Pre-Service Teachers in the Italian Context: What Influences Their Acceptance of Distance Education?

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Abstract
The willingness of educators to introduce opportunities for Distance Education (DE) remains uncertain despite the substantial use of such approaches during the COVID-19 pandemic. The aim of the study is to identify which factors may influence DE acceptance in a sample of Italian pre-service teachers from different subjects. Following the General Extended Technology Acceptance Model for E-learning (GETAMEL), we hypothesized that perceived ease of use and perceived usefulness may predict intention of future use of DE, which is an indicator of DE acceptance. We also hypothesized that a social factor (such as subjective norm) and a contextual factor (such as facilitating conditions) could influence perceived ease of use and perceived usefulness. One hundred and fifty pre-service teachers (F = 139; average age 37.11 years) completed the Teacher's Acceptance of Distance Education Scale (TADES) and its factor structure was verified by a Confirmatory Factor Analysis (CFA). Results emerging from a Path Analysis confirmed our hypotheses in part. Implications to promote future use of DE in higher education are discussed.

Keywords: Distance education, pre-service teachers, technology acceptance; secondary school teachers

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The introduction and adoption of technology mediated opportunities in the delivery of teaching and learning cannot yet be assumed, despite the substantial use of such approaches during the COVID-19 pandemic. Indeed, the sudden and forced use of technologies during this period elicited mixed reactions from teachers and students (e.g., Hoofman & Secord, 2021; Son et al., 2020). In their review of the literature, Faridah and colleagues (2021) showed how each education sector (primary and secondary education, higher and vocational education, and special education) had distinct perspectives on online learning and its challenges (e.g. internet connectivity for pre- and early school, primary and secondary school, and lack of students' motivation for online learning in higher education), and how varied the strategies were to overcome them. Furthermore, Sari and Nayir (2020), in their study with administrators, teachers, and educators across different school levels, found that the most important challenges for teachers were difficulties in internet access, lack of infrastructure and classroom management. Some of the strategies that emerged to tackle these problems included introducing changes in classroom management, seeking help from others who were more digitally skilled (e.g., colleagues, family members and experts), and using different tools (e-mail, phone, WhatsApp) to maintain communication with parents and students. Authors concluded that the participants lacked the support, specific training, and experience needed for distance education (DE).

Perspectives from around the world have highlighted variation in the potential advantages and challenges of DE for students in higher education (Masalimova et al., 2022). Although DE was already present in university contexts prior to the pandemic, its adoption was less common in lower levels of education, particularly in Italy. Therefore, the long-term effects of the pandemic on online teaching and learning across education contexts remain unclear (Cairney & Kippin, 2022). In their review of 27 articles on DE in higher education during COVID-19, Masalimova and colleagues (Masalimova et al., 2022) found that DE had been implemented to varying degrees over the years, offering advantages for students, including flexibility to learn at any time and from any location. However, the extensive use of digital devices in isolation during the pandemic contributed to a variety of physical and psychological concerns, including fear, anxiety, stress, and attention problems.

Access to digital tools alone is insufficient for delivering effective education programs, even during the forced adoption of DE. This has been clearly described by Papadakis (2023) in a review, which reports how even MOOCS—considered one of the best online alternatives to the traditional education system—faced many significant challenges. Papadakis highlights how one of the most relevant, and still underexplored, factors, is the quality of the content made available via MOOCs. This raises broader concerns about the consistency between educational content and the "containers" to which such content is entrusted. Indeed, attention should be paid to avoid the temptation to merely dump content designed for face-to-face formats onto digital platforms (Xie et al. 2018).

