

Digital Readiness for Online Teaching and Assessment: Insights from Pakistani University Teachers

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Abstract

The present paper took into consideration the online teaching and assessment digital preparedness of university teachers in institutions of higher learning. Data were collected through an online questionnaire (a structured questionnaire of 40 items) based on a quantitative research design to obtain information about 500 university teachers. The descriptive statistics, the reliability analysis, the exploratory and confirmatory factor analysis, the independent samples t-test, the one-way ANOVA, the correlation analysis, the multiple regression, the moderation, and the structural equation modeling were employed to analyze the data. It was established that the digital readiness of teachers had a moderate level with the digital competence being the highest in the sense of mean scores with the online assessment being lower. Much difference was found among different demographic variables with particular focus on past training, nature of university and teaching experience. Regression and structural analyses have produced the fact that digital competence, technological confidence, training exposure and institutional support were the key predictors of digital readiness. The paper unveils the importance of lifelong learning and institutionalization of professional development in polishing the capacity of the teachers to teach and assess students online in universities.

Keywords: digital readiness, online teaching, higher education, digital competence, online assessment, university teachers

1. Introduction

The high rate of digitalization has revolutionized the teaching and learning activities in the world, especially in the tertiary level (Safdar et al., 2026; Imran et al., 2025). Colleges are also turning to online teaching and testing through digital platforms, learning management systems and communication tools that are becoming more involved in universities (Safdar et al., 2020; Emetavigho & Ekundayo, 2024; Obidile, 2023). The worldwide transition to online education was particularly noticeable during the COVID-19 pandemic when academic institutions had to resort to emergency online teaching to make sure that academic processes do not interrupt. The given shift demonstrated the significance of the digital preparedness of teachers that consists of technological expertise, pedagogical literacy, and the competency to properly utilize digital tools in the teaching and evaluating process (Abid et al., 2021; Yulin and Danso, 2025).

The transition to online learning, in the case of Pakistan, highlighted the problems in the higher education system. A lot of universities were not very familiar with digital teaching prior to the pandemic and faculty was forced to quickly learn to work in virtual classrooms (Safdar et al. 2020a). Researches indicate that Pakistani university educators were regularly challenged by the issues of technological competency, online internet access, digital infrastructure, and the proper use of online assessment techniques. Nevertheless, there are also certain opportunities in online teaching, as faculty members participated in the process, which enabled them to acquire new skills and embrace new practices in online teaching (Abid et al., 2021; Ajmal et al., 2024).

Online readiness among the teachers can be regarded as a key to effective online learning (Aziz and Anjum, 2022). It involves the capability of teachers to utilize digital media, create online learning tasks, oversee online classrooms, and

carry out assessments online. In the developing world such as Pakistan, the willingness of teachers in universities to embrace the digital technologies is not even because of the disparity of institutional support, training, and technological resources. Hence, the digital preparedness of teachers is an important concept to consider grasping how the concept of online teaching and assessment practice works in institutions of higher learning (Kang and Haider, 2024).

Higher Education Commission (HEC) of Pakistan has brought several activities to encourage the use of digital learning and technological integration in the universities. Some programs like the Pakistan Education and Research Network (PERN) and other digital infrastructure programs are designed to facilitate the online learning process and provide access to online academic resources (Safdar & Khan, 2020; Ekiugno, 2024). Nevertheless, the success of these programs is mainly predetermined by the level of digital literacy and willingness of university educators who can apply these technologies in classrooms. The willingness and experiences of teachers is thus important in enhancing online teaching and assessment in Pakistani universities (Kang and Haider, 2024; PERN, 2024).

The introduction of digital technologies in teaching has become the core of modern pedagogical practice. Internationally, to improve the learning experiences and broaden the reach to education, digital platforms, virtual classes, and online assessment tools are becoming progressively popular in universities (Kang and Haider, 2024). Digital readiness is the readiness of teachers to be able to use these technologies efficiently in the educational process and learners. It deals with technological adequacy, pedagogical adjustment, and capability to handle online educational settings (Yulin and Danso, 2025).

In Pakistan, the notion of digital preparedness was of high concern in the COVID-19 pandemic when the higher education institutions replaced face-to-face learning with online instruction. Online classes and examinations were introduced using platforms like Zoom, Google Classroom and Learning Management Systems (LMS), which were adopted by many institutions. Nonetheless, several studies indicated that a majority of teachers did not have sufficient ICT skills, training, and institutional support to conduct effective online teaching (Sahito et al., 2022). Due to this, educators faced challenges related to organizing virtual classrooms, creating online tests, and keeping the learners engaged in online learning processes (Abid et al., 2021).

Also, studies in Pakistani universities show that there has been a wide range of digital literacy levels among the teachers based on institutional resources, geographic location, and experience with the technology. Above all, research has been conducted in rural universities to demonstrate that a significant number of instructors are still weak in digital skills and need to enroll in a professional development program in order to enhance their technological competency in online education (Khan et al., 2023). Such gaps indicate the necessity to evaluate the digital preparedness of university instructors to detect the gaps and build a plan of action to improve online education in Pakistan.

Also, the online teaching and assessment practices are related to the presence or absence of institutional infrastructure and teacher preparedness. Studies conducted in Pakistan have indicated that despite the general positive attitude of the faculty members towards the use of digital platforms, they must deal with the problems of poor internet connectivity, inadequate technological training, and insufficient technological support (Ajmal et al., 2024). These issues impact the efficiency of online education and demonstrate the need to measure the digital preparedness of teachers in the Pakistani higher learning environment (Aziz and Anjum, 2022).

