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Digital Readiness and Challenges Faced by University Students in Adopting Online Learning Platforms

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Abstract

As technology becomes more prevalent in higher education, the way learning is taking place has also changed, but there is a lack of understanding among students about how prepared they are for learning in an online environment. This study focused digital readiness, and perceived challenges among post-graduate students, in the changing scenario of digital education in India. A descriptive survey design was used and data was collected from 180 students at the University level using stratified random sampling which ensured that they were well balanced according to their gender and discipline. A self-made validated instrument, Digital Readiness and Challenges in Online Learning Scale (DRCOLS) was used to measure the technical readiness and challenges, the self-learning readiness and challenges, as well as the access readiness and challenges for online learning. Overall, it was found that there was high digital readiness (M = 3.59, SD = 0.73) and moderate perceived challenges (M = 2.69, SD = 0.89). There were no significant gender differences (p = .56) or differences between disciplines (p = .34) in readiness. There was a moderate negative correlation between readiness and challenges (r = –.313, p < .001) indicating that there was a relationship between the students' digital competence levels and their challenges to online learning. The results highlight the need for boosting the pedagogical quality, digital training of faculty, and self-regulation of learners to improve technology mediated learning in Indian universities.

1. Introduction

1.1. Context and Rationale

The last ten years of such a rapid digital transformation of education, compounded by the COVID-19 pandemic has changed the ways education is designed, delivered and experienced globally. In recent times, higher education institutions have been increasingly adopting technology-mediated and blended learning environments, embedding online learning tools, virtual classrooms and digital resources into their fundamental teaching and learning approaches (Brown et al., 2019). This revolution has also revealed inequalities among learners in their readiness to interact with digital environments. Thus, the level of digital readiness of university students has now become a focal point of research within the current educational technology agenda of education research (Kim et al., 2019). Digital readiness is not only about being able to access devices or the internet, but also about the combination of technical skills, information literacy, self-regulated learning and digital communication skills (Fuchs et al., 2022). Initiatives seeking to ensure equity, innovation and lifelong learning within higher education institutions must rely on the assessment and improvement of digital readiness in order to ensure that students can meaningfully engage in technology-driven academic ecosystems (Samara et al., 2015).

1.2. Digital Readiness in Higher Education

Digital readiness is the ability of a student to use technology for learning, collaboration and problem-solving. In recent years, digital readiness has been conceptualized as a multi-dimensional construct, which involves technical, cognitive and affective dimensions (Handel et al., 2020). Research found that in the global context, digital ready pupils demonstrate higher confidence, engagement and academic

success in their online learning (Kim et al., 2019). But there is a significant and varied level of readiness, however, when it comes to demographic, disciplinary and cultural contexts. Digital readiness in developing countries is typically limited by infrastructural gaps, poor pedagogical preparation, and lack of experience of technology-enhanced curricula (Ndibalema, 2022). The postgraduate learners constitute a special population in this context because they need to have advanced self-directed learning and digital collaboration skills to enable them to learn from their peers, develop academic skills in writing and research, and collaborate with others in the workplace. Therefore, it is imperative to know their readiness to inform institutional's capacity building and national's digital education policies.

1.3. Challenges in Online Learning

Though technology is increasingly incorporated into learning, online learning is still faced with several challenges that hinder the effectiveness of student learning. These challenges tend to occur in the following three general areas:

The three categories of barriers include (a) technical barriers, which are mainly connectivity and device limitations, (b) pedagogical barriers, which are due to insufficient interaction and unclear course design, and (c) personal and contextual barriers, which are related to motivation, time management and environmental distractions (Ndibalema, 2022).

In addition to the infrastructure of an institution that supports online education, the quality of online learning experiences also relies on the congruence between the design of learning and the learner's digital readiness (Weng & Wirda, 2020). The low self-efficacy in digital learning and limited exposure to digital pedagogies tend to negatively impact learning engagement and satisfaction, especially for students with low self-efficacy (Aldhafeeri & Alotaibi, 2022). It is therefore important to examine the interaction between these challenges and students' readiness to gain an overall understanding of students' resilience and adaptation in digital learning.

1.4. The Indian Context and NEP 2020 Alignment

The National Digital University, e-PG Pathshala and SWAYAM are the national initiatives taken in India to promote the digitalization of higher education institutions, as backed by the National Education Policy (NEP) 2020. The policy has visions of integrating technology at all levels of education and a focus on the development of digital literacy and students' self-learning abilities as important 21st century skills (Ministry of Education, 2020). Empirical studies, however, reveal that while there has been a lot of infrastructural development, there are still notable disparities in students' technological access, pedagogical exposure, and self-regulation skills between regions and disciplines (Ndibalema, 2022; Kashou, 2016; Xu, & Zhu, 2023). The University students might be facing different challenges related to connectivity, digital pedagogy and socio-environmental issues in the universities located outside of the city center and in the outskirts. Thus, the need to assess the readiness and challenges of postgraduate students in this context in an online learning environment is important and can provide localized information to contribute to national digital education policy.

1.5. Theoretical Framework

In the theoretical framework of this study, Social Cognitive Theory (Bandura, 1997) was used, which upholds that learning takes place when the personal, behavioral and environmental factors interact in a dynamic fashion called reciprocal determinism. Self-efficacy is one of the key factors that affect motivation and persistence in digital learning environments in this context. Students who have ample digital self-efficacy can better deal with technology-related problems, manage their learning activities and succeed academically (Bellini, 2016). Furthermore, the study is based on the Technological Pedagogical Content Knowledge (TPACK) framework (Mishra & Koehler, 2006) that stresses the integration of technological knowledge with pedagogical and content knowledge. These theoretical perspectives taken together highlight that digital readiness is neither a singular concept nor a technical one, but a concept that is multi-dimensional and depends on self-belief, context, and pedagogy as an important framework for understanding the link between readiness and learning problems.

