

Teacher's Digital Competence and its Impact on the Students Learning Outcomes in Hybrid Learning Environments

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ABSTRACT

The study investigates the relationship between the digital skill of the teachers and their pedagogical aspects using digital tools and their effects on the learning outcomes and student satisfaction in hybrid learning environments. The most important goals were to determine the correlation between the digital competence of teachers and student performance, determine whether students are satisfied and perceive digitally competent teaching, and develop the strategies to improve the teaching performance. With the approach of mixed method, the study has been conducted with 200 teachers and students of the Dhaka, Bangladesh region, with stratified random sampling and data analysis by the use of SPSS. Results showed that there was a strong positive relationship between the digital competence and student outcomes of teachers ($r = .175$, $p < .05$) and a stronger relationship between perceived competence and satisfaction ($r = .495$, $p < .01$), and the pedagogical and motivation importance of digital fluency. The study concluded that the digital competence of teachers was a determinant to success in hybrid education that needs to be supported by the institution and train teachers. Nevertheless, the study was focused on a single area and used self-reported information. Further research needs to be longitudinal and cross-contextual in nature and investigate the new technology such as AI and VR in order to reinforce digital teaching.

Keywords: Digital Competence, Hybrid Learning, Teachers, Students, Pedagogical.

INTRODUCTION:

In hybrid learning, teacher digital skills refer to a combination of technical, pedagogical, and socio-emotional knowledge. It is not just about familiarity with the usage of digital tools, but also incorporating them in the most effective way to improve the learning experience, both online and offline. The instructors will have to rely on the synchronous and asynchronous tools, where face-to-face teaching will reinforce digital assignments to maintain intellectual stimulation and cooperation (Demaziere 2021). This skill is multi-layered, i.e. it involves the skills of effectively using the tools, creating interactive lessons, meaningfully evaluating the learning and providing an inclusive environment that would favor all the students. During hybrid education, educators become facilitators who bridge the digital possibilities with the active learning approaches (Pierpaolo and Antonia 2022). It is not merely the application of technology, but rather transformation of pedagogy which enhances engagement, participation and understanding. Digital competence is thereby an important professional skill that defines the level of success with which students can adjust and work in a hybrid environment (Raes 2022).

Digital competence of teachers has many relationships with student learning outcomes in the form of interconnected mechanisms. Hybrid lessons are designed by competent teachers, and they incorporate online materials with the interactive classroom (Basilotta-Gomez-Pablos et al., 2022). They adopt online channels to deliver feedback in a timely manner, personalize learning, and monitor the progression of learning in a better way. With teachers being adept at technology use, it becomes possible to recognize learning gaps at the early stage, and they are able to modify their teaching approaches as well as improve the overall quality of teaching (Smestad et al., 2023). These settings have been known to have students who are more motivated, cognitively engaged and achieve higher performance. To the contrary, where educators have a poor grasp of digital tools, learners might experience incoherent communication, ambiguous work, and a lack of access to learning resources, which can slow down the process (Tondeur et al., 2023). Good integration of technology with skilled educators is crucial to the implementation of hybrid learning that fosters personal and team development to enhance retention, comprehension, and achievements (Gisbert et al., 2022).

Digital competence has a direct influence on the fairness of students receiving hybrid education. Proficient educators are certain that their instructional design consists of accessible forms, low-bandwidth options, and numerous ways of engagement to various students (Tzafilkou et al., 2023). They also consider the principles of inclusivity through captioned materials, flexible assessment, and support to students with different access to technology (Lindfors et al., 2021). This practice makes learning more inclusive to students who have varying socioeconomic status or have disabilities. Educators with the sense of the significance of accessibility are the ones who build learning experiences in which all students are able to engage fully irrespective of external factors (Tzafilkou et al., 2022). On the contrary, low levels of digital awareness can lead to unavailable content, insufficient support of various needs, and reduced student satisfaction. Thus, the definition of digital competence does not rely solely on the skills of using tools, but on the creation of equitable learning environments that would allow everyone to learn equitably and fully in a hybrid environment (Falloon 2020).

There are several indicators that can be used to measure the relationship between the teacher digital competence and student learning. Self-evaluation, classroom observation, or even digital integration rubric can be used to determine teacher competence, and performance metrics like test scores, project quality, and participation rate can be used to determine student outcomes (Lucas et al., 2021). In cases where teachers are rated highly in digital competence, students tend to record high learning outcomes, higher completion rates and an increase in the level of engagement. Learning platforms can offer a lot of data analytics that can assist researchers and institutions determine a clear connection between the practice of teachers and student achievement (Chaw and Tang 2024). The combination of qualitative and quantitative data is more comprehensive to the ways teacher competence motivates student performance in hybrid environments. These are evidence-based approaches that enable institutional design of successful professional development programs that have a direct effect on learning (Falloon 2020).