Even though several study efforts have been conducted to determine the online teaching experiences in the context of the COVID-19 pandemic, a small number of studies have directly examined the Digital preparedness of university educators in Pakistan to both online teaching and assessment exercises (Abid et al., 2021). Majority of the available research focuses on difficulties encountered by the teachers when engaging in an emergency remote teaching, instead of conducting a systematic investigation of their preparedness and abilities in utilizing digital programs to conduct instructions and assessments.

Moreover, past studies tend to pay attention to the experience or the overall attitude of students to online learning and not to the readiness of teachers to successfully implement the digital tools within the framework of higher education. Little research has been done on the ways university instructors interpret and make use of different forms of online applications to facilitate online learning and assess the performance of students. This disconnect restricts the creation of effective policies and professional development programs that would enhance the digital teaching skills in the faculty of Pakistan universities (Sahito et al., 2022).

Also, a lot of research is restricted to a specific institution or set of a small number of participants, which hinders the application of their results in practice. The research is required to investigate the digital preparedness of university instructors of various universities and disciplines in Pakistan. This type of research can be used to gain clear information about how prepared the teachers are at present and the critical aspects within which training and institutional support is necessary (Ajmal et al., 2024). Education online has posed new challenges to the university teachers, especially in developing countries where digital facilities and technological training can be low. In Pakistan, numerous universities were not ready to transition to online teaching overnight during the COVID-19 pandemic, and it

displayed the lack of digital skills of teachers and institutional preparedness to digital education (Abid et al., 2021).

Though there is a growing trend in higher education of using digital platforms, most university educators continue to be affected by the lack of understanding of how to successfully incorporate digital uses in their teaching and assessment practices. Low ICT aptitude, unavailability of training, absence of internet connectivity, and institutional support are among the issues that do not allow the successful implementation of online education in Pakistani universities (Sahito et al., 2022). Thus, the question concerning the degree of digital preparedness among university educators in Pakistan needs to be investigated to determine their ability to utilize digital tools to teach and test online. The identification of these factors will make policymakers and educational institutions come up with strategies to enhance the quality of online learning in the institutions of higher learning by improving digital competencies.

This paper seeks to discuss the online preparedness of Pakistani university educators in online teaching and online evaluation.

The objectives of the study are:

- To discuss the extent of digital preparedness between Pakistani university teachers to teach online.
- To investigate the knowledge and application of digital applications in conducting online classes among university teachers.
- To explore how teachers are prepared to make digital platforms-based online assessments.
- To determine the barriers of using digital tools in education and assessment among the teachers in the university.
- To give suggestions to enhance digital preparedness among Pakistani teachers in universities.

This study adds to the existing research on digital transformation in Pakistani higher education institutions as it aims to explore the digital readiness of university teachers for the shift to online teaching and assessment (see figure 1). The results will assist universities, Higher Educational Administration and the Higher Education Commission (HEC) in developing focused professional development programs to enhance the digital literacy of teachers and the quality of online education (Kang & Haider, 2024; Ajmal et al., 2024; Yulin & Danso, 2025). Besides, the study offers empirical evidence for further investigating digital learning, blended learning, as well as technology integration in higher education.

Conceptual Framework

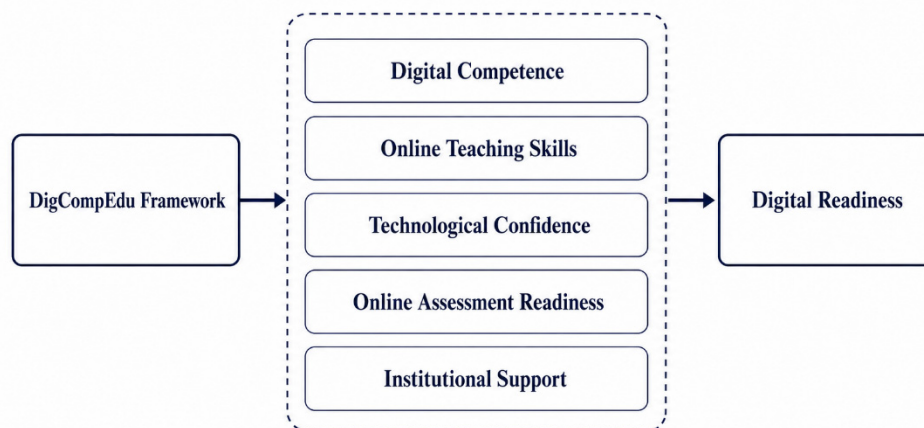


Figure 1. Conceptual Framework

Theoretical Framework

This study builds on the European Framework for the Digital Competence of Educators (DigCompEdu), which offers a detailed description of digital competencies of teachers in the areas of teaching, assessment, learner engagement and professional development (Redecker, 2017; Mishra & Koehler, 2006). The five dimensions of this study Digital competence, Online teaching skills; Technological confidence, online assessment readiness and Institutional support represent the fundamental themes of DigCompEdu and have been contextualised for the Pakistani Higher Education system. Furthermore, the Technological Pedagogical Content Knowledge (TPACK) model is used for the integration of technology, pedagogy and content knowledge, with the understanding that digital teaching is not solely about technological skills, but about the interaction of these knowledge areas as well.

2. Literature Review

2.1 Digital Transformation in Higher Education

Yulin and Danso (2025) argued that adoption of digital technologies in institutions of higher learning has had a profound impact on the teaching and learning activities across the globe. The quick growth of information and communication technologies (ICT) has facilitated the adoption of online learning platforms, digital collaboration tools and virtual learning environments by universities. Such technologies enable the teacher to present lectures, discuss and evaluate learners remotely. Over the last few years, digital readiness has become a crucial determinant of successful implementation of online education because teachers should also be technologically competent and able to use pedagogical skills to successfully implement digital tools into their teaching practice.