Kerres and Buchner (2022) report a rich debate spanning both university and lower school levels. They argue that the use of digital technology in teaching and learning, and the future widespread adoption of technologically mediated learning, will largely depend on the interpretation and re-construction of experiences during the pandemic. Two contradictory visions for the role of educational technology post-pandemic are possible: a pre-digital view that implies a return to "normal," and a post-digital view calling "for a digital normality" that tries to utilize the experiences of the pandemic for a consequential reform of education. Therefore, it is logical to think that the way in which both educators and more general users perceive the introduction of DE in different educational settings today is likely to have been

influenced by their experiences during the COVID-19 pandemic. For example, Mushtaha and colleagues (Mushtaha et al., 2021) examined how engineering students (N = 1,486) and faculty members (N = 227) at the University of Sharjah (Dubai) responded to the abrupt transition. While flexibility was a key advantage of online learning, over half of their participants raised concerns regarding mental health and socialization, with most expressing preference for more flexible models of delivery blending face-to-face and e-learning techniques rather than solely depending on either one of them. While the perceptions of DE reported in this study may have been influenced by the COVID-19 context, the efficacy of blending diverse modes of teaching and learning is echoed in other studies (Amenduni & Ligorio, 2022; Kumar et al., 2021; Megahed & Hassan, 2022).

The acceptance of DE is influenced by factors that predate the pandemic, as documented in existing literature. To better understand these influences, DE acceptance is often framed within the broader concept of "technology acceptance," defined as the user's positive decision to adopt technology in their professional practice, which can be expressed in terms of intention to use and the current use of a technological innovation (Ifenthaler & Schweinbenz, 2013; Simon, 2001). Taking a broader view of technology, some authors have observed that even the intention to respond to online surveys is shaped by pre-pandemic factors. Lavidas et al. (2022) clearly shows that teachers' likelihood of responding to web-based surveys is conditioned by factors such as the authority of the person/institute launching the survey; incentives for answering; survey design; ethical issues; reminders and pre-notifications; and the time when the survey was received. If a routine digital task like answering a survey requires such a complex set of conditions, working professionally online is even more complex.

Several theoretical models explain the conditions under which technological innovation can be used within professional and educational contexts. The Technology Acceptance Model (TAM) (Davis, 1989; Davis et al., 1989), originally used to understand computer acceptance (Davis et al., 1989), is rooted in the Theory of Reasoned Action (TRA; Fishbein & Ajzen, 1975) and the Theory of Planned Behavior (TPB; Ajzen, 1991). According to the TRA, a person's behavior is driven by intention, which is shaped by attitudes towards the behavior (the positive or negative judgment that people attribute to a certain behavior) and subjective norms (the influence that the opinions of others exert on the individual's choices). In the TPB, Ajzen (1991) extended the TRA by adding "Perceived behavioral control" (the confidence that an individual has in her/his own ability to successfully complete a specific task) as a factor that can influence behavioral intentions, TAM builds on these theoretical foundations by postulating that the actual use of a technology is closely connected to the intention to use it, which in turn is determined by the perception of its usefulness and ease of use (Venkatesh & Davis, 1996).

The Unified Theory of Acceptance and Use of Technology (UTAUT; Venkatesh et al., 2003) builds on TAM by integrating core elements from several different models of technology acceptance. UTAUT explains the acceptance of new technologies introduced in professional contexts through four main factors: performance expectancy, effort expectancy, and social influence - which predicts behavioral intention -and facilitating conditions (e.g., technical infrastructure), which predict actual use. Performance expectancy is defined as the degree to which an individual believes that using the system will help them to improve their job performance. Effort expectancy is the degree of ease associated with the use of the new system. Social influence is the degree to which an individual perceives that socially important others believe they should use the new system. Facilitating conditions identify the degree to

which an individual believes that an organizational and technical infrastructure supports the use of the new system.