Table 1: Teacher Digital Competence

Dimension	Key Teacher Behaviors	Student Outcome Linked
Technical Fluency	Effective use of LMS, video tools, and assessment software	Smooth delivery, higher engagement
Pedagogical Integration	Designing interactive hybrid lessons	Better conceptual understanding
Formative Assessment	Use of online quizzes and feedback loops	Improved learning progress
Accessibility & Inclusion	Providing captions, adaptable formats, low-bandwidth options	Higher retention and satisfaction
Classroom Management	Maintaining online discipline and communication	Consistent attendance and motivation

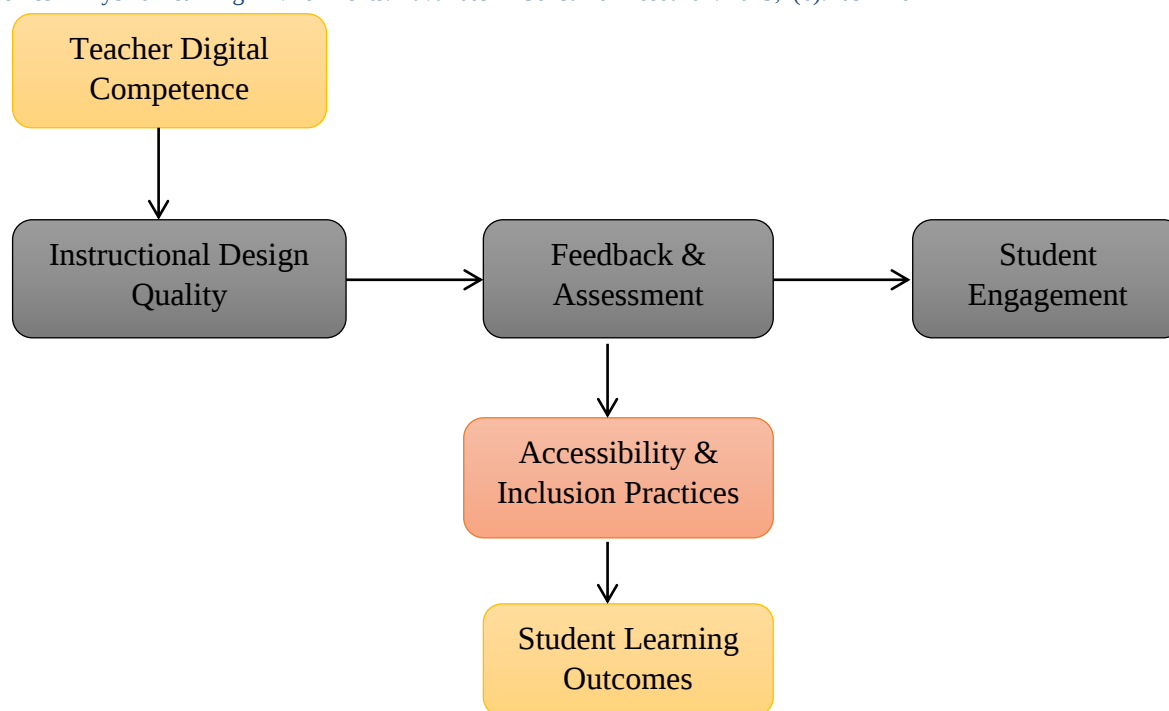


Figure 1: Teacher Digital Competence and Student Learning

Having digital competence takes a substantial daily professional education and institutional support. It is difficult to produce long-term effects when conducting one-time training on the use of educational tools. Rather, long-term interventions involving coaching, peer-to-peer collaboration and reflection have been found to be more effective (Kučera and Haffner 2025). When teachers are helped to redesign hybrid lessons, make use of feedback and analyze student performance results, this is beneficial. The institutional support is also necessary sufficient as well, schools need to offer a stable technological infrastructure, instructional designers, and time so that teachers can test new pedagogies (Kai 2022). Leadership commitment is critical in encouraging teachers to be digital in their innovation. Schools that develop a culture of supporting each other, offer resources, and reward the work of teachers are more likely to record a positive change in the results of students (Torrato et al., 2023). An encouraging eco-system facilitates the fact that any teacher can use his/her digital competencies efficiently, making hybrid learning an effective and interesting educational system (Pramila-Savukoski et al., 2023).