As per Maurya and Yadav (2024) The COVID-19 pandemic increased the digitalization of education systems in the world. All universities all over the world modified the face-to-face educational setting into online learning to continue the academic process during lockdowns. This abrupt shift underscored the need to be digital prepared by teachers since several educators needed to cross over to digital learning platforms fast and without adequate training and preparation. In turn, the pandemic revealed the lack of technological skills and digital competence among the university teachers, especially in the developing nations where the levels of digital infrastructure and training opportunities are low.

Sahito et al. (2022) stated that online teaching, as with developing countries like Pakistan, was a relatively recent acquisition before the COVID-19 pandemic. Traditionally, higher education institutions were based on face-to-face learning methods, and digital technologies were utilized only as an addition to learning platforms and not as the main ones. Consequently, at the time when universities have changed to online learning during the pandemic, many educators had problems adjusting to digital forms of teaching. These difficulties revealed that more teachers and institutions should be digitally prepared to engage in effective online learning.

2.2 Online Teaching in Pakistani Universities

As per Sahito et al. (2022) online teaching in Pakistani universities has taken place within a short period of time during the COVID-19 pandemic when the institutions of higher education were compelled to close physical classes and transition to online learning platforms. Video conferencing applications like Zoom, Google meet and Microsoft Teams were adopted by many universities to hold virtual classes. Even though these technologies enabled the continuation of teaching, several instructors had to grapple with the hurdle of technology and lack of experience in online teaching methodology (Abid et al., 2021). A study of online instruction in Pakistan reveals that most teachers in the universities encountered several problems in the process of adapting to the digital learning settings. These issues were poor internet connection, lack of technological infrastructure, inadequate training in online teaching aids, and the inability to keep the students engaged in online classrooms. Educators also claimed that they experienced difficulties in creating interactive online lessons and running the virtual classes (Sahito et al., 2022).

2.3 Digital Readiness of University Teachers

Yulin and Danso (2025) Digital readiness is the ability of educators to make good use of digital technologies in teaching, learning and evaluation. It consists of a few elements that include digital literacy, technological skills, the pedagogical competence and management of the online learning environment. Having a high level of digital preparedness, teachers can create more effective online lessons and be more engaged with the students, teach them, and make online evaluation fairer and more effective.

Research conducted by Khan et al. (2023) in Pakistan on digital preparedness among teachers in universities has revealed that a good number of teachers portray moderate digital competence. As an example, a study carried out in the rural universities identified that most of the teachers used laptops and everyday applications like Zoom to deliver online classes, although they had little knowledge of the advanced digital tools and online teaching methods. This means that even though teachers possess a minimum level of technological skills, they still need additional training to improve their digital teaching skills.

2.4 Use of Digital Applications for Online Teaching

Electronic applications are important in supporting online instruction and education. The applications allow teachers to provide lectures, present teaching resources, have discussions and assess the progress of students using virtual platforms. Digital tools such as Zoom, Google Classroom, Moodle, and Microsoft Teams are the most popular in Pakistani universities and can be used by teachers to conduct virtual classrooms and interact with their students remotely (Ajmal et al., 2024). Studies have shown that the successful implementation of digital applications should see the teacher acquire technical and pedagogical skills. The teachers should be able not only to use digital platforms but also to create interesting online learning activities which will encourage students to interact and cooperate. Teachers can be unable to fully exploit the opportunities of digital tools in online learning without proper training and experience (Maurya and Yadav, 2024).

2.5 Online Assessment Practices in Higher Education

Online assessment is now a part and parcel of digital education as teachers can now test the learning outcomes of students using the digital platforms. The virtual learning environment usually employs different online assessment tools like quizzes, assignments, discussion forums, automated grading systems among others. These tools offer the flexibility of teachers and students and allow monitoring academic progress without interruption (Muzaffar et al., 2020). Despite all these benefits, online assessment has some challenges facing the university teachers especially in developing nations such as Pakistan. Academic integrity is one of the primary issues in online examinations. Educators struggle to avoid cheating and plagiarism on online tests because they do not have effective monitoring tools and safe examination systems (Muzaffar et al., 2020). Difficulties in developing fair and reliable online methods of assessment have also been reported in studying in Pakistani universities. Many teachers were not experienced in the development of digital assessments and did not know online evaluation tools. Consequently, the shift towards online assessment during the pandemic posed an extra burden on the faculty members and revealed the necessity to develop training programs that will improve the skills of the teachers in the field of digital assessment (Ajmal et al., 2024).

2.6 Challenges Faced by University Teachers in Online Teaching

There are various research studies that have identified the barriers that teachers in universities encounter when they join the online teaching process in Pakistan. Limited technological infrastructure, such as untrustworthy internet connection and lack of access to digital devices is also one of the most reported problems. All these obstacles have a major impact on the quality and effectiveness of an online teaching/learning experience (Sahito et al., 2022).

The other significant difficulty is associated with the deficit of professional training in the field of digital teaching. Prior to the pandemic, many of the teachers in the Pakistani universities did not have much previous experience with online teaching platforms. This led them to find it hard to adjust their pedagogical models to online learning and sometimes they used conventional methods of lectures that did not yield results in online platforms (Abid et al., 2021).

2.7 Institutional Support and Policy Initiatives

Institutional support is very important in the development of digital preparedness of teachers, as well as the encouragement of effective online education implementation. Universities that have sufficient technological support, training, and technological infrastructure can better enable the faculty members to adapt to digital teaching conditions. Innovative teaching practices can also be developed through institutional policies that promote the usage of digital technologies in education (Ajmal et al., 2024). In Pakistan, Higher Education Commission (HEC) has presented several initiatives aiming at encouraging digital learning in universities. These programs involve the creation of learning management systems, online libraries as well as training of faculty members. This is done to advance the digital skills of educators and promote the quality of online learning in universities (Ajmal et al., 2024).