More recently, Abdullah and Ward (2016) developed an extended version of TAM, the General Extended Technology Acceptance Model for E-Learning (GETAMEL). Based on a quantitative meta-analysis of 107 papers, the authors identified the most common external factors previously cited as predictors of technology acceptance. GETAMEL foresees that the strongest predictor of student's perceived ease of use of e-learning systems is likely self-efficacy, followed by enjoyment, experience, computer anxiety, and subjective norm. In addition, the strongest predictor of students' perceived usefulness of e-learning systems is likely enjoyment, followed by subjective norm, self-efficacy, and experience. Applying GETAMEL, Rizun and Strzelecki (2020) found that enjoyment was the strongest predictor of DE acceptance among undergraduate and graduate students, with self-efficacy also playing a significant role by influencing both perceived usefulness and ease of use. These perceptions, in turn, shape students' attitudes toward DE and their intention to use it in the future.

TAM and its extensions have proved to be a sound theoretical model for studying the adoption and acceptance of many technological innovations, including tablets (Author et al., 2018), e-learning (Teo, 2010), telemedicine (Kamal, et al., 2020), gamified learning tools (Luo, 2024), and virtual reality (Manis & Choi, 2019). Furthermore, TAM has also been applied DE, as shown in a recent study investigating Italian DE's university professors' acceptance of DE (Cacciamani et al., 2022). In these studies, the users' positive decision to adopt technology in their professional practices is considered central to DE acceptance.

The use of DE during the Covid-19 pandemic was pervasive. Understanding the factors that influenced teachers' acceptance of DE during this period can provide valuable insights into potential drivers and barriers to acceptance. Such insights are essential for promoting more effective use of DE in the post-pandemic era, where a "new normal" perspective in education is desirable. To this aim, we analyze which factors may have influenced pre-service secondary school Italian teachers' DE acceptance during the second wave of COVID-19 pandemic.

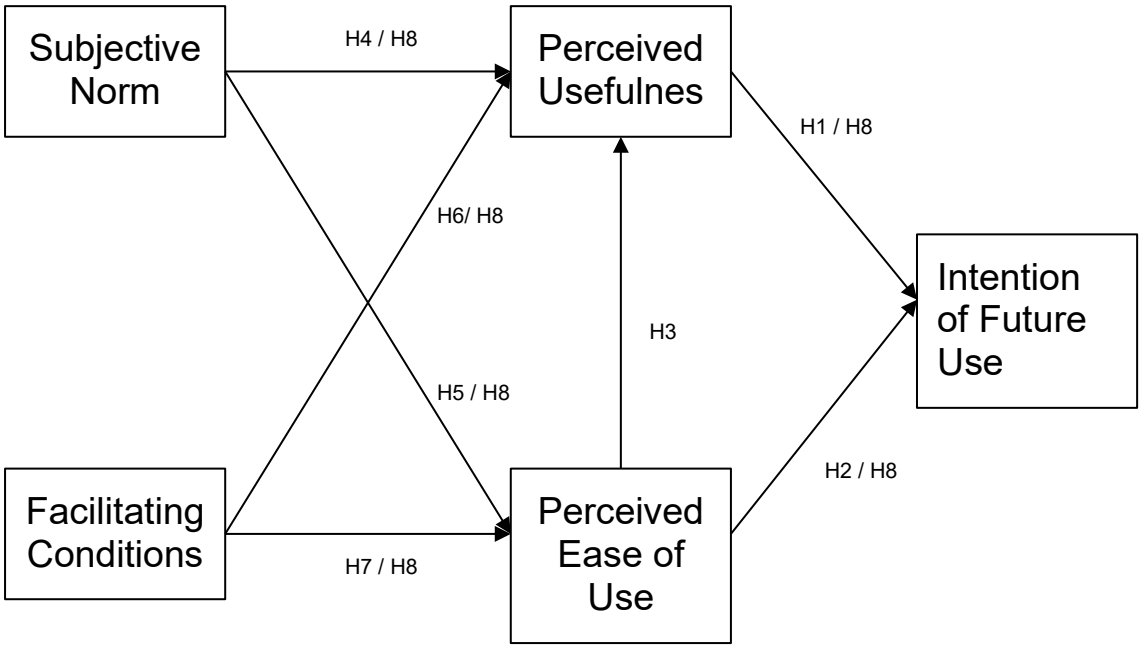
In our opinion, even though DE experience during COVID may have been negative for many teachers, it is important to reflect on the factors that influenced the acceptance (or non-acceptance) of DE during this time, to ensure the lessons learned influence the development of future iterations of DE provision. While the second wave of COVID-19 put teachers to the test from a more psychological point of view (Lizana & Lera, 2022), some studies have reported that teachers perceived a qualitative shift during the second wave, attributed to the support received by principals and colleagues (Barnová et al., 2021). Investigating this period offers insights that are less influenced by the initial shock and novelty of the first wave.