In order to achieve the best learning outcomes in hybrid spaces, schools should prioritize the teacher development of overall digital competence (Raes 2022). The training programs are supposed to include not only the use of technology but also how to create interactive, inclusive, and data-driven learning experiences. The teachers are to be motivated to examine their digital habits, to exchange successful initiatives, and constantly improve their methods (Mettis and Väljataga 2021). Education leaders are expected to set structures to check the level of competence and match the professional development and achievement targets of the students. Future studies should consider how to find out additional factors of digital competence that most affect learning outcomes, how digital skills change over time, and how technology adoption depends on institutions (Xiao et al., 2020). Finally, teacher digital competence is a long-term investment, which positively influences the quality of teaching, equity, and students are equipped to study and work in a technology-intensive academic and professional environment (Hapke et al., 2021).

The study focuses on digital competence of teachers and its effects on the learning outcomes of students in hybrid classes that employ both online and offline methods of learning. As the use of technology-enhanced education continues to grow particularly following the world transition to digital and blended learning, there has been a necessity to comprehend the best way in which teachers can use digital tools to create quality learning experiences. This study is necessary because the increasing disparity between technological development and educators' readiness to develop digital pedagogies is a significant gap. The level of digital literacy among many teachers differs, and it is a direct result of this that affects the engagement of students, their success, and their general learning satisfaction in hybrid environments. The relevance of the study is its possible informational value to the educational institutions and policymakers regarding the need to develop professionally continuously in the sphere of digital competence. Locating the correlation between the digital competence

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of the teachers and the student learning outcomes, the study can be a valuable source of information in terms of enhancing the teaching strategies, designing the curriculum, and supporting more efficient hybrid learning processes.

The study is divided into 8 sections. Section 1 presents the introduction part of the study. Section 2 presents the literature review or empirical studies related to the topic. Section 3 presents the identified research gaps. Section 4 presents the problem statement of the study. Section 5 presents the research methodology of the study. Section 6 presents the results based on demographic profile along with objectives and hypothesis. Section 7 presents the discussion based on findings of the study. Section 8 presents the conclusion, limitations, and future research directions of the study. Finally, references have been listed.

Empirical Studies

Theme 1: Teacher Digital Competence and Pedagogical Transformation in Hybrid Learning Environments

Digital competence in teaching has been incorporated into teaching as one of the fundamental aspects of hybrid education, transforming the approach to its organization and the preparedness of teachers. The studies in various educational settings support the idea of the multidimensional character of digital competence, including technical, pedagogical, and affective dimensions. As an example, Raes (2022) emphasizes that successful hybrid learning does not only rely on being digital but on pedagogically planned interactions between on-site and remote students. This is consistent with the ACAD model where the decisions made in the design of learning should be set, epistemic, and social in order to be engaged and cognitively comprehended. Likewise, Mushtaq and Iqbal (2024) show that such hybrid pedagogies as blended and flipped learning enhance engagement and cognitive achievement, as well as make teachers not content givers, but collaborative learning facilitators. These pedagogies also promote skills of the 21st century such as digital skills and problem-solving, making hybrid learning technological and pedagogical innovation. Taken as a whole, these results indicate that digital competence does not consist only of technical competence; it includes pedagogical creativity and interpersonal presence in order to guarantee meaningful interaction in the hybrid classroom.

Additional support to the relationship between digital competence and student engagement in the hybrid classroom comes by Munawar and Jannah (2025) and Bigné et al. (2018). The skill of teachers to incorporate digital tools in an integrated way in pedagogical product affects the affective and behavioral interaction of students in a significant manner. Bigné et al. (2018) group the necessary skills of teachers into technical, affective, and communicative ones and observe that successful virtual classrooms require an awareness of the emotional and behavioral needs of learners. On the same note, Munawar and Jannah (2025) highlight the importance of using digital readiness and adaptive instructions when it comes to the pedagogical innovation in a hybrid classroom. Digital fluency intersecting innovative pedagogy creates encompassing and flexible learning space that maintains interaction beyond the physical space. As a result, the hybrid classroom turns out to be not only a place of technological adoption but also a pedagogical reinvention, in which the digital ability of teachers can serve as a booster of learner-centered change.

There are also empirical studies indicating that there are systemic factors that affect the development of digital competence. According to Althubyani (2024), personal determinants of digital competence include perceived usefulness, self-efficacy and openness to technology as important predictors than contextual determinants. It becomes a very important source when it comes to the DigCompEdu framework (European Commission), which organizes the competencies into various dimensions that are interconnected such as communication, content creation, or safety. Lucas et al. (2021) achieved such results using a large-scale regression and machine learning analysis to verify that the level of digital tool use and the confidence of teachers were the strongest predictors of digital competence. These observations indicate that successful hybrid teaching is contingent on the digital mentality of teachers and their hands-on use of technology instead of access to resources. The key to maintaining competence and the pedagogical flexibility in hybrid environments, therefore, should be continuous and reflective practice as the primary focus of professional development programs.