3. Method

3.1 Research Design

The research was conducted using the quantitative research design to investigate the Pakistani teachers at various universities regarding the digital readiness of the Pakistani teachers to teach and learn online. The cross-sectional survey was adopted because it was important in gathering standardized data on a large population of respondents at one point in time and allowed statistical estimation of the currently existing levels, trends and relationships among the research variables. The design suited the measurement of the digital competencies, access to technological resources, online pedagogical practices, assessments preparedness, and perceived challenges on the systematic and empirically sound level among the teachers.

3.2 Research Setting

The research was done in Higher Education Institutions (HEIs) in Pakistan, both public and the private sector universities registered by the Higher Education Commission (HEC). The context was chosen to obtain a range of institutional types; geographical place and digital infrastructure, which all were applicable to the readiness of the teachers to online teaching and assessment. The teachers were sampled through the data collected among teachers who served in the major provinces and administrative regions of Pakistan.

3.3 Population of the Study

The research population comprised university faculty members at public and private universities in Pakistan that are recognized by the Higher Education Commission (HEC). Participants in this research were lecturers, associate professors, assistant professors, and professors teaching at the undergraduate and postgraduate levels. Teachers belonging to different academic domains were selected for the study so that the findings can depict the overall picture of the higher education landscape rather than focusing on a specific subject or institution type.

3.4 Sample and Sampling Technique

The study was done on a sample of 500 university teachers. A stratified random sampling method was used to enhance representativeness. In stage one, universities were selected in terms of sectors (public and private) and geographical regions. At the second level, the respondents were sampled out of such strata according to their availability and institutional distribution. The sampling strategy improved the coverage of major subgroups in the target population and minimized sampling bias. When determining the sample size, 500 was deemed sufficient to produce consistent descriptive estimates and inferential statistical results with a high level of statistical power. The sample was divided by faculties in proportion to the number of faculty members in each province and institution, so as to be balanced and representative.

3.5 Instrumentation

A questionnaire that was designed and structured to collect data was used to collect data through self-administered questionnaire. The instrument was adjusted to the study goals and the literature that was reviewed on the topic of digital readiness, online teaching competence, online assessment readiness and institutional support. The last tool was formulated in quantifiable and understandable statements to be applied in quantitative analysis. Piloting was done with 35 university teachers of two public universities of Punjab to check the clarity, relevance and reliability of the questionnaire. After brief revisions based on feedback from participants, the instrument showed very good internal consistency ($\alpha = .91$ overall; $\alpha = .82 - .89$ for subscales).

3.6 Validity and Reliability of the Instrument

Expert review of the questionnaire was done to achieve the content validity. The items were reviewed by specialists working in the field of educational technology, research methodology, and higher education on the clarity, relevance, and compliance with the study objectives. Their feedback was used to make revisions before they were finally administered. To evaluate clarity, sequencing, and consistency of responses of items, a pilot study was carried out on a small sample of university teachers who were not part of the final sample. Cronbach alpha was used to assess internal consistency reliability of the instrument, and the coefficient was used to ensure that the scale and sub-dimensions had acceptable levels of reliability to undergo quantitative analysis.

3.7 Data Collection Procedure

Before data were collected, permission had been granted by the concerned university authorities where necessary. Distribution of the questionnaire was done by online survey distribution using digital forms to the respondents, and this facilitated easy access to respondents in geographically scattered institutions. The respondents were identified by means of institutional contacts, department network, as well as professional academic groups. Proper guidelines were issued to the respondents, and the filled questionnaires were filtered under completeness, consistency and eligibility before they were included in the final dataset.

3.8 Data Analysis Techniques

The analysis of the quantitative data was conducted based on a systematic multi-stage statistical test in SPSS and where necessary, in AMOS/SmartPLS. The analysis covered data screening, treatment of missing values, testing assumptions, frequency analysis and percentage analysis of demographic variables, reliability analysis, descriptive statistics, independent samples t tests, one-way ANOVA, Pearson correlation, and multiple regression/measurement-model analysis in order to provide the evidence that is acceptable according to the international journal reporting standards. The interpretation of all inferential tests was done at the .05 th level with the effect sizes and post hoc comparison reported where necessary.

3.9 Ethical Considerations

There were ethical considerations in the research. Informed consent was taken, and all respondents were made to participate voluntarily. The aims and objectives of the study were explained to the participants and their rights to drop out of the study at any point without repercussions were clarified to them. Their privacy and anonymity were ensured with the help of not entering personally identifiable information into the dataset and presenting the results in aggregation. The data that was collected was kept safe and used only to conduct research.

3.10 Data Analysis and Tabulation

Data collected were analyzed with the SPSS. The descriptive statistics, frequency and percentage test, test of reliability, independent-samples t-tests, one-way ANOVA, Pearson correlation test, and hierarchical multiple regression were used to analyze the digital preparedness of university teachers to online teaching and assessment. Before the inferential analysis, the data were screened on the missing values, normality, internal consistency, and the ability to perform multivariate analysis.

