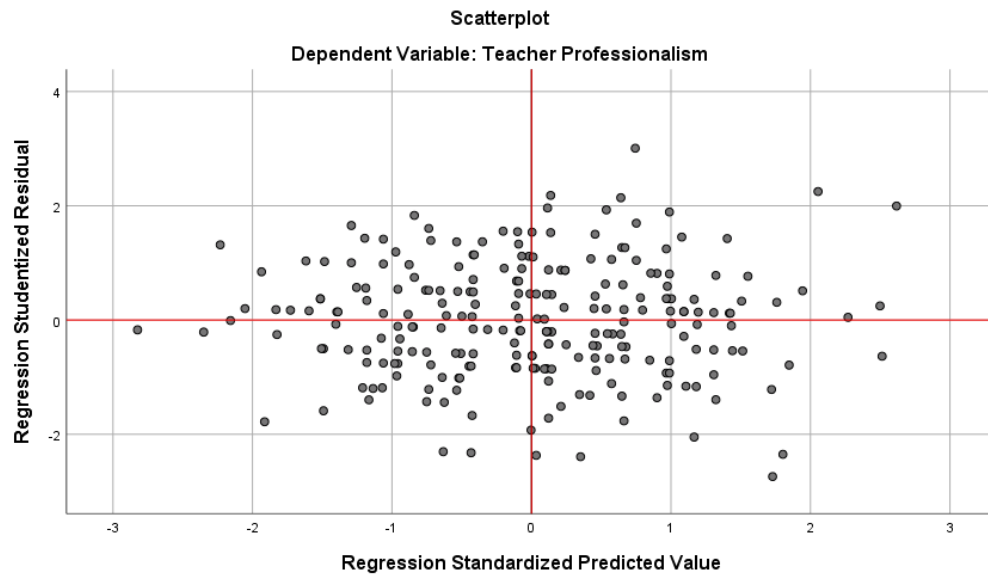
Scatterplot
Dependent Variable: Teacher Professionalism

Fig. 1. Heteroscedasticity Test
Source: Primary data processed by researchers (2025)

From the image above, it can be explained that the heteroscedasticity test results using a scatter plot show that the residual variance does not exhibit a systematic pattern against the predicted values, so the regression parameter estimates can be confirmed to remain valid and efficient. Given that all model analysis tests using classical assumption tests are satisfied, the data can be used as a tool to measure and answer research problems.

4.3 Multiple Linear Regression Test

The results of the multiple linear regression test show that digital transformation and innovative learning have a *significant and positive* effect on teachers' professionalism. This is evident from the calculated F-value of 201.132 with a significance level of 0.002 (< 0.05), which means that both independent variables (DT and IL) simultaneously have a positive and significant effect on the dependent variable (TP). A similar result is also seen in the partial test, which shows that DT has a regression coefficient value of 0.472 with a significance level of 0.008 (< 0.05), meaning that the higher the level of digital transformation applied in the learning process, the higher the level of professionalism possessed by teachers, especially in the application of learning media. Furthermore, the results of the IL test have a regression coefficient value of 0.388 with a significance level of 0.001 (< 0.05), meaning that the application of innovative learning strategies also significantly improves teachers' professional competence in teaching.

In addition, the regression analysis results also show that the coefficient of determination (R-Square) has a value of 0.863, meaning that in this study, 86.3% of the variation in teacher professionalism can be comprehensively explained by the combination of digital transformation

in education and innovative learning variables, while the remaining 13.7% is influenced by other factors outside of these variables. Therefore, based on the results of the multiple linear regression test above, it can be concluded that digital transformation and innovative learning can be considered important factors in providing significant impetus for improving the quality and professionalism of teachers in the digital education era. The summary of the multiple regression analysis test results can be seen in the table.

Table 3. Summary of Normality, Multicollinearity, and Linearity Testing

Variable	Regression Coefficient	Value	t-count	Sig.
Konstanta	9.632	-	-	-
DT	.472	-	6.253	.008
IL	.388	-	5.842	.001
F-hitung	-	201.132	-	.002
R-Square	-	.863		.000

Source: Primary data processed by researchers (2025)

5 Discussion

The test results concluded that digital transformation variables in innovative education and learning have a positive and significant effect on teacher professionalism, both partially and simultaneously. The findings of this study are also supported by results indicating that digital transformation emphasizes changes in teachers' professional identities, not merely technological proficiency, thereby requiring teachers to simultaneously develop digital and pedagogical competencies, which will impact the learning process in the digital age [29]. Furthermore, another study also found that the integration of digital platforms in learning also has a positive influence on teachers' self-efficacy and their perceptions of their professionalism, particularly in relation to how they manage their classrooms and their interactions in the learning process when using technology-based media [30]. Additionally, other findings also mention that digital transformation will accelerate changes in teachers' paradigms in teaching and strengthen the urgency of technology in enhancing teachers' professionalism, making digital readiness essential in supporting teachers' adaptability [31].