Theme 2: Development, Assessment, and Challenges of Teacher Digital Competence

The evaluation and training of the digital competence of teachers have been the topic of considerable academic interest, particularly in the context of the way in which these competencies are converted into pedagogical excellence. The authors of the study Lázaro Cantabrana et al. (2019) created the COMDID-C tool to assess systematically the teacher digital competence, focusing on the multidimensional nature of the concept and the significance of standardized benchmarks during its measurement. Equally, Napal Fraile et al. (2018) concluded that pre-service teachers portray low self-perceived

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competence, especially in content development and problem-solving- which are critical in transforming learning processes. It shows a disjuncture between operational and pedagogical literacy. To overcome this gap, Buluma and Walimbwa (2021) established through an action research model that blended pedagogy improves such digital competences as information navigation and communication but that deliberate instructional scaffolding is necessary to augment content creation. Therefore, it is important to implement systematic competence measurement and specific pedagogical interventions to shift digital familiarity to transformative digital fluency in educators.

Digital competence is both an agent and an indicator of systemic response in the wider context of educational change. According to Zabolotska et al. (2021), the digital and professional competencies transformation of educational settings requires the collective model that is based on the concept of values-purpose-actions. With the examples of Ukrainian institutions, they find moderately high levels of digital literacy among faculty, although there are no efforts at full system integration. This correlates with Antonietti et al. (2022) because they show how teachers' perceptions of digital competence are a major determinant of technology acceptance with dimensions of ease of use and perceived usefulness, which confirms the Technology Acceptance Model (TAM) in the vocational education setting. These studies collectively emphasize the idea that the promotion of digital competence cannot be confined to training but it must be through the development of digital culture, institutional reinforcement, and a digitalization philosophy that is part of educational reform.

Recent sources also emphasize situational issues and possibilities that define teacher digital competence, especially after the pandemic. Aldhaen (2024) found that digital competence significantly enhances student engagement across cognitive, affective, and behavioral dimensions, with the pandemic acting as a positive moderator. This implies that digital adaptation due to crisis can hasten the development of competence and pedagogical innovation. Nonetheless, Asagar (2025) and Althubyani (2024) disclose that there are still certain barriers, namely the infrastructural gaps, bureaucratic load, and professional underdevelopment in the developing countries such as India. Although teachers are quite digitally literate, they tend to have low levels of critical thinking and collaboration in design, which is fundamental to maintaining hybrid learning systems. As a result, the development of continuous capacity-building, institutional rewards, and peer-oriented professional learning communities have become the required measures to unite teacher digital competence. Altogether, the studies reviewed prove that digital competence is a developing concept the sustainability of which relies on dynamic evaluation, contextual adaption, and systemic educational correspondence.

RESEARCH GAP

Although the digital competence and hybrid learning is rapidly expanding, the connection between the digital skills of teachers and their long-term pedagogical change and student interaction in various learning environments has a lot to be desired. The majority of the available literature is devoted to measuring the degree of digital competence or determining the factors that affect it, but the occurrence of the increasing of these competences during the lifetime of the professional activities and institutional encouragement is scarcely explored. Also, studies are inclined to focus more on the technological expertise instead of studying the more in-depth pedagogical blending and reflective pedagogical principles needed to attain successful hybrid classrooms. The flexibility of digital infrastructure, training opportunities and implementation of policies across regions makes it even more challenging to design a single framework that would be used to assess and improve digital competence. Additionally, the long-term effects of teacher digital competence on the learning outcomes, inclusivity, and innovation in the context of hybrid models have not been thoroughly studied, which stresses the necessity of longitudinal and cross-contextual research to relate digital preparedness to the actual educational change.

Statement of the problem

The sudden inclusion of digital transformation in the education sector which has been accelerated by the world transition towards hybrid and online learning has made it clear that teacher digital competence is one of the most important factors when it comes to delivering effective learning and teaching results. Nonetheless, not all educators can easily incorporate the use of digital tools in the pedagogical process, assure the engagement of the students and adjust to the changing technological requirements. Even though there are many programs and frameworks that may help to improve the level of digital literacy, the gap between the technical skills that teachers demonstrate and their practical application to the hybrid learning setting is still present. This variation tends to lead to unreliable teaching standards, low student engagement, and fewer teaching changes. The issue, in turn, is how the digital competence of teachers influences the teaching methods, engagement process, and flexibility in hybrid classrooms and which systemic and contextual obstacles prevent the effective implementation of digital technologies in the educational process.