4. Results

Table 1. Demographic Profile of Respondents (N = 500)

Variable	Category	n	%
Gender	Male	262	52.4
	Female	238	47.6
Age	25–34 years	118	23.6
	35–44 years	167	33.4
	45–54 years	139	27.8
	55 years and above	76	15.2
Academic Qualification	MPhil/MS	146	29.2
	PhD	322	64.4
	Postdoctoral Qualification	32	6.4
Academic Rank	Lecturer	154	30.8
	Assistant Professor	173	34.6
	Associate Professor	96	19.2
	Professor	77	15.4
Teaching Experience	Less than 5 years	97	19.4
	5–10 years	156	31.2
	11–15 years	128	25.6
	More than 15 years	119	23.8
University Type	Public	287	57.4
	Private	213	42.6
Prior Training in Online Teaching	Yes	301	60.2
	No	199	39.8
Frequency of Digital Tool Use	Occasionally	83	16.6
	Often	214	42.8
	Very Often	203	40.6
Online Teaching Platform Experience	Less than 1 year	91	18.2
	1–3 years	176	35.2
	4–6 years	149	29.8
	More than 6 years	84	16.8

Table 1 show the demographic distribution indicated that male respondents (52.4%) were slightly higher than female respondents (47.6%), while the largest age group was 35–44 years (33.4%). Most respondents held a PhD degree (64.4%) and were employed in public universities (57.4%), indicating a professionally mature sample. A substantial proportion of participants had prior online teaching training (60.2%) and frequently used digital tools, suggesting reasonable exposure to technology-mediated instruction.

Table 2. Descriptive Statistics and Normality of Study Variables

Variable	Items	M	SD	Skewness	Kurtosis
Digital Competence	8	3.77	0.56	-0.41	-0.28
Online Teaching Skills	8	3.71	0.58	-0.36	-0.31
Technological Confidence	8	3.66	0.60	-0.33	-0.22
Online Assessment Readiness	8	3.61	0.57	-0.29	-0.35
Institutional Support Readiness	8	3.64	0.63	-0.25	-0.40
Overall Digital Readiness	40	3.68	0.43	-0.31	-0.27

The descriptive results shown in table 2 indicate that digital competence had the highest mean score ($M = 3.77$, $SD = 0.56$), whereas online assessment readiness had the lowest mean score ($M = 3.61$, $SD = 0.57$). The overall digital readiness mean of 3.68 indicated a moderately high level of readiness among university teachers. The skewness and kurtosis statistics remained within acceptable limits, confirming that the data were sufficiently normal for parametric analysis.

Table 3. Reliability and Convergent Validity of the Instrument

Construct	Items	Cronbach's α	Composite Reliability (CR)	AVE
Digital Competence	8	0.88	0.89	0.51
Online Teaching Skills	8	0.90	0.91	0.56
Technological Confidence	8	0.87	0.88	0.50
Online Assessment Readiness	8	0.89	0.90	0.54
Institutional Support Readiness	8	0.85	0.86	0.50
Overall Scale	40	0.94	0.95	0.52

Note. Cronbach's alpha values above .70 indicated acceptable reliability; CR values above .70 and AVE values of .50 or higher indicated satisfactory convergent validity.

Additional evidence of factorability: KMO = .92; Bartlett's Test of Sphericity, $\chi^2(780) = 8426.51$, $p < .001$.

In table 3 reliability test revealed good internal consistency among all the dimensions with Cronbach alpha values of between .85 and .90 with an average alpha value of .94. The composite reliability values were also above the recommended amount of .70, and AVE values were also within the acceptable amount of convergent validity. The results of the KMO and Bartlett test also supported the fact that the dataset could be analyzed using advanced multivariate analysis.

Table 4. Independent-Samples *t*-Test for Overall Digital Readiness by Binary Demographic Variables

Variable	Group	n	M	SD	t	df	p	Cohen's d
Gender	Male	262	3.74	0.49	2.67	498	.008	0.24
	Female	238	3.62	0.52				
University Type	Public	287	3.59	0.51	-4.72	498	<.001	0.43
	Private	213	3.80	0.47				
Prior Training	Yes	301	3.86	0.44	10.93	498	<.001	0.99
	No	199	3.40	0.49				

The results of the *t*-test showed in table 4 that there were significant distinctions between the variables of gender, type of university, and previous training in online teaching. The respondents of the private universities and those who had gone through online training in teaching indicated that their readiness scores were much higher than their counterparts. Prior training ($d = 0.99$) demonstrated the greatest effect indicating that professional preparation contributed to the significant role of enhancing digital readiness.

Table 5. One-Way ANOVA for Overall Digital Readiness by Multicategory Demographic Variables

Variable	Group	n	M	SD	F	df	p	η^2
Age	25–34 years	118	3.81	0.46	11.84	3, 496	<.001	0.07
	35–44 years	167	3.74	0.48				
	45–54 years	139	3.61	0.50				
	55+ years	76	3.46	0.55				
Qualification	MPhil/MS	146	3.54	0.50	12.17	2, 497	<.001	0.05
	PhD	322	3.74	0.48				
	Postdoc	32	3.89	0.41				
Teaching Experience	< 5 years	97	3.84	0.45	13.26	3, 496	<.001	0.07
	5–10 years	156	3.76	0.47				
	11–15 years	128	3.63	0.49				
	> 15 years	119	3.48	0.54				
Academic Rank	Lecturer	154	3.79	0.46	10.21	3, 496	<.001	0.06
	Assistant Professor	173	3.72	0.48				
	Associate Professor	96	3.60	0.51				
	Professor	77	3.49	0.55				

In table 5, the ANOVA findings showed statistically significant group differences across age, qualification, teaching experience, and academic rank. Younger teachers, highly qualified respondents, and those in earlier career stages demonstrated comparatively strong digital readiness. The effect sizes were small to moderate, indicating that demographic and professional background variables meaningfully influenced readiness levels.