Guided by the GETAMEL framework, we are interested in understanding whether external factors of TAM, such as subjective norms and facilitating conditions, can have positive effects on the perceived ease of use and perceived usefulness of DE. To our knowledge these factors have not been considered until now in analysing preservice teachers' acceptance of DE.

In addition, we intend to verify whether internal factors already included in the TAM—perceived ease of use and perceived usefulness—predict the intention to use DE in the future. Our hypotheses are synthesized in Figure 1.

Figure 1

Research Model



Hypothesis 1 (H1): Perceived usefulness has a positive effect on intention of future use of DE.

Hypothesis 2 (H2): Perceived ease of use has a positive effect on intention of future use of DE.

Hypothesis 3 (H3): Perceived ease of use has a positive effect on perceived usefulness of DE.

Hypothesis 4 (H4): Subjective norm has a positive effect on perceived usefulness.

Hypothesis 5 (H5): Subjective norm has a positive effect on perceived ease of use.

Hypothesis 6 (H6): Facilitating conditions have a positive effect on perceived usefulness.

Hypothesis 7 (H7): Facilitating conditions have a positive effect on perceived ease of use.

Hypothesis 8 (H8): Perceived usefulness and perceived ease of use will mediate the relationship between subjective norm and facilitating conditions and intention of future use of DE

The results of the study will allow us to extract useful information to better understand the implications of using DE—especially for pre-service teachers—and to design more efficient DE settings for pre-service teachers' training.

Method

Participants

Participants in the study were enrolled in an Active Training Internship (ATI) that consisted of a theoretical and practical training period aimed at professionalizing teaching. At the end of the course, participants take a teaching qualification exam and obtain a professional qualification enabling them to apply for permanent teaching positions in lower secondary schools. The ATI course was delivered by the University of Bari and attended by 150 teachers (Female = 139; Age M = 37.11 years, SD = 7.19 years) with an average of 3.69 years (SD = 4.03 years) teaching experience.

Most participants were employed in the South of Italy (N = 141). Seventy-five participants taught in primary schools, 66 in lower secondary level, one in both grades, and seven were not employed in a teaching position at the time of data collection. Data collection was carried out exclusively online from February to March 2021. Teachers were contacted by members of the research team via emails containing information about the study, informed consent, and the survey link. All participants voluntarily signed their informed consent forms, allowing for the use of their data for the research. Ethical principles were observed throughout the study. Ethical committee approval was not deemed necessary as the data collected was concerning teaching approaches on a university course and since data were collected through an online questionnaire and no personal information was required other than age, gender, and school level.

Materials

A translated and adapted version of the Technology Acceptance Measure for Preservice Teachers (TAMPST) questionnaire (Teo, 2010b), one of the most used tools to study technological innovation acceptance, was used to explore factors influencing DE acceptance in school contexts. All items were first adapted, replacing the terms “computer” or “technology” with DE. Four additional items were included to capture a dimension entitled “The intention to use technology in the future,” inspired by Lee et al.’s (2017) questionnaire and assumed as an indicator of DE acceptance. A back-translation technique was used to ensure concordance between the English and the Italian versions. Items were translated from English into Italian, then from Italian back to English by a different translator. Finally, a native English speaker, not involved in any of the two previous steps, compared the two English versions (the original one and the translation) and inconsistencies were resolved. We called this new version of the questionnaire “Teacher’s Acceptance of Distance Education Scale” (TADES). TADES is composed of five subscales, measuring the constructs reported in Table 1. Items were measured on a seven-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree).