RESEARCH METHODOLOGY

The study is based on the mixed methodology, which is the combination of qualitative and quantitative methodology to achieve a comprehensive overview of the issues, which shape the hybrid learning environment. The approach is used to balance the analysis of digital competence of teachers, perceptions of students, outcomes of learning, and satisfaction.

➤ Research Design and Approach

The study is conducted in a descriptive and exploratory design where it is possible to identify and expound the relationship between variables. Mixed-method method incorporates both numerical data and insights that allow interpreting the digital competence of teachers and the effects it has on learning of students in a more profound and comprehensive manner. The design appropriately enables empirical analysis and allows for the discovery of new trends in hybrid education.

➤ Sampling, Data Collection, and Analysis

The study was carried out in the Dhaka, Bangladesh area and involved the teachers offering hybrid courses and the students who were taking courses. The sampling technique was stratified random sampling in order to have a fair representation and a sample size of 200. The survey would collect data based on a structured questionnaire with the help of secondary sources. Analytical packages like MS Excel and SPSS (Version 27) were employed, where mean, Standard deviation, and Correlation were applied to understand a relationship between digital competence of teachers, perceptions of students, learning outcomes, and satisfaction degree of students in hybrid learning.

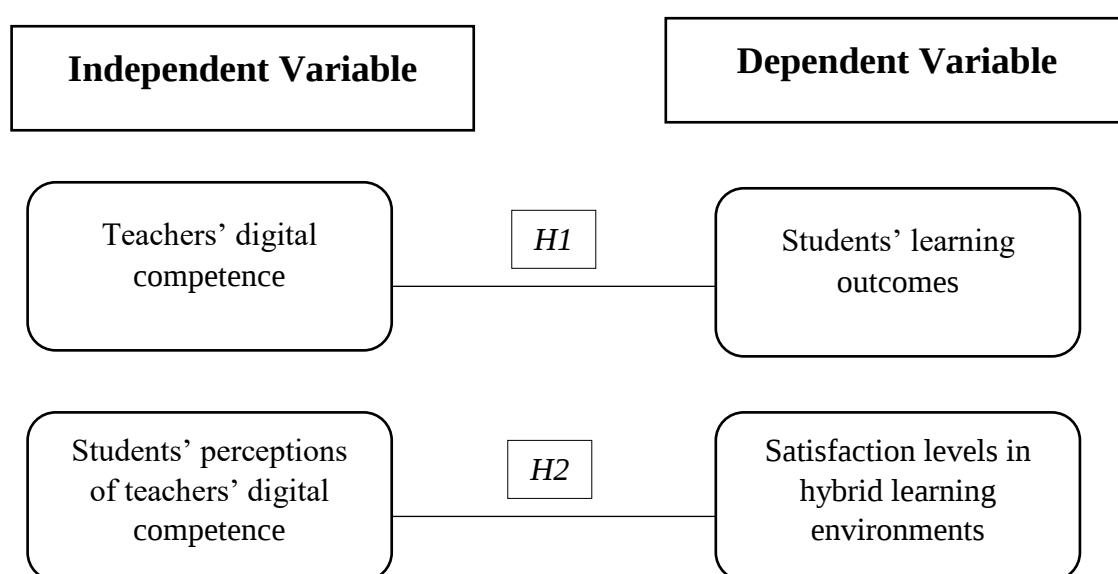


Figure 1: Conceptual Framework

RESULTS AND INTERPRETATIONS

Table 2: Demographic Characteristics

S.NO.	Demographic Characteristics		N	%
1	Gender	Male	104	52%
		Female	96	48%
2	Age Group	Below 25 years	37	18.50%
		25–34 years	34	17%
		35–44 years	46	23%
		45–54 years	44	22%
		55 years and above	39	19.50%
3	Educational Qualification	Bachelor's Degree	66	33%
		Master's Degree	50	25%
		Ph.D.	38	19%
		Doctorate	46	23%
4	Teaching Experience	Less than 1 Year	31	15.50%
		1-3 Years	48	24%
		4-7 Years	38	19%
		8-10 Years	37	18.50%
		More than 10 Years	46	23%
5	Type of Institution	Government	79	39.50%

6	Frequency of Hybrid Teaching	Private	63	31.50%
		Semi-Government	58	29%
		Occasionally	50	25%
		Sometimes	46	23%
		Frequently	57	28.50%
		Almost Always	47	23.50%