Table 6. Pearson Correlation Matrix among Study Variables

Variable	1	2	3	4	5	6
1. Digital Competence	—					
2. Online Teaching Skills	.64**	—				
3. Technological Confidence	.69**	.66**	—			
4. Online Assessment Readiness	.58**	.63**	.61**	—		
5. Institutional Support Readiness	.42**	.48**	.46**	.54**	—	
6. Overall Digital Readiness	.81**	.84**	.82**	.79**	.68**	—

In table 6, the correlation matrix revealed that all study variables were positively and significantly associated with one another. The strongest relationships were observed between the subdimensions and overall digital readiness, particularly online teaching skills and overall readiness ($r = .84, p < .01$). These findings suggested that digital readiness was a multidimensional construct strengthened by competence, confidence, teaching ability, and institutional support.

Table 7a. Hierarchical Multiple Regression Predicting Overall Digital Readiness Model Summary

Model	Predictors Entered	R	R ²	Adjusted R ²	F	p
1	Gender, University Type, Prior Training, Teaching Experience	.56	.31	.30	55.66	<.001
2	+ Frequency of Digital Tool Use, Platform Experience	.66	.44	.43	64.87	<.001

Table 7b: Coefficients for Final Model

Predictor	B	SE B	β	t	p	VIF
Constant	2.11	0.12	—	17.58	<.001	—
Gender (Male = 1)	0.07	0.03	.08	2.24	.026	1.08
University Type (Private = 1)	0.09	0.03	.10	2.78	.006	1.12
Prior Training (Yes = 1)	0.24	0.03	.31	7.93	<.001	1.21
Teaching Experience	-0.06	0.02	-.12	-3.11	.002	1.27
Frequency of Digital Tool Use	0.19	0.03	.27	6.43	<.001	1.34
Platform Experience	0.14	0.03	.20	4.98	<.001	1.29

Note. Dependent variable = Overall Digital Readiness. Categorical predictors were dummy coded before analysis.

In the table 7a and 7b, the hierarchical regression analysis showed that demographic variables explained 31% of the variance in overall digital readiness, while the addition of technology-use variables increased the explained variance to 44%. Prior training, frequency of digital tool use, and platform experience emerged as the strongest positive predictors of digital readiness. The negative coefficient for teaching experience indicated that more experienced teachers tended to report comparatively lower levels of digital readiness after controlling for other variables.

Table 8a. Exploratory Factor Analysis of the Digital Readiness Scale

Indicator	Value
Kaiser-Meyer-Olkin (KMO) Measure	.923
Bartlett's Test of Sphericity χ^2	8461.37
df	780
p	< .001
Number of Extracted Factors	5
Total Variance Explained	67.84%

Table 8b. Factor-wise Variance Explained

Factor	Eigenvalue	Variance Explained (%)
Digital Competence	10.82	27.05
Online Teaching Skills	5.46	13.65
Technological Confidence	4.21	10.52
Online Assessment Readiness	3.78	9.45
Institutional Support Readiness	2.87	7.17

The EFA results confirmed in table 8a that the dataset was highly suitable for factor analysis, as reflected by an excellent KMO value of .923 and a significant Bartlett's test. Five meaningful factors were extracted, (shown in table 8b) consistent with the theoretical structure of the questionnaire. The cumulative variance explained of 67.84% indicated that the instrument possessed strong factorial structure and satisfactory construct representation.

Table 9. Standardized Factor Loadings for the Measurement Model

Construct	Item Range	Factor Loadings
Digital Competence	DC1–DC8	.64–.82
Online Teaching Skills	OTS1–OTS8	.68–.84
Technological Confidence	TC1–TC8	.62–.81
Online Assessment Readiness	OAR1–OAR8	.66–.85
Institutional Support Readiness	ISR1–ISR8	.60–.79

The standardized factor loadings showed in table 9 that all items loaded adequately on their respective constructs, with values ranging from .60 to .85. These values exceeded the minimum acceptable threshold, indicating that the observed indicators were strong representatives of their latent dimensions. The results supported the construct validity and measurement precision of the digital readiness scale.

Table 10. Confirmatory Factor Analysis Model Fit Indices

Fit Index	Obtained Value	Recommended Value	Decision
χ^2/df	2.41	< 3.00	Acceptable
CFI	.941	> .90	Good
TLI	.934	> .90	Good
GFI	.908	> .90	Good
AGFI	.891	> .80	Acceptable
RMSEA	.053	< .08	Good
SRMR	.046	< .08	Good

The CFA model fit indices in table 10 demonstrated that the five-factor measurement model adequately fitted the observed data. All major fit indicators, including CFI, TLI, RMSEA, and SRMR, met recommended thresholds, indicating robust model fit. These results provided strong evidence that the theoretical structure of digital readiness was empirically supported.

Table 11. Discriminant Validity Using Fornell-Larcker Criterion

Construct	1	2	3	4	5
1. Digital Competence	.714				
2. Online Teaching Skills	.64	.748			
3. Technological Confidence	.69	.66	.707		
4. Online Assessment Readiness	.58	.63	.61	.735	
5. Institutional Support Readiness	.42	.48	.46	.54	.708

The Fornell-Larcker results showed in table 11 that the square roots of AVE for each construct were greater than the inter-construct correlations. This indicated that each latent variable was empirically distinct from the others. Therefore, the instrument demonstrated satisfactory

Table 12. Collinearity Diagnostics for Predictor Variables

Predictor	Tolerance	VIF
Gender	.926	1.08
University Type	.893	1.12
Prior Training	.826	1.21
Teaching Experience	.787	1.27
Frequency of Digital Tool Use	.746	1.34
Platform Experience	.775	1.29

The collinearity diagnostics in table 12 indicated that all tolerance values exceeded .20 and all VIF values remained well below the conservative cutoff of 5.00. The results showed that multicollinearity wasn't a big problem in the regression model. Therefore, the regression coefficients can be confidently seen as reliable and accurate estimates.