Furthermore, innovative learning practices using digital-based learning media have also been found to improve teacher professionalism, particularly in their ability to design more interactive and instructional learning, including learning reflection using project-based learning, Canva, flipped learning, and other technology-based interactive media [14]. This means that the higher a teacher's ability to integrate digitalization into the learning process, the stronger their professional capabilities in education, particularly in pedagogical aspects. However, some studies have revealed that not all teachers feel an increase in their professionalism due to the availability of digital facilities at school. Teachers cited the lack of technical support, equipment, and inadequate technological infrastructure to accommodate various online activities as obstacles [32]. The equitable distribution of facilities is also a crucial challenge, as disparities between schools in the availability of learning resources significantly affect the quality of the learning process [33].

The availability of teaching technology, both digital and non-digital, in educational institutions plays a role in facilitating the integration of technology into the pedagogical practices of educators [34]. Limited digital facilities can hinder the optimization of teachers' roles in managing learning, which indirectly affects the process of improving their

professionalism [35]. Research [36] highlights the importance of technology in supporting teacher participation and professional development. Digital transformation in education can be achieved through the gradual strengthening of infrastructure from the bottom up, which integrates technology into teachers' learning practices, as well as a top-down approach through the provision of integrated digital solutions to meet strategic and logistical needs [37]. Digital transformation requires educational institutions to strategically consider infrastructure aspects as the foundation for implementation [38]. Teachers need support in utilizing educational technology, including the use of digital devices and applications [39].

In addition, educational institutions need to provide support through adequate training to prevent negative impacts on teachers' well-being. Digital transformation requires teachers to have adequate skills and abilities to utilize technological devices and apply the latest learning strategies [40]. Effective teachers need pedagogical, personal, and professional competencies to implement innovative learning that improves student performance [41]. Some perspectives suggest that effective teachers will implement innovative learning in the classroom, build good relationships with students, optimize learning time, and demonstrate a high level of commitment to their profession [42]. The UNESCO Teacher Competency Framework (2018) emphasizes the importance of technology training as an integral element in teacher professional development [43].

Teachers play a key role in the success of digital transformation in education. Modernization and renewal of professional development are prerequisites for educators to be able to optimize technology in supporting learning [18]. With the rapid advancement of technology, educational institutions need to optimize opportunities through investment in sustainable technology-based professional training programs, thereby not only strengthening teachers' capacity for innovative learning but also improving the quality of student learning outcomes [44]. The optimal use of digital technology not only enriches the learning process but also requires a redefinition of the teacher's role to align with the needs of students in the digital age. In the context of digital transformation in education, the integration of digital devices, the repositioning of teachers' roles, and continuous professional development are key strategies to ensure that teachers are able to respond to the demands of innovative learning and the dynamics of future needs [45]. The development of teacher professionalism in the digital era requires the enhancement of competencies through training programs and continuous education [46]. Therefore, in order to support teachers' professional development, intensive training, systematic guidance and a comprehensive approach are needed to change teachers' mindsets and perspectives on the role of technology in supporting their professionalism and improving their pedagogical skills to facilitate innovative learning.

Furthermore, from the results of research and literature review, it appears that this study has significant implications in strengthening the collaboration between digital transformation and innovative learning, thereby giving rise to a comprehensive understanding, especially regarding the impact on teachers' professional competence. In addition, it also provides positive encouragement to schools to cultivate technological adaptation and innovation in learning.

6 Conclusion

The results of the study indicate that collaboration between digital transformation and the application of innovative learning during the learning process will play a very important role in supporting the improvement of teachers' professional skills. Furthermore, strong integration between digital media, such as Canva, can encourage creativity, collaboration and effectiveness among teachers during the learning process. The hope is to gradually and continuously

strengthen the development of teachers' professional competencies, while still paying attention to the relevance of education in the digital era. However, in practice, there are still many challenges that require further attention, including the uneven distribution of technology-based learning facilities across all regions, a lack of adequate technical support, and the suboptimal mental preparedness and pedagogical abilities of teachers in implementing technology with innovative learning in the classroom. Therefore, strategic efforts that can be made to support this are to expand technology-related infrastructure, particularly in the field of education, provide intensive training and mentoring to teachers, especially in mastering technology for education, and provide effective stimuli to improve teachers' pedagogical abilities, so that digital transformation in the education sector will have a significant impact on the quality of learning.

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