The demographic status of the respondents in table 2 indicates that it is well represented in significant variables giving a complete picture of the population being studied. Male teachers formed a slightly higher percentage (52) than female (48) teachers, which implies almost gender balance in hybrid teaching. The age distribution demonstrates that a big share of the teachers belongs to the 35 44 years (23) and 45 54 years (22) brackets indicating that the middle-aged professionals constitute the majority of the participants. Majority of the respondents have a Bachelor (33) or Master (25) degree and 42 percent have a higher degree e.g. Ph.D. or Doctorate which is a well-qualified teaching workforce. In terms of experience, the sample is mature, almost half of the respondents having over four years of experience in teaching. At the institutional level, 39.5% of the industry is government-instituted, 31.5% is at the private, and 29% at the semi-government, which means that the industry is well-represented. Lastly, the hybrid teaching frequency demonstrates that hybrid teaching is prevalent among most teachers, with 28.5 percent practicing it regularly and 23.5 percent practicing it nearly all the time, indicating that hybrid teaching is not an infrequent occurrence but a habitual practice.

➤ Result Based on Objectives

Objective 1: To examine the relationship between teachers' digital competence and students' learning outcomes in hybrid learning settings.

H1: There is a significant positive relationship between teachers' digital competence and students' learning outcomes in hybrid learning settings.

Table 3: Descriptive Statistics Table

Descriptive Statistics			
	Mean	Std. Deviation	N
Teachers' digital competence	10.8700	2.58000	200
Students' learning outcomes	9.3550	2.98219	200

According to the descriptive statistics table 3, the mean value of digital competence among the teachers is 10.87 and the standard deviation is 2.58 which implies that, on average, all teachers in the study have moderate to high level of digital competence with some variations among themselves. This is indications that even though most teachers show sufficient competence in the use of digital tools and the incorporation of technology into the teaching process, some of them still have areas of weakness that could lead to an increase in their skill set. Conversely, the learning outcomes of the students have a mean score of 9.36 and a standard deviation of 2.98 which suggests a slightly lower but positively correlated level of performance with higher variability than the competence of the teachers. This broader spread of student results implies that learning in the hybrid setting can heavily rely on the quality with which the teacher implements his or her digital competence.

Table 4: Correlations Table

Correlations			
		Teachers' digital competence	Students' learning outcomes
Teachers' digital competence	Pearson Correlation	1	.175
	Sig. (2-tailed)		.013
	N	200	200
Students' learning outcomes	Pearson Correlation	.175	1
	Sig. (2-tailed)	.013	
	N	200	200
. Correlation is significant at the 0.05 level (2-tailed).			

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The correlation analysis table 4 shows that teachers' digital competence and the learning outcomes of students have a positive and statistically significant correlation ($r = .175$, $p = .013$) meaning that, the higher the level of teacher's digital competence the better the learning outcomes of students are likely to have. Even though the level of the correlation is intermediate, it proves an existing significant association between the two variables, as it is important to note that digitally competent teachers help to improve the performance of students in hybrid learning settings. This significant level ($p < 0.05$) indicates that this correlation is not accidental, which justifies the hypothesis that the level of knowledge of teachers to use digital tools and pedagogical integration has a positive effect on student achievement. The outcome of this discovery is that, in cases where instructors successfully use digital resources, interactive learning, and online tests, they increase student engagement, understanding, and the efficiency of their learning. The moderate correlation, however, also means that although digital competence is a significant factor, other factors, including student motivation, institutional support, and technology access, might also determine the learning outcomes in a hybrid education environment.

Objective 2: To evaluate students' perceptions and satisfaction levels regarding digitally competent teaching practices in hybrid learning environments.

H2: There is a significant positive relationship between students' perceptions of teachers' digital competence and their satisfaction levels in hybrid learning environments.

Table 5: Descriptive Statistics Table

Descriptive Statistics			
	Mean	Std. Deviation	N
Students' perceptions of teachers' digital competence	10.1900	2.50505	200
Satisfaction levels in hybrid learning environments	9.4900	2.41434	200

The descriptive statistics table 5 indicate that the mean of the perception of teachers concerning the use of digital tools and technologies in a hybrid learning setting is 10.19 with a standard deviation of 2.51 as students reported that they moderately believe that their teachers are digital competent in using digital tools and technologies. The standard deviation is not too large, which indicates that student opinions are rather similar in the sample. In the meantime, the average rating of the levels of satisfaction in hybrid learning settings is 9.49 with a standard deviation of 2.41 indicating that students are generally pleased with the quality and efficiency of learning hybrid setting, but there is a certain amount of variation in their experiences. A slightly decreased mean satisfaction than that with perceived digital competence indicates that even though students acknowledge that teachers are proficient in the technical aspects, there is the possibility that there are other variables, including course design, work load or quality of interaction that could be influencing overall satisfaction. On the whole, these findings indicate an optimistic attitude towards teacher digital skills and positive experience in hybrid learning which means that teacher digital competence is likely to make a significant impact on the engagement and satisfaction of students in blended educational settings.