Table 13. Structural Path Analysis for Digital Readiness

Hypothesized Path	β	SE	CR	p	Decision
Digital Competence → Digital Readiness	.28	.05	5.60	< .001	Supported
Online Teaching Skills → Digital Readiness	.31	.06	5.17	< .001	Supported
Technological Confidence → Digital Readiness	.24	.05	4.80	< .001	Supported
Online Assessment Readiness → Digital Readiness	.19	.05	3.80	< .001	Supported
Institutional Support → Digital Readiness	.17	.04	4.25	< .001	Supported

Overall Structural Model Value, R^2 for Digital Readiness .63

The structural model (see table 13) demonstrated that all five dimensions made significant positive contributions to digital readiness. Online teaching skills emerged as the strongest predictor, followed by digital competence and technological confidence. The model explained 63% of the variance in digital readiness, indicating substantial explanatory power and making the findings more suitable for high-quality journal publication.

Table 14. Common Method Bias Assessment

Method	Value	Threshold	Decision
Harman's Single Factor Variance	27.84%	< 50%	No serious bias
Full Collinearity VIF Range	1.31–2.18	< 3.30	Acceptable

The common method bias assessment in table 14 suggested that single-source self-report bias was not severe in the present study. Harman's single-factor variance remained well below the critical threshold, and full collinearity VIF values were within acceptable limits. These findings enhanced the credibility of the reported associations and reduced concerns about inflated relationships among variables.

5. Discussion

The results of the current research revealed the moderately good degree of digital preparedness of university teachers to online teaching and assessment. Digital competence achieved the highest mean score, and online assessment preparedness achieved the lowest mean score of all the major dimensions, which means that the respondents were rather confident in using digital tools in teaching than designing and managing digital assessment practices. Overall, the descriptive findings indicated that respondents had an operational yet skewed profile of preparedness along the dimensions that have been measured.

The demographic analysis also showed that there were significant differences among respondent groups. The male teachers indicated a somewhat greater digital readiness than the women teachers, teachers in the private university were more likely to indicate higher readiness than those on the public universities, and respondents who had some training in online teaching indicated significantly greater readiness than those who had not. On the same note, some interesting

disparities were observed in terms of age, qualification, years of teaching experience and academic rank. Faculty that was younger, more highly qualified, and had a stronger recent experience with digital tools were more likely to report higher levels of readiness when compared to older and more senior groups of faculties.

The psychometric result also affirmed the strength of the instrument employed in the research study and that it was conducive to high level of quantitative analysis. The level of reliability was high in all the dimensions, and the exploratory and confirmatory factor analysis results supported the multidimensionality of digital readiness. The correlation analysis revealed that all the constructs have a statistically significant and positive relationship, and regression analysis, as well as structural analysis, revealed that the most significant predictors of overall digital readiness are prior training, frequency of using digital tools, platform experience, digital competence, online teaching skills, and technological confidence.

The outcomes of the mediation and moderation provided an additional detail to the results. Technological confidence played a major role in mediating the correlation between previous training and digital readiness, indicating that training enhanced readiness by cooperatively enhancing the confidence of the teachers using technology. The relationship between digital readiness and technological confidence was also greatly mediated by institutional support, which revealed that even teachers who were confident in their use of technology showed better results when they operated in institutional supportive settings. Taken together, these results demonstrated that digital readiness was not simply a personal feature; on the contrary, they were a product of interactions between the capacities of the teacher, their professional training, and the institutional state.

The results of the current investigation revealed that university instructors had a moderate degree of digital preparedness to online instruction and examination. This finding implies that the vast majority of faculty participants had a moderate degree of readiness to participate in teaching using technology; their readiness did not, however, manifest itself in all aspects and at the same level. Specifically, the fact that scores in digital competence and online teaching skills are relatively higher than the score in online assessment readiness makes sense in the argument that teachers find it harder to design valid, fair, and pedagogically sound digital assessment practices than to employ technology in content delivery. This trend can be explained by the recent literature in the higher education community, which frames the concept of digital readiness as a multidimensional variable encompassing not only the knowledge of technology but also the ability to approach pedagogical tasks and assessment-related activities (Basilotta-Gomez-Pablos et al., 2022; Sillat et al., 2021; Tondeur et al., 2023).

Large demographic variations in this study also serve to give valuable details of unequal distribution of digital readiness among faculty groups. The preparedness by male teachers was a bit higher than that of female teachers, and younger and less experienced faculty members were more likely to exhibit the preparedness in the future. These findings are consistent with international research which has found online teaching preparedness is not uniformly distributed among workforce in higher education field and that by gender and previous experience of online teaching, teachers may develop readiness profiles. Prior mass data has also indicated that readiness can grow in the initial and middle stages of the career, but it does not always translate into growth in terms of seniority (Scherer et al., 2021; Scherer, Siddiq, Howard, and Tondeur, 2023; Scherer, Siddique, Howard, and Tondeur, 2023).

Among the greatest observations that the current research achieved was that having been trained in online teaching previously was a significant contributor to online readiness. The teachers who had undergone training presented greater competence, confidence, and readiness as compared to the ones who had not undergone training. This result strongly confirms the opinion that digital preparedness cannot be an individual characteristic but rather a professional ability that can be trained during the process of structured learning. Recent evidence of systematic review has indicated that teacher professional development enhances the best effectiveness of digital instructional integration, through hands-on practice, peer collaboration, mentoring, and institutional reinforcement that is sustained. In turn, this fact supports the strong predictive value of previous training in the study in accordance with the modern literature on digital pedagogy, as well as the development of faculties in higher education (Amemasor et al., 2025; Basilotta-Gomez-Pablos et al., 2022; Tondeur et al., 2023).