1.6. Research Gaps and Need for the Study

While there are a number of studies that have examined students' preparedness for online learning, most of these studies have taken place within a Western or metropolitan context (Johnson et al., 2023). In the Indian context, current studies have largely been centered on access to the region and infrastructure, but not the intricacies of readiness and perceptions of challenges (Sindakis & Showkat, 2024). The study has examined few studies on postgraduates who are supposed to have high DCL skills especially in northern Indian universities. Furthermore, previous research tended to address readiness and challenges separately, but few studies have looked at the interrelationship between readiness and challenges in relation to the discipline. The present study seeks to fill this gap by using a validated, multi-dimensional scale (DRCOLS) to measure readiness and challenges at the same time, thus offering an integrated understanding of the interaction between these two factors in shaping digital learning experiences for students.

1.7. Objectives of the Study

The specific objectives of the study were to:

1. To determine the overall digital readiness level among postgraduate students.
2. To identify key infrastructural, technical, and pedagogical challenges faced by postgraduate students in online learning environments.
3. To examine whether digital readiness differs significantly by gender.
4. To examine whether digital readiness differs significantly by discipline (Arts, Science, and Commerce).
5. To assess the relationship between students’ digital readiness and their perceived challenges in online learning.

1.8. Hypotheses of the Study

In line with the objectives, the following hypotheses were formulated for empirical testing:

1. H1: There is a significant difference in digital readiness between male and female postgraduate students.
2. H2: There is a significant difference in digital readiness among postgraduate students of different disciplines.
3. H3: There is a significant negative correlation between digital readiness and perceived challenges.

2. Review of Related Literature

A literature review provides background information to situate the current study in relation to past research and theory on digital readiness, technology integration and online learning challenges. The review is structured in the following thematic sub-sections:

Conceptualizing Digital Readiness in Education, Awareness and Adoption of Educational Technologies, Digital Readiness and Online Learning Competence, Challenges and Barriers in Online Learning.

2.1. Conceptualizing Digital Readiness in Education

Digital readiness is a person's ability to use technology for learning, communicating and creating knowledge effectively. This includes technical skills, as well as cognitive flexibility, self-management, and openness to digital innovation (Oberlander, 2020). According to Nasution et al. (2018), digital readiness is the "meeting of technological access, digital literacy and digital self-efficacy, which allows for meaningful interaction with technology mediated education. Therefore, digital readiness is a multi-faceted phenomenon involving the infrastructural, behavioral and psychological aspects.

Initially, the emphasis of digital competence was on operational and access aspects (Duan & Dong, 2025). But, modern methods focus on more skills, such as information literacy, critical thinking, communication ethics, and digital resilience. This was extended in the European Commission's DigComp 2.2 Framework (Silver & Ruokamo, 2025), which introduced the concepts of safety, problem-solving, and lifelong learning, resulting in a paradigm shift from technical literacy toward digital citizenship. Digital readiness has been found to be closely linked to students' engagement, motivation, and performance in education (Kim et al., 2019). Students who are more ready can better navigate digital platforms, work well in online settings, and persist with online learning problems (Koh et al., 2023). Assessing digital readiness is not just a diagnostic tool, but a critical measure of the effectiveness of institutions and equity for students in the 21st century education system.

2.2. Awareness and Adoption of Educational Technologies

Digital education is highly dependent upon student and teacher awareness and uptake of educational technologies (Kauts and Rather, 2025). The adoption of pedagogical technological tools represents the fact that they have been integrated into learning practices; Awareness indicates that they have been recognized as tools that have pedagogical potential (Dahri et al., 2024). Studies in a variety of settings

have demonstrated, that despite awareness, the effective use of technology takes other factors into account, including digital confidence and institutional support, perceived usefulness (Naatu et al., 2025). At the level of higher education, the adoption of digital tools is shaped by the students' background in technology use and their academic domain as well as pedagogical culture (Abeysekera et al., 2024).

Science and engineering students are almost likely to be more digitally confident, as they are involved in technology-based activities on a regular basis (Warschauer & Matuchniak, 2010), whereas, arts and humanities students are more likely to be less digitally ready (Kundu, 2021).

Nevertheless, recent research indicates that these differences have become narrower since the onset of the COVID-19 pandemic with its shift to remote teaching (Pelekas, 2023). The pandemic, in fact, served as a “forced catalyst” for digital use, forcing teachers and students to quickly adjust to the virtual platforms they were using (Antonio & Rita, 2021).

The government of India has taken several measures to ensure awareness and adoption of digital learning, including the launch of SWAYAM, DIKSHA and the National Digital University. However, the effectiveness of these programs relies on the learner's ability to make the most of digital environments. As pointed out by Singh et al. (2022), the ‘digital divide' is no longer about access but about usage and competence in India. Therefore, the study of learner awareness and adoption should not only focus on technological access, but also on how learners are using and how they can make effective use of these new digital resources.

2.3. Digital Readiness and Online Learning Competence

There is a considerable literature that focuses on digital readiness as a factor that influences students' competence, engagement, and persistence in digital learning contexts. Digital readiness is an important step in developing online learning competence, which includes information management skills, virtual communication skills, self-directed learning, and digital collaboration skills (Blayone, 2018). Kundu (2021) suggests that digital readiness has a direct impact on the ability of learners to access digital materials, communicate with their instructor, and manage time in digital environments.