Table 1

TADES Subscales, Definition of the Constructs and Examples of Items

Subscales	Definition of constructs	Example scale items
Perceived Usefulness (PU; 4 items)	Degree to which a user perceives DE useful in teaching	Using Distance Education will improve my work
Perceived Ease of Use (PEU; 3 items)	Degree to which a user perceives DE is easy to use	I find Distance Education easy to use
Subjective Norm (SN; 2 items)	Degree to which a user perceives that others (e.g., a colleague) believe that DE should be used	People whose opinions I value will encourage me to use Distance Education
Facilitating Conditions (FC; 3 items)	Degree to which technical infrastructures support the use of DE	When I need to use Distance Education, a specific person is available to provide assistance
Intention for Future Use of DE (IFU; 4 items)	Degree to which a user has the intention to use DE in future teaching	In the future I will continue to use some tools for Distance Education

Data Analysis

Descriptive and correlational analysis of the data was conducted using IBM SPSS Statistics 29 (IBM SPSS Statistics, IBM Corporation). Based on a preliminary analysis, no univariate outliers were found. The multivariate outliers in the data were checked, using Mahalanobis distance (Tabachnick & Fidell, 1989) and only one participant was excluded because of the anomalous distribution of scores in the items, therefore, potentially capable of influencing the analyses. Mplus (version 8,6, Muthén & Muthén, 1998–2017) was used to conduct subsequent Confirmatory Factor analysis and Path Analysis. The factor structure of the TADES was verified by a Confirmatory Factor Analysis (CFA). We analysed the prerequisites for conducting CFA, to confirm the adequacy of the sample size and the sphericity of the relationships, through the KMO and Bartlett test. The Mardia test (TADE value = 323, greater than the critical value = 228) verified the non-normality of the multivariate distribution. Robust Maximum Likelihood Estimation was used. The estimation of the goodness of fit of the model was based on the following fit indexes: root-mean-square error of approximation (RMSEA), standardized root-mean-square residual (SRMR), and comparative fit index (CFI). Values between .97 and .1 for CFI, <.05 for RMSEA and SRMR suggest an excellent fit; values higher or equal to .95 and lower than .97 for CFI, between .05 and .08 for RMSEA and between .05 and .10 for SRMR suggest an acceptable fit (Schermelleh-Engel et al., 2003). We relied especially upon SRMR and CFI, because the

literature cautions against the use of RMSEA in the case of models with small degrees of freedom and small sample size, as in the present study. In these conditions, RMSEA often incorrectly indicates a poor-fitting model (Kenny et al., 2015). We used Average Variance Extracted (AVE: acceptable .50 excellent >.70) to assess Convergent Validity and the Fornell Larcker criteria to analyse Discriminant Validity. We also analyzed the internal consistency of the questionnaire using Cronbach's Alpha and McDonald's Omega. Finally, to verify the hypothesis of the study, we ran a Path Analysis. The estimation of the goodness of the model followed the criteria indicated above.

Results

Descriptive Analysis

Among the 149 participants entered in the final analysis, 109 (73.2%) did not receive any formal training before the use of DE in their teaching practice. This is not surprising in the Italian context since there is no formal obligation to participate in training about DE; therefore, we can consider this data as quite representative of Italian pre-service teachers. With reference to the delivery of DE used by the pre-service teachers in their teaching activity, 92 (61.7%) employed synchronous modes of delivery, 49 (32.9%) used approaches that combined synchronous and asynchronous delivery, and only two (1.3 %) used asynchronous communication as their core delivery style. Just one participant (0.7%) adopted a hybrid approach, combining in-person delivery to support a student with special educational needs, with simultaneous online delivery to the rest of the class. Five participants (3.35%) did not provide details of their delivery approach. Most participants (N = 112, 75%) reported using a variety of teaching strategies to support DE, combining front-led teaching with activities to promote students' interaction and active learning, such as group work, discussions, project work, and construction of products. Only 28 (18.8%) respondents reported using traditional lesson delivery approaches (i.e., front-led instruction only) with more passive student engagement and nine (6.04%) did not respond to the question.