Table 6: Correlations Table

Correlations			
		Students' perceptions of teachers' digital competence	Satisfaction levels in hybrid learning environments
Students' perceptions of teachers' digital competence	Pearson Correlation	1	.495
	Sig. (2-tailed)		.000
	N	200	200
Satisfaction levels in hybrid learning environments	Pearson Correlation	.495	1
	Sig. (2-tailed)	.000	
	N	200	200

. Correlation is significant at the 0.01 level (2-tailed).

The correlation analysis table 6 indicates that there is a strong positive and statistically significant relationship between the student's perception of the digital competence of the teachers and their levels of satisfaction in the hybrid learning environments ($r = .495$, $p = .000$). This means that the higher the students believe that their teachers are more digitally proficient, the higher the general satisfaction with the hybrid learning experience. The significant correlation indicates

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that the efficient application of digital tools, interactive platforms, and innovative methods of instruction by teachers is a critical factor that will help improve the engagement of students, their motivation, and their satisfaction. The p-value (< 0.01) proves the significance of this relationship at the 1-percent level, i.e. the findings are very reliable and could not be a matter of accident. These results do suggest that students do not merely appreciate the technical skill of the teacher, but that they have a positive linkage between that and enhanced communication, accessibility, and learning effectiveness in hybrid classroom environments.

Objectives 3: To propose strategies and best practices for improving teachers' digital competence to enhance learning outcomes and overall educational quality in hybrid models.

H3: Implementation of targeted digital training and pedagogical support programs significantly improves teachers' digital competence and positively influences students' learning outcomes and educational quality in hybrid models.

Specific digital training of teachers and pedagogical assistance have become critically important in terms of the development of digital competence in the hybrid education model, and they are directly related to better student learning and academic performance (Abdigapbarova et al., 2025). The study highlights that conventional teacher preparation does not usually equip teachers with the needs of more digital and blended classrooms, and that new facets are necessary to balance both technological and pedagogical aspects based on the real-life needs and subject-related requirements (QIAO et al., 2025). Technological frameworks that are designed in alignment to train hybrid teachers offer flexibility, accessibility, and individual learning experiences to teachers and students to suit the unique needs of various geographical and cultural settings (Joya et al., 2025). These digitally enhanced settings are built on a combination of online courses, live classes, and interactive technologies to develop the necessary digital competencies, nurture flexibility, and promote long-term interaction (Chiu et al., 2024). It has been demonstrated that hybrid training programs of teachers lead to a higher retention rate and increased motivation of educators and this translates into increased significant learning experiences among the students. Among the outcomes of the program, there is the development of digital teaching materials, effective and safe use of ICT, better instructional design, and empowered communication skills, which play a significant role in successful hybrid teaching (Davies 2025).

Best practices and strategies of enhancing the digital competence of teachers entail more than frequent access to technology-based training; they involve the organized pedagogical guidance to take into consideration the instructional design, classroom engagement, and assessment in blended classes (Johanson et al., 2022). Studies has revealed that a strong digital competence can help teachers to maximize digital teaching material,

increase student interaction, and respond to the changing digital environment in a dynamic manner. The effective presentation of these strategies is based on the clarity of learning goals, the need to incorporate appropriate learning management systems and communication tools, and a robust focus on the continued development of the subject and context (Abdigapbarova et al., 2025). Notably, the effect is multidimensional in that direct impacts are seen in the delivery of contents and academic performance among the students, and indirect effects are seen through the enhancement of learning engagement and classroom interactivity practices, particularly in STEM and collaborative subjects. Accordingly, systematic, specialized training and assistance are not only a necessity to increase the level of digital literacy of teachers but also to stimulate a wider range of educational innovation and quality advancement in the field of hybrid learning models (Pan et al., 2024).

DISCUSSION BASED ON FINDINGS

The study's results indicate that the digital competence of teachers has a central role of improving the learning outcome and overall satisfaction of students in hybrid learning environments. Correlation analysis results show that there is a positive and significant relationship between the digital competence of teachers and the learning performance of the students ($r = .175$, $p < .05$), which proves that digitally proficient teachers are in a better position to create interesting lessons, utilize technology to gauge learning outcomes, and offer timely feedback. These outcomes are in line with the previous studies by Raes (2022) and Smestad et al. (2023) that suggest that the success of hybrid education should be determined by the capacity of teachers to strike a balance between technological proficiency and pedagogical innovation. Students are more motivated, exhibit a better understanding and better performance when teachers successfully combine learning management systems, digital content as well as interaction tools. Besides, the results also highlight that the competence of teachers extends past technical capability to encompass the ability to promote inclusiveness, virtual classroom management and the training of diverse learners needs. According to Tzafilkou et al. (2023) and Lindfors et al. (2021), digital practices that are inclusive, like the provision of flexible materials and available formats, make students more engaged and equitable in a hybrid environment. Thus, the study confirms that teacher digital competence is multidimensional and it has a