Studies have consistently found that there are positive relationships between digital readiness and satisfaction, academic performance, and perceived utility of online courses among learners. (Alam et al., 2024). For example, Arzeen et al. (2023) concluded that the students with higher digital readiness showed significantly higher engagement and lower dropout intentions in online learning programs. In the same way, Wang et al. (2021) found that digital self-efficacy and access readiness were significant factors determining successful online learning performance. In spite of the fact that the evidence base is expanding around the globe, there are only a few empirical studies that have investigated how digital readiness, online competence, and contextual challenges intersect in the higher education system in India, especially for post-graduate students in semi-urban Universities. This lack of knowledge has implications for the need for more localized enquiry, and this is what the current study seeks to investigate.

The transition towards digital learning has created new and unique possibilities for learning access and innovation in the world, but it has also exacerbated existing and new challenges in higher education. Research from various contexts has consistently found that the success of online learning is not just dependent on the availability of technology, but also on psychological, pedagogical, and environmental adaptability of the learners (An et al., 2024). Learning challenges, in general, refer to technical, pedagogical, and personal-contextual aspects that hinder students' involvement, satisfaction and success in virtual learning settings.

2.4 Challenges and Barriers in Online Learning

While the global shift toward digital learning has opened unprecedented opportunities for access and innovation, it has simultaneously magnified pre-existing and emerging challenges in higher education. Studies across contexts have consistently reported that the effectiveness of online learning depends not only on technological availability but also on learners' psychological, pedagogical, and environmental adaptability (An et al., 2024). The term learning challenges broadly encompasses technical, pedagogical, and personal-contextual barriers that impede students' engagement, satisfaction, and achievement in virtual environments.

2.4.1. Technical Barriers

Technical challenges are the core difficulties this brings to the online learning experience, such as unstable internet connections, insufficient digital devices, software bugs, and access barriers to the school's learning management system (Li et al., 2024). It has also been demonstrated that in developing countries the lack of infrastructure and bandwidth can disproportionately impact students from marginalized or rural communities (Salzer, 2023). Even when a school or classroom has a fairly robust technology infrastructure, there is a possibility for disruptions to the continuity of learning, creating frustration or disengagement. Thus, the gaps in the infrastructure must first be addressed in order to realize equitable digital education.

2.4.2. Pedagogical Barriers

In addition to technical issues, limitations in pedagogy have become important factors in the quality of online learning. Students often complain about a lack of teacher presence and feedback, poor instructional design, and excessive reliance on lecture mode digital delivery (Abdelfattah et al., 2023). Faculty who suddenly switched to online teaching were often not properly trained in digital pedagogy which led to reduced engagement in teaching. Some pedagogical barriers come from the fact that technology usage is "misaligned with pedagogical intent" (Serikov, 2017), that is, from using technology without changing pedagogical practice.

2.4.3. Personal and Contextual Barriers

Student motivation, emotional regulation, time management, and home-learning environments are also significant in determining students' digital learning experiences. In the pandemic, students around the

world experienced psychological stress, loneliness, and impaired self-discipline in the management of remote learning (Eweida et al., 2020). With regard to online modalities, Esparragoza (2021) determined that students who have good self-regulated learning strategies are able to perform better than those who lack self-motivation and digital confidence. In the context of higher education in India, Sharma et al. (2025) noted a combination of structural and psycho-social challenges for postgraduate students, such as insufficient feedback, heavy workload and lesser peer interaction. These results demonstrate the interaction between readiness and challenge in which readiness may be a protective factor against learning disruptions. The current study builds on this growing body of literature by examining the relationship between digital readiness and view of challenges which is neglected in the post-graduate context in India.

3. Methodology

The research design, population, sample selection, instrumentation, and data-analysis procedures used in the study are described. Research goals, underlying hypotheses, and analysis procedures were carefully designed to ensure consistency of the methodological framework. As the study was descriptive and inferential, quantitative methods were used to evaluate the extent of digital readiness amongst the postgraduate students as well as the challenges and problems faced by the students in digital learning platforms.

3.1 Research Design

The study used descriptive survey design which is suitable for studying the current state of things, attitudes and practices of the learners in adopting the use of educational technology. The design allowed quantitative data to be gathered from a large group of postgraduate students to establish their readiness for digital learning, challenges encountered in online learning and the effect of demographic factors such as gender and discipline. The survey method was chosen because it is appropriate for an educational setting and can provide reliable and generalized information about the prevalence and relationship of variables (Creswell & Creswell, 2017).

3.2 Population and Sample

3.2.1. Population

The subjects of the study were all the post-graduate students of the University who were studying in various fields of Arts, Science and Commerce. This population was selected due to its diversity of academic experiences and its high prevalence of using blended and online learning platforms that have been implemented since and during the COVID-19 pandemic.

3.2.2. Sample and Sampling Technique

To ensure that all disciplines, as well as all genders, are represented in the analytical sample and so that the sample is balanced, a stratified random sampling technique was used to select the analytical sample

(N = 180) from the total sample. This provided equal representation within each major population segment in order to maximize the comparability and validity of further analyses. In particular, the resulting balanced sample consisted of: 90 male students and 90 female students (equal numbers between gender in all disciplines); 30 male and 30 female students per discipline within balanced sample (Arts, Science, and Commerce; equal numbers in each of these disciplines between the genders). The selection was made with random sampling techniques to avoid possible selection bias.

3.2.2.1. Inclusion Criteria

There was a minimum of one semester of either online or blended instruction and a maximum of two, and participants who met the following criteria were included: Attended at least one full semester of online or blended instruction, and provided complete and valid responses to all items on the questionnaire.