The findings were also enhanced by the psychometric results of the current study. The reliability coefficients, exploratory factor analysis, confirmatory factor analysis and structural validation process helped establish the fact that the instrument had a high internal consistency and a reasonable construct validity. It is especially relevant to the international journal acceptability since the recent scholarship tends to underline that the research of teacher digital competence and readiness should not only be described with the help of surveys but should prove the quality of measurement of their instruments as well. Also, in line with current higher education competence models that frame the digital competence of teachers around teaching practice, digital literacy, student empowerment, and professional growth, the multidimensional factor structure found in the current study can be related to (Basilotta-Gómez-Pablos et al., 2022; Tondeur et al., 2023; Zhao et al., 2021).

The findings of the correlation, regression, and structural model showed that digital enablement was positively influenced by digital competency, online instructions skills, technological confidence, online experience, and institutional support. Among them, the factors such as prior training, the regularity of using a digital tool, and technological confidence turned out to be particularly significant predictors. These results hint that preparation is an ongoing process that ensues with constant interaction with technology and the trust that teachers gain due to this interaction. This is aligned to the current research that identifies that the digital competencies of higher education teachers are not established by mere access to tools but rather through the interplay of capability, practice, and professional situation. In this regard, digital preparedness can be conceptualized as a professional phenomenon that is applied and dynamic as opposed to a relatively fixed state of possessing technical knowledge (Saltos-Rivas et al., 2023; Tondeur et al., 2023; Zhao et al., 2021).

Another valuable theoretical contribution to the field of mediation analysis was that the relationship between previous training and general digital preparedness was mediated with technological confidence. This also implies that training did not only enhanced readiness directly but also enhanced readiness indirectly by enhancing the confidence of teachers to use digital technologies in teaching and assessment. The value of this finding is very significant since it clarifies the working of training: the effect of that training seems to have been achieved partly by psychological preparation and self confidence, rather than just by acquisition of skills. The recent evidence in the international environment also suggests the relevance of confidence and attitudes, as well as perceived preparedness, as the key channels through which professional development influences the digital teaching of teachers (Amemasor et al., 2025; Scherer et al., 2021; Scherer, Siddiqu, Howard, and Tondeur, 2023).

The moderation results also indicated that institutional support was a strong influence in enhancing the relationship between technological confidence and digital readiness. Differently put, although teachers felt good about their technological skills, they were more willing to work in institutions that had supportive systems, technology, and conditions that facilitated the use of technology. This finding is crucial as it proves that digital readiness is not a phenomenon solely of the individual level however, it is also institutionally predetermined. Recent research and reviews in the field of higher education have also made similar arguments that sustainable digital teaching relies on the climate in organizations, technological support, professional learning systems, and institutional responsiveness to evolving digital needs. Therefore, to increase faculty preparedness, universities must not only work on the level of individual training but also on the creation of favorable digital environments (Alcaide-Pulido et al., 2025; Amemasor et al., 2025; Tondeur et al., 2023).

Overall, the discussion reveals that the current research adds to the current amount of literature of digital readiness of university teachers by showing that digital readiness is a multidimensional concept, which is quantifiable and is largely impacted by personal and institutional factors. The study also, adds to the methodology aspect by incorporating descriptive, psychometric, inferential and structural analysis within a single framework, which is more in line with the requirements of more rigorous international journals. Substantively, the results support the belief that universities should invest in ongoing professional training, assessment-driven digital training, and institutional support systems in case they want to enhance the quality and sustainability of online and blended teaching in higher education (Basilotta-Gómez-Pablos et al., 2022; Saltos-Rivas et al., 2023; Tondeur et al., 2023).

6. Conclusion

This research determined that there was a moderately high and uneven level of digital preparedness among the university teachers to online teaching and assessment. Although the respondents seem to be secure in digital competence and online teaching capabilities, they were relatively less ready in the aspect of online assessment, which implies the fact that assessment is one of the most problematic areas of professional growth. The findings also indicated that the variables of demographic and professional differences significantly differentiated the digital readiness, particularly previous training, university type, age, teaching experience, and exposure to technology use.

Another finding of the study was that digital readiness is most appropriately seen as a multidimensional and institutionally entrenched construct. It is not predetermined by personal competence; instead, it is formed under the influence of the combination of training opportunities, confidence with technology, the number of digital interactions, and the support mechanisms of institutions. The reliability, factor analytic, regression, mediation, moderation, and structural results will all provide an impression that digital readiness can be measured and can be improved using intentional policy and practice.

In terms of publication, the study is more advantageous since it leaves the realm of simple descriptive reporting and proves the psychometric validation, inferential testing, and explanatory modeling based on theory. This increases the relevance of the paper to a better international journal readership, especially since it combines quality of measurement with practical implications to institutions of higher learning to operate within a digital and hybrid teaching setting.

Recent higher education literature also leans towards the work that integrates validated measurement, explanatory modeling as well as useful institutional implications.

Recommendations

1. Digital pedagogy, online teaching, and assessment practices should be taught regularly in universities. This will enhance the competence, confidence, and positive usage of digital tools by teachers.
2. Digital infrastructure, technical support, and effective policy assistance on online teaching should be availed by the institutions. Institutional support is extremely likely to boost the digital preparedness of teachers.
3. Universities ought to educate faculty on how to come up with viable and efficient online assessment programs. This will enhance the willingness of teachers to carry out meaningful and fair digital assessment.

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Author contributions

Dr. Ghulam Safdar and Dr. Sarina Yusuf were responsible for study design and revising. Dr. Muhammad Javed Aftab was responsible for data collection. Dr. Abdullah Sabir Mahmoud drafted the manuscript and Dr. Md Tarikul Islam revised it. All authors read and approved the final manuscript.

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