Confirmatory Factor Analysis and Internal Reliability of TADES

Preliminary analysis checking the prerequisites for CFA confirmed the adequacy of the sample size (KMO= .81) and correlation among the variables (Bartlett's test= 475,85, p<.001). A Confirmatory Factor Analysis (CFA) was conducted to assess the factor structure of the TADES. Results of the CFA indicated an acceptable goodness of fit (CFI = .95; RMSEA = .075; SRMR = .056). With reference to Convergent Validity the values of AVE are for all construct >.50 (PU=0.732; PEU=0.592, SN=.760, FC= .698, BI=.783) showing an acceptable Convergent Validity of the scale. Concerning Divergent Validity, the Fornell Larcker table is shown in Table 2.

Table 2

Fornell Larcker Table

Constructs	PU	PEU	SN	FC	BI
PU	.855				
PEU	.648**	.769			

SN	.737**	.528**	.872		
FC	.449**	.428	.489**	.835	
BI	.866**	.700**	.712**	.370**	.885

**p<.01

As is possible to see, all the values of the correlations between the constructs are lower than the Square Root of AVE values (in gray), except for the correlation between PU and BI. It is possible to justify this exception by considering that in TAM literature, PU is the stronger predictor of BI (e.g. Han & Sa, 2012; Syahruddin et al. 2021). So, we can assume Divergent Validity as a property of the scale.

Internal reliability for the full questionnaire (Cronbach's Alpha .92) and five individual dimensions was satisfactory (see Table 3).

Table 3

Internal Consistency of TADES and its Subscales

TADES and subscales	Cronbach's Alpha	Mc Donald's Omega
TADES overall scale	.92	.94
Perceived Usefulness	.92	.92
Perceived Ease of Use	.81	.81
Subjective Norm	.86	(1)
Facilitating Conditions	.86	.87
Intention of Future Use of Distance Education	.85	.86

(1) Omega cannot be estimated because the number of elements is less than 3.

Correlational Analysis

The zero-order correlations between the constructs of the TADES were examined (see Table 4).

Table 4

Zero-Order Correlations for TADES

Constructs	1.	2.	3.	4.	5.
1.PU	-				
2. PEU	.648***	-			
3. SN	.737***	.528***	-		
4. FC	.449***	.428***	.489***	-	
5. IFU	.866***	.700***	.712***	.370***	-
M	3.97	4.50	3.34	3.18	4.32
SD	1.40	1.32	1.44	1.45	1.35