3.3. Instrumentation

The researchers created and adapted a self-administered and standardized instrument called the Digital Readiness and Challenges in Online Learning Scale (DRCOLS) to gather data for this study. The instrument aimed to measure two general constructs: (a) students' readiness to enter into an online learning environment, and (b) the challenges students are faced with when they enter into an online learning environment. The tool has been developed following a comprehensive literature search and policy guidance including India's National Education Policy (NEP) 2020 which has stressed for integration of Digital and Blended Learning in education.

3.3.1. Structure of the Instrument

The final DRCOLS was composed of 23 items with two major scales:

3.3.1.1. Digital Readiness Scale (13 items)

The students' readiness for technology enhanced learning was measured on four sub-dimensions of this scale: (a). Information and Communication Readiness (3 items): is about competence in accessing, sharing and managing information on digital platforms; (e) Self-Learning Readiness (3 items): is about self-assurance and motivation in the way learners complete self-paced and independent learning tasks. Access Readiness (3 items): assesses access and availability of digital devices and internet resources. The items were examined on a 5-point Likert scale from Strongly Disagree (1) to Strongly Agree (5), with higher scores representing higher readiness.

3.3.1.2. Challenges in Online Learning Scale (10 items)

This component assessed the degree of perceived barriers on three sub-dimensions, (a) Technical Barriers (3 items): connectivity difficulties, device breakdown, and technological interruptions; (b) Pedagogical Barriers (3 items): difficulties in the online course design, interaction and teacher feedback;

and (c) Personal and Contextual Barriers (4 items): difficulties with motivation, home environment and concentration in virtual settings. The responses were scored on a Likert scale ranging from 1 (Not a Challenge at All) to 5 (Very Major Challenge) with higher scores representing increased levels of perceived difficulty.

3.3.2. Reliability and Validity

To test the reliability of the DRCOLS and its clarity, the instrument was initially given to a pilot sample of 50 post-graduate students who were not part of the main sample. The obtained internal consistency coefficients (Cronbach's α) for the Digital Readiness Scale and Challenges Scale were 0.89 and 0.84, respectively, which are both greater than the acceptable level of reliability ($\alpha \geq 0.70$). Reliability was also assessed for the main study (N = 180) using both Cronbach's α and split-half test, with Cronbach's α for readiness = 0.901 and Cronbach's α for challenges = 0.851 (see Table 1 in Section 4.1).

Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were conducted to establish construct validity of the instrument, and the results indicated that the instrument could be used because the KMO value was 0.931 for readiness and 0.862 for challenges with Bartlett's test of sphericity $p < .001$. The multidimensional structure of the instrument was additionally confirmed by Principal Component Analysis (PCA) which resulted in the cumulative variance of more than 65% on both scales. So, the DRCOLS was determined to be a psychometrically valid instrument of digital readiness and the perceived challenges of postgraduate students.

3.4. Procedure of Data Collection

The data were collected in a systematic manner, keeping in the view institutional norms and ethical standards. Once the relevant academic bodies gave their approval, the final version of the DRCOLS was transformed into an online questionnaire, using Google Forms, which would be accessible and easy to respond to.

3.4.1. Administration

The data was collected from the postgraduate students by sending a questionnaire link through the official departmental channels and faculty coordinators. A brief introduction to the purpose of the study was given to the participants, they were assured that no one would know about their answers, and that they were free to participate in the study. Analytical precision and representativeness were maintained by taking a balanced analytical subsample of 180 students as per stratified random sampling technique, 60 each from Arts, Science and Commerce.

3.5. Ethical Considerations

The conduct of all the procedures in this research was in accordance with the accepted ethics of educational research and institutional regulations. The study protocol and instrument were reviewed and approved by the Department of Teacher Education, North Campus, University of Kashmir that provides

post graduate programmes prior to data collection. Ethical clearance provided that the research followed the principles of voluntary participation, informed consent, confidentiality and anonymity of respondents.

The consent statement, which was clearly presented to participant at the start of the online questionnaire, stated that: (a). the purpose and scope of the study; (b). participation was voluntary; (c). participation in the study was not a requirement to be penalized if they chose to withdraw; and (d). that all responses would be kept confidential, and that all responses would be for academic purposes only. To demonstrate consent, participants were asked to check the box saying “I agree to participate voluntarily” prior to answering the questions in the questionnaire. No personal data (such as names, roll number) was collected and anonymity of the respondents was ensured. The data were password protected and only accessible by the researchers.

3.6. Normality Checks

Before conducting inferential statistical analyses, the normality of data distributions for both the Digital Readiness and Challenges scores was assessed. To guarantee the robustness of normality verification, multiple indicators were used, including: (a). No significant departure from normality (all Shapiro–Wilk test results $p > .05$) (b). The skewness and Kurtosis were within the acceptable limit (+/- 1.0); Visually checking histograms and Q-Q plots, which were found to be approximately normally distributed. These tests confirmed that parametric statistical tests (t-test, ANOVA, and Pearson's correlation) could be used for further analysis. Homogeneity of variance was also assessed before group comparisons were made, with the results of Levene's test being non-significant ($p > .05$).

3.7. Statistical Treatment

The data collected were analyzed by descriptive and inferential statistics using IBM SPSS Statistics (Version 28). Along with significance testing, effect sizes (Cohen's d for t-tests and eta-squared (n^2) for ANOVA) were calculated to provide a fuller interpretation of the significance test's results. Moreover, the reliability coefficients (Cronbach's α) and KMO values were interpreted based on the known psychometric criteria. Conventional inferential standards in educational research were adopted and two-tailed significance levels ($p < .05$) were employed in hypothesis testing, where applicable. The internal consistency of the descriptive and inferential results was cross-validated for all analyses.