Moreover, the study confirms that the attitudes of students towards the digital skills of instructors and the satisfaction with the hybrid mode of education are significantly related to each other ($r = .495$, $p < .01$); in other words, students are significant about the fact that the teachers can use technology in an effective and creative way. This is in line with the findings of Munawar and Jannah (2025) and Bigné et al. (2018), who found out that a higher degree of proficiency in digital communication and interaction in the instructors contributed to more efficient affective relations, which boost student satisfaction and retention. The other area of the findings is that the aspect of the professional development and the support of the institution is very heavy in respect of the capacity of the teachers to sustain digital competence. As Abdigapbarova et al. (2025) and Qiao et al. (2025) suggest, the digital skills of teachers supported by the targeted digital training and pedagogical assistance programs positively influence the performance of students. In enabling educators to organize their capacity-building and reflective learning opportunities, they not only transform more effectively with the technological transformation, but also create new pedagogical solutions that can adapt to the hybrid modalities. It means that schools ought to pay attention to the continuous professional learning and develop digital infrastructure and the policy framework that facilitates the teacher innovation and cooperation. The steps will aid in making sure that digital competence is a living, breathing attribute capable of enhancing the quality of education, inclusivity, and sustainability in the era of hybrid learning.

CONCLUSION

The study concludes that the digital competence of teachers can positively and significantly influence the learning results and student satisfaction of students in the hybrid learning settings. In the findings, it is shown that there is a moderate, although significant relationship between the digital competence of teachers and the academic performance of the students ($r = .175$, $p < .05$) indicating that teachers who are well-skilled in digital tools and integration of technology in pedagogy can help the students in terms of engaging with the content, motivating and understanding the subject matter better. In the same vein, a positive relationship that indicates significant correlation between the perception of digital literacy among students and their satisfaction with the teachers ($r = .495$, $p < .01$) indicates that students are more satisfied and participating when they believe that their teachers are digitally competent and responsive. These results indicate that, the success of hybrid learning is not only determined by the availability of technology,

but also on the way teachers use it to create inclusive, interactive, and meaningful learning environments. Those teachers who are able to match digital materials with pedagogical approach will make the classroom more coherent and interesting where students will be able to succeed in academic and emotional aspects. Therefore, digital competence turns out to be a crucial part of the successful teaching in hybrid environments, and it has a direct impact on the process and the outcomes of learning.

The study indicates that professional training and institutional support are important factors in enhancing the digital competence of teachers and achieving long-term quality improvement in the quality of teaching. The possibility of participating in digital skill development, mentoring, and reflective practice regularly allows teachers to refine and enhance the quality of technology integration into teaching. This results in increased learning results, student satisfaction, and better education quality. The study highlights that digital competence needs to be perceived as a moving ability undergoing changes over time and development with practice, cooperation and institutional support. Educational institutions can empower teachers to become comfortable providers of hybrid learning by engaging in intensive professional development, access to technological infrastructure, and a culture of innovation. Finally, the study confirms that digitally competent educators are the primary agents of pedagogical change, being the ones who close the divide between traditional education and technology-based one, as well as to provide engaging, equitable, and future-oriented learning experiences to students.

LIMITATIONS OF THE STUDY

The study also has a limitation of being regional in the scope to the Dhaka, Bangladesh and having a sample of 200 respondents which can compromise the generalization of the findings. Use of self-reported information and quantitative relationships may not be able to capture the qualitative nature of digital practices of teachers. Also, the cross-sectional design does not allow determining the long-term variations of digital competence. There was no deep analysis of factors like institutional infrastructure, subject variations and the digital readiness of the students. Longitudinal and mixed method designs with larger and diverse samples should be used in future studies as a means to develop a more comprehensive picture of digital competence in hybrid education.

➤ Future Research Directions

The longitudinal evolution of digital competence in teachers and its changing influence on student academic achievement in various learning settings should also be examined in future studies. Research projects would be in a position to use mixed method designs in order to

record quantitative and qualitative information; the focus would be on the impact of continuous professional development, institutional support, and digital infrastructure on teaching performance within the context of a hybrid environment. Generalizability could be improved by increasing the number of educational levels, academic areas, and cultural settings to which the study could be applied. Also, future research ought to focus on the potential to enhance the digital competence of teachers with the help of emerging technologies, including AI, virtual reality, and adaptive learning platforms to turn hybrid teaching and learning processes into a stronger force.

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