****p*<.001

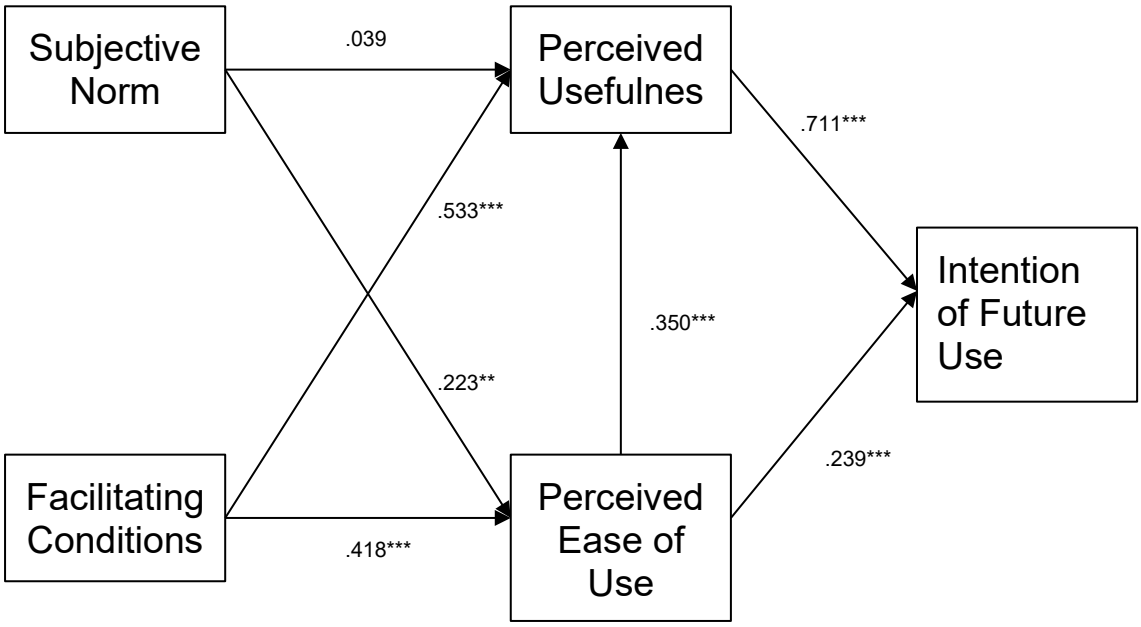
Table 4 indicates that, within the considered range (from 1 to 7), the values of intention for future use, subjective norm, and facilitating conditions tend towards the lowest levels of the Likert scale; whilst the values of perceived ease of use and perceived usefulness are close to the average value of the range (4). Significant positive correlations were evident between all variables. Perceived usefulness was positively correlated with perceived ease of use (r=.648, p<.001), subjective norm (r= .737, *p*<.001), facilitating conditions (r= .449, *p*<.001), and intention of future use of DE (r= .866, *p*<.001). Perceived ease of use was positively correlated with subjective norm (r= .528, *p*<.001), facilitating conditions (r= .428, *p*<.001), and intention of DE future use (r=.700, *p*<.001). Subjective norm was correlated with facilitating conditions (r= .489, *p*<.001) and intention of DE future use (r=.712, *p*<.001). Finally, facilitating conditions correlated with intention of DE future use (r=.370, *p*<.001).

Path Analysis

A structural equation model was used to test the proposed research model and hypotheses. For the observed variables, the model was found to offer an acceptable fit for the data ($\chi 2(2) = 7.53$, $p > .05$; RMSEA = 0.14 CFI = 0.98; SRMR= 0.02). The variance explained by the model ranged from moderate (R2 = 0.32 for perceived ease of use) to high (R2 = 0.78 for intention of future use of DE, R2 = 0.64 for perceived usefulness). The standardized path coefficients are reported in Figure 3 and described below.

Figure 3

Research Model with the Standardized Path Coefficients



Standardized path coefficients. * = $p < .05$; ** $p < .01$; *** = $p < .001$.

As shown in Figure 3, the standardized coefficients indicated that the paths between perceived usefulness and perceived ease of use to intention of future use of DE attained statistical significance (β = .711, $p < .001$ and β = .239, $p < .001$, respectively). Moreover, the standardized coefficient relating perceived ease of use to perceived usefulness was statistically significant (β = .350, $p < .001$). While the standardized coefficient relating subjective norm to perceived ease of use was statistically significant (β = .223, $p < .01$), the path from subjective norm for perceived usefulness was not statistically significant (β = .039, $p > .05$). Finally, for facilitating conditions the standardized coefficients of the paths between both perceived usefulness and perceived ease of use were statistically significant (β = .533, $p < .001$ and β = .418, $p < .001$, respectively). In sum, the analysis of direct paths provided support for the hypotheses tested, except for H4 (the influence of subjective norm on perceived usefulness).