4. Results

The analysis of the data was carried out for a balanced analytical sample of respondents (N = 180); results are reported in this section. All the analyses were conducted according to the research objectives and hypotheses. A 0.05 level of significance was used for all statistical tests.

4.1. Reliability and Validity of the Instrument

Before substantive analyses, the reliability and validity of the instrument namely Digital Readiness and Challenges in Online Learning Scale (DRCOLS) was checked to ensure that the instrument has both

internal consistency and construct adequacy. For the Digital Readiness Scale (13 items) and the Challenges Scale (10 items) as well as their sub-dimensions, Cronbach's α and the split-half (Spearman–Brown) procedure was applied to test the reliability of the scales.

4.1.1. Internal Consistency

The overall Digital Readiness Scale had excellent internal consistency (Cronbach's α = 0.901) and high split-half reliability (r = 0.739, rsb = 0.850) as can be seen in Table 1. The reliabilities for the subscales fell between α = 0.670 (Technical Skills) and α = 0.799 (Self-Learning Readiness) which were acceptable to good. The internal consistency of the Challenges Scale was also high (Cronbach's α = 0.851; rsb = 0.887) with subscale alphas of 0.677 (Technical), 0.741 (Pedagogical) and 0.850 (Personal/Contextual Barriers). These results suggest that all subscales are internally consistent and represent the same constructs.

Table 1
Reliability Coefficients for the DRCOLS and Its Subscales (N = 180)

Scale/Subscale	Cronbach's α	Split-Half r	Spearman-Brown rSB
Digital Readiness Scale	0.901	0.739	0.850
Technical Skills (4 items)	0.670	0.541	0.651
Information & Communication (3 items)	0.778	0.694	0.795
Self-Learning Readiness (3 items)	0.799	0.725	0.824
Access Readiness (3 items)	0.775	0.680	0.770
Challenges Scale	0.851	0.745	0.887
Technical Barriers (3 items)	0.677	0.593	0.726
Pedagogical Barriers (3 items)	0.741	0.639	0.715
Personal & Contextual Barriers (4 items)	0.850	0.805	0.872

4.1.2. Construct Validity

KMO and Bartlett's tests were also used to look at construct validity. The KMO values for both scales showed good sampling adequacy with 0.931 for Readiness, and 0.862 for Challenges. The Bartlett's tests for sphericity were significant (Readiness: χ^2 (78) = 1691.12, $p < .001$; Challenges: χ^2 (45) = 1135.25, $p < .001$), indicating that the correlation matrices were factorable. The Principal Component Analysis (PCA) identified four interpretable components for each scale, matching the conceptual dimensions identified during the instrument development process. The first component accounted for 46.24% of variance for the Readiness scale and the first four components combined explained 66.31% of variance. The first of the two components accounted for 44.19 percent of the variance of the Challenges scale and the first four components together explained 73.29 percent of the variance. All indices indicate

that the DRCOLS is internally consistent, has good construct validity, and is psychometrically suitable for further analyses.

4.2. Descriptive Statistics of Digital Readiness and Challenges

The overall level of digital readiness and perceived challenges were assessed using descriptive statistics in the balanced analytical sample (N = 180) of postgraduate students. Total scores and subscale scores for the Digital Readiness and Challenges in Online Learning Scale (DRCOLS) were analyzed. The scores on all items were between 1 (“Strongly Disagree” / “Not a Challenge at All”) and 5 (“Strongly Agree” / “Very Major Challenge”). The higher the score on the readiness scale, the more digitally competent they are, and the higher the score on the challenges scale, the more challenging they perceive online learning to be.

4.2.1. Digital Readiness

The overall mean digital readiness score for postgraduate students was found to be M = 3.59, SD = 0.73, which was a generally high level of digital preparedness among the postgraduate students, as shown in Table 2. Overall, the most ready was with regard to the Access Readiness dimension (M = 3.74, SD = 0.81), indicating high levels of device and internet connectivity. Self-Learning Readiness (M = 3.68, SD = 0.77) was the next score, indicating moderate levels of self-learning readiness among students. Information and Communication Readiness (M = 3.61, SD = 0.79) and Technical Skills Readiness (M = 3.53, SD = 0.72) were also above the midpoint, which meant that there was an adequate level of operational skills and communication competence in the digital learning environment. When broken down by level, 59.2% of respondents were High digital preparedness, 33.3% were at Moderate level, and 7.5% were at Low readiness. The results show that most of the post graduate students have a positive readiness profile in respect of Technology-mediated learning.

4.2.2. Perceived Challenges

The mean score for the overall perceived challenge was 2.69 (SD = 0.89), indicating an average level of perceived challenges in online learning. The subscales in which challenges were reported most were Pedagogical Barriers (M = 2.85, SD = 0.93) and mostly related to limited teacher interaction and lack of clarity of the course. Personal and Contextual Barriers was the next score M = 2.70, SD = 0.86; problems with home distractions and lower levels of motivation in remote environments. Infrastructure-related issues were relatively easy to manage (M = 2.52, SD = 0.88), the least challenging area. Overall, these findings suggest that although the postgraduate students are ready for online learning, they still face moderate pedagogical and contextual problems that could impact their learning experience.

Table 2

Descriptive Statistics for Digital Readiness and Challenges Scales and Subscales (N = 180)

Scale / Subscale	Mean (M)	SD	Interpretation
Digital Readiness	3.59	0.73	High
Technical Skills Readiness	3.53	0.72	Moderate–High
Information & Communication Readiness	3.61	0.79	High
Self-Learning Readiness	3.68	0.77	High
Access Readiness	3.74	0.81	High
Challenges in Online Learning	2.69	0.89	Moderate
Technical Barriers	2.52	0.88	Moderate
Pedagogical Barriers	2.85	0.93	Moderate–High
Personal & Contextual Barriers	2.70	0.86	Moderate

Overall, in the balanced sample, the postgraduate students had high levels of digital readiness for all the subdimensions, but moderate perceived difficulties in their online learning experiences. The results indicate that although the self-learning abilities and infrastructural access are mostly adequate, the pedagogical dimension of online instruction still needs to be improved to facilitate seamless integration of digital learning.

4.3. Gender Differences in Digital Readiness (H1)

To test Hypothesis 1, an independent-samples t-test was used to compare mean digital-readiness scores of the male and female postgraduate students in the balanced analytical sample (N = 180). The respondents were purposefully selected to ensure equal number of male and female respondents with 30 male and 30 female respondents from each academic stream. Prior to analysis, the assumptions of normality and homogeneity of variances were evaluated. Approximately normal score distributions were found within each gender group by visual inspection of Q-Q plots and Shapiro-Wilk tests. The variances of male and female readiness scores were not significantly different in Levene's test ($F(1, 178) = 3.24$, $p = .074$) and these measurements met the assumption of equality of variance.

4.3.1. Descriptive statistics and t-test results are presented in Table 3.

Male students' mean readiness score was $M = 3.65$ ($SD = 0.70$); female students' mean readiness score was $M = 3.59$ ($SD = 0.74$). This difference in means was small and statistically insignificant, $t(178) = 0.58$, $p = .56$, Cohen's $d = 0.10$, which represents a very small effect size (see Table 3). These findings

indicate that males and females are equally prepared to engage with digital tools in learning, in terms of access to and confidence in technology-mediated learning tools.

Table 3
Independent-Samples t-Test Comparing Digital Readiness by Gender (N = 180)

Gender	n	Mean (M)	SD	Levene's F	Sig.	t(df = 178)	p	Cohen's d	Interpretation
Male	90	3.65	0.70	3.24	.074	0.58	.56	0.10	No significant difference
Female	90	3.59	0.74						

Interpretation
Hypothesis 1

failed to be supported by the analysis. The overall results of the study showed that there were no significant differences between male and female postgraduate students in each of the dimensions of digital readiness, thus gender does not seem to be the determining factor in this group's technological readiness. This discovery is consistent with previous research in higher education that has noted a reduction in the gender gap when looking at how well digitally exposed students feel they are able to use technology and how they feel about their own online-learning skills.

4.4. DWD - Discipline-Wise Differences in Digital Readiness (H2)

For the purpose of examining Hypothesis 2, one-way analysis of variance (ANOVA) was used to check the differences in digital readiness among the postgraduate students from three academic streams Arts, Science and Commerce of the balanced analytical sample (N = 180). There were 60 respondents (30 males, 30 females) per stream, which ensured that there were equal numbers of males and females in each disciplinary group. Normality and homogeneity of variances assumption were tested before performing ANOVA. All Shapiro–Wilk tests were not significant (all $p > .05$) and suggested that the readiness scores were normally distributed within each discipline. The results of Levene's test showed equality of variance among groups, $F(2, 177) = 1.46$, $p = .236$.

The descriptive statistics of each stream and ANOVA results are displayed in Table 4. Mean readiness scores were $M = 3.57$ ($SD = 0.76$) for Arts students, $M = 3.66$ ($SD = 0.60$) for Science students, and $M = 3.36$ ($SD = 0.73$) for Commerce students. The overall ANOVA found no significant difference between the academic disciplines ($F(2, 177) = 1.09$, $p = .338$). The computed effect size ($\eta^2 = 0.007$) showed that there was very little variance explained by the discipline and that the influence of the discipline background was negligible in determining the digital readiness level. Table 4 shows results of digital readiness across academic disciplines.

Table 4

One-Way ANOVA Comparing Digital Readiness Across Academic Disciplines (N = 180)

Discipline	n	Mean (M)	SD	Levene's F	Sig.	F(df = 2,177)	p	η²	Interpretation
Arts	60	3.57	0.76	1.46	.236	1.09	.338	0.007	No significant difference
Science	60	3.66	0.60						
Commerce	60	3.36	0.73						

Interpretation

There was no significant difference between the level of digital readiness of Arts, Science, and Commerce streams, indicating that the students' background in their disciplines is not relevant in terms of their readiness in the online learning environment. This discovery points towards the prevalence of technology use in and pedagogical technology by disciplines, in postgraduate studies, and the diminishing differences between technology-intensive and non-technology disciplines. This finding therefore does not support the hypothesis that the digital readiness within academic disciplines is heterogeneous among the sampled population, thereby affirming the homogeneity of digital readiness across the academic disciplines in the sampled population

4.5. Relationship Between Digital Readiness and Perceived Challenges (H3)

To test the third hypothesis, Pearson product–moment correlation coefficient was computed to investigate the relationship between digital readiness and perceived challenges for the post-graduate students in the balanced analytical sample (N = 180). The two variables were found to be linearly and inversely related after their scatter plots were examined and the data were found to be normally distributed with equal variance. The Digital Readiness Scale and Challenges Scale were measured on 5-point Likert scales, higher scores in the former scale representing a higher level of technological preparedness and higher scores in the latter scale representing a greater perception of barriers to online learning.