The indirect influence of subjective norm on intention of future use of DE, via perceived ease of use and perceived usefulness (H8) was tested. Significant indirect effects were found via perceived ease of use (standardized estimate = 0.053, $p < .01$; bootstrap 95% CI = 0.021 – 0.086) and via both perceived usefulness and perceived ease of use (standardized estimate = 0.056, $p < .05$; bootstrap 95% CI = 0.020 – 0.91). The indirect effect through perceived usefulness alone (standardized estimate = 0.028, $p > .05$; bootstrap 95% CI = -0.036- 0.091) was not statistically significant. Finally, we tested the indirect influence of facilitating conditions on intention for future use of DE via perceived ease of use and perceived usefulness (H8). Statistically significant indirect effects were evident through perceived usefulness (standardized estimate = 0.38, $p < .01$; bootstrap 95% CI = 0.298 – 0.460), perceived ease of use (standardized estimate = 0.10, $p < .01$; bootstrap 95% CI = 0.058 – 0.142) and through both variables, perceived usefulness and perceived ease of use (standardized estimate = 0.104, $p < .01$; bootstrap 95% CI = 0.061 – 0.148). In sum, the

analysis of the indirect effects showed partial support for H8. All tested indirect effects, except for the path from subjective norm to intention of future DE use via perceived usefulness, were statistically significant.

Discussion

The aim of this study was to verify which factors may influence the acceptance of DE in Italian pre-service secondary school teachers. Drawing on an enriched TAM, the findings confirmed that perceived usefulness (H1) and perceived ease of use (H2) positively affect the intention to use DE in the future. Furthermore, our results showed that perceived ease of use influences perceived usefulness (H3) and that the influence of two external factors, subjective norm (H5) and facilitating conditions (H7), impact perceived ease of use. While facilitating conditions (H6) influence perceived usefulness, subjective norm has no significant impact (H4). Finally, perceived usefulness and perceived ease of use mediate the relationship between facilitating conditions and intention of future use of DE. A significant mediation was also found between subjective norm and intention of future use of DE, via perceived ease of use (H8).

Among all predictors, perceived usefulness emerged as the stronger predictor of the intention to use DE in the future for preservice secondary school teachers. This result confirms previous studies (e.g. Han & Sa, 2012; Syahruddin et al. 2021) highlighting that DE's perceived usefulness positively affects the acceptance of and the intention to use it in the future. This suggests that for pre-service teachers to adopt DE as an innovation in their practice, they need to be reassured that DE can effectively improve their teaching performance. Therefore, pre-service teachers who found DE useful during the second phase of lockdown are more likely to see the value in continuing to use it in their teaching post pandemic.

Interestingly, during the COVID-19 pandemic, DE was primarily delivered through synchronous modes of delivery (for 61% of the preservice teachers). While there was the risk that this would undermine the flexibility normally associated with online learning, it did not reduce the perception of perceived usefulness. This is reflected in the average score for perceived usefulness (3.97 on a 7-point Likert scale). It is plausible that, under conditions of enforced isolation, perceptions of usefulness were based on the opportunity to continue training, rather than on the flexibility of asynchronous online learning.

The present study also confirmed that perceived ease of use influences the intention to use DE in the future. This finding is consistent with other studies across different educational levels (e.g. Al - Al-Alak & Alnawas, 2011; Hong et al., 2021). Conversely, this means that teachers may reject DE if it is perceived as difficult to integrate with their teaching practices. Hong et al. (2021) suggest that pre-service teachers may lack the confidence and ability to use educational technology, instead choosing face-to-face communication and teaching as the preferred approaches in their teaching practices. In such cases, educational technology's simplicity and ease of use would enhance pre-service teachers' willingness to use DE.

Consistent with previous studies, our findings confirm that perceived ease of use influences perceived usefulness (Hong et al.2021; Kelly, 2014). This implies that if DE is difficult to use, it is unlikely to be considered useful, and without perceived usefulness, pre