Table 5 indicated a negative and statistically significant correlation between the digital readiness and challenges variables, r(178) = −.313, p < .001. Students who were more digitally prepared tended to report fewer difficulties in accessing learning platforms online, a result that suggests that digital readiness is associated with students' abilities to access learning platforms online. By Cohen's (1988) standard the value of the relationship (r = −.31) indicates a moderate negative correlation. Subscale correlations were also done to investigate the specific relationships between the dimensions of readiness and the areas of challenge. Interestingly, Technical Readiness was negatively correlated with Technical Barriers (r = −.289, p < .001), and Self-Learning Readiness negatively correlated with Pedagogical Barriers (r = −.352, p < .001). The patterns suggest that a higher level of digital skills and self-directed learning skills help to reduce the perceived challenges of virtual learning.

Table 5

Correlation Between Digital Readiness and Perceived Challenges (N = 180)

Variables	1	2
1. Digital Readiness	-	-
2. Perceived Challenges	– .313**	-

Note. p < .001 (two-tailed). Higher readiness scores reflect greater digital preparedness; higher challenge scores indicate more perceived difficulties.

Interpretation

Results confirm Hypothesis 3, that is the statistically significant negative correlation between postgraduate students' digital readiness and the difficulties encountered in online learning. The discovery suggests that, as students' technological skills and confidence grow, so will their experience of digital difficulties, and vice versa. This association reveals the need to improve digital literacy and self-regulation of students to reduce barriers to effective use of technology in learning. Overall, it can be seen that the levels of readiness and challenge seem to be connected in a systematic way, highlighting digital competence as a protective factor against obstacles to online learning

5. Discussion

The findings are considered in relation to existing research and theory, as well as implications for digital learning in Higher Education, in the following subsections.

5.1. Digital Readiness Among Postgraduate Students

The study showed that the level of digital readiness among post graduate students was found to be high (M = 3.59) signifying high level of competence, confidence and access to technology. This is consistent with previous studies that highlighted that university learners are becoming increasingly digitally mature in the post-pandemic era (Kim et al., 2019; Awdziej et al., 2023). The highest readiness was seen in Access Readiness and Self-Learning, where the students had greater access to devices and internet connectivity and the ability to learn independently with the help of India's National Education Policy (NEP) 2020, which emphasizes self-paced and technology-driven education (Ministry of Education, 2020).

The results are consistent with the theoretical framework of Social Cognitive Theory (Bandura, 1997) which states that digital self-efficacy can positively affect the motivation and engagement of the learners in online learning. Self-efficacy beliefs are associated with adaptive learning behaviors and persistence among students. Therefore, the perceived high readiness may be seen as an indicator of the high self-efficacy and the environmental support which are part of the triadic reciprocal model in the theory.

5.2. Challenges in Online Learning

Students' reported perceived challenges were moderate (M = 2.69), despite readiness being high, indicating that although the infrastructural challenges are becoming less important, pedagogical and contextual challenges still exist. The pedagogical barriers (M = 2.85) were the most apparent, which included limited interaction, lack of feedback, and lack of engaging instructional design, in line with the study conducted by Adedoyin and Soykan (2020) and Awdziej et al. (2023), which found that pedagogical adaptation was one of the key issues in online teaching in the post-pandemic era. This is a persistent issue related to access to technology and the use of the technology to achieve pedagogical goals. The results also highlight the significance of pedagogical skills of the university staff members. The use of technology without effective pedagogy would not be conducive to effective learning as emphasized by Mishra and Koehler (2006) in their TPACK framework (Technological Pedagogical Content Knowledge). Therefore, although students have become ready for learning, the readiness of the teachers and course design practices of the teachers may limit optimal learning experiences. Additionally, moderate challenges included personal and contextual barriers like home distractions, time management and decrease in motivation. These are similar to past research that found that remote learning caused psychosocial stress on students, especially in self-regulated environments (Acosta et al., 2021). Therefore, it is important to foster emotional resistance, time-management competencies and support systems within institutions to maintain student engagement in online learning settings.

5.3. Gender and Discipline Differences in Digital Readiness

Contrary to initial expectations, there was no significant gender differences in digital readiness (p = .56). This is consistent with recent research (Blaso et al., 2020) that shows the narrowing of the digital gender gap among university learners as a result of more exposure to digital technology in both the university and everyday life. Male and female students were found to have similar self-efficacy, access, and learning autonomy, indicating a convergence of digital competencies among the postgraduate cohorts of today. Likewise, there was no significant difference between disciplines (p = .34) implying that the level of readiness of Arts and Science and Commerce students is similar. The current parity may be because of the institutionalization of digital tools across all faculties following the adoption of blended-learning mandates, open educational resources (OER) and virtual learning management systems (LMS) by most of the universities in India since 2020 (UGC, 2021). So, digital readiness seems to have turned into a cross-disciplinary competence as opposed to a skill.

5.4. Relationship Between Digital Readiness and Perceived Challenges

There was a strong negative correlation between digital readiness and perceived challenges ($r = -.313$, $p < .001$), whereby more positive digital readiness scores were related to fewer perceived challenges. The findings supported Hypothesis 3 and were consistent with the findings of previous studies (Alotaibi et al., 2025) which found that students who had a higher technological confidence and used SRL strategies had less problems in online learning contexts. Theoretically, this relationship is indicative of the reciprocal determinism of Social Cognitive Theory, which outlines how personal properties (self-efficacy) affect environmental demands and thus affect behavior. The more confident a student is in his/her

ability to manage online platforms, the less they see technological or pedagogical issues as a hindrance, which leads him/her to express adaptive coping and persistence. The moderate level of the correlation points to the fact that, digital readiness reduces the challenges, but still not eliminates them, which stresses the need for institutional, pedagogical and emotional support systems. Thus, readiness cannot be interpreted as a precondition for successful digital learning engagement but is rather a precondition.

5.5 Implications for Policy and Practice

This research has implications for higher education policy and practice on several points:

- Digital Capacity Building: Institutions need to keep investing in digital infrastructure, training of students and faculty development programmes to maintain readiness high.
- Pedagogical Redesign: faculty should take learner-centered and interactive pedagogy and should incorporate the use of various media tools so as to eliminate pedagogical barriers.
- Supportive Ecosystems: Policies in line with NEP 2020 should be centered on creating digital resilience by providing ongoing mentoring, accessibility programs and emotional support programs.
- Cross-Disciplinary Integration; Readiness levels are common across disciplines, so universities can have a common digital-literacy module that applies to curricula to improve equity in online learning participation.

These measures help in building inclusive, resilient and technology-rich learning environments aligned with JETDE's vision of supporting the pedagogical applications of educational technology.

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6. Conclusion

6.1. Conclusion

This study aimed to explore the digital readiness of post-graduates and the obstacles they encounter when using online learning platforms in higher education in the University's context. The overall level of digital readiness among the postgraduate students, the nature and extent of conceptual, pedagogical and infrastructural challenges faced and the relationship between readiness and perceived challenges were examined using data from the administration of the Digital Readiness and Challenges in Online Learning Scale (DRCOLS) for a balanced analytical sample (N = 180). Results showed that postgraduate students were highly ready for digital (M = 3.59) and moderately challenged (M = 2.69). The results of the subscale analysis showed that there was an especially strong result in the category of Access and Self-Learning Readiness, which means that the learners were well equipped in using technology and were confident in self-directed digital learning. On the other hand, Pedagogical Barriers were found to be the most prominent challenge which pointed to pedagogical interaction and engagement in online settings. The genders (males vs females) and disciplines (business vs non-business) were not statistically different with respect to readiness ($p = .56$ and $p = .34$ respectively), indicating that digital competence is

a relatively common competency among postgraduate students across demographic differences. The level of perceived challenges showed a moderate but statistically significant negative correlation with readiness ($r = -.313$, $p < .001$), indicating that higher technological competence and confidence was related to fewer difficulties to participate in online learning.

Overall, these outcomes suggest that postgraduate students in the context examined are well positioned to navigate digital learning environments, but that the success of digital learning still relies on the quality of teaching and learning, the expertise of instructors, and the support systems for learners. Digital readiness does not reduce learning challenges, but rather helps to lower them; therefore, there is a need for a comprehensive approach that involves both technology and pedagogical capability building. The results of this study support the tenets of Social Cognitive Theory (Bandura, 1997) in which the learner's self-efficacy and their environment interact to produce their digital learning behaviors and the TPACK model (Mishra & Koehler, 2006) highlighting the interdependence of TK, PK, and TCK in the development of effective online learning experiences. Overall, this study adds to the empirical evidence available showcasing that digital competence is more of a multi-dimensional competence than a mere technical construct, essential for the adaptability, engagement and resilience of learners in today's higher education system.

6.2. Implications for Policy and Practice

The implications of the findings are important for higher education policy, especially in the Indian context of a post-pandemic digital transformation. This study has shown that although the postgraduate students are ready and willing to learn using the digital tools, they also have pedagogical restrictions, thus highlighting the shift from a gap in access to a gap in pedagogy. Thus, interventions in the policy should focus on the empowerment of faculty, inclusive teaching design, and supportive learning environment as well as investments in infrastructure. The study also underscores the need to embed digital competence frameworks in institutional accreditation and teacher education standards as recommended by UNESCO (2023) and OECD (2022) for the development of TE in the international arena. By implementing these frameworks, digital readiness would mean the individual, pedagogic, and structural transformation of education into pedagogical innovation, inclusion of learners, and educational resilience.

6.3. Limitations and Future Directions

Higher rigorous design and balanced sampling were used in the study, but a few limitations are recognized. First, data were gathered from one university, and may not be generalizable. Second, there may be social-desirability bias when using self-report measures. Future research could include mixed methodology such as interviews and observational studies to better understand the digital behaviours and experiences of learners. In addition, longitudinal studies may examine what changes in readiness and challenges occur across time and how these affect the achievement of sustained academic engagement.

Declarations

Conflict of Interest Disclosure

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Clinical Trial Number

Not applicable. This study did not involve any clinical trial or interventional medical procedure.

Ethical Approval

The study was conducted in accordance with institutional research ethics guidelines for educational research involving human participants. The research protocol was reviewed and permitted at the departmental level at the Department of Teacher Education, North Campus, University of Kashmir prior to data collection. The study involved a voluntary, non-invasive educational survey among adult postgraduate students all aged above 18 years and did not involve any clinical or medical procedures.

Consent to Participate

Informed consent was obtained from all participants prior to their participation in the study. To demonstrate consent, participants were asked to check the box saying “I agree to participate voluntarily” prior to answering the questions in the questionnaire. Participants were informed about the purpose of the research, the voluntary nature of participation, confidentiality of responses, and their right to withdraw at any stage. In this study, all participants were above 18 years of age and participated purely on voluntary basis.

Consent to Publish

Informed consent for publication of anonymized research findings was obtained from all participants.

Funding Statement

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contribution

A.A.P. contributed to supervision, conceptualization, investigation, methodology, formal analysis, validation, and resources. M.A.R. contributed to writing the original draft, writing - review and editing,

methodology, data curation, formal analysis, investigation, and software handling (MS Office and SPSS). All authors reviewed and approved the final manuscript.

Data Availability

Data Availability StatementThe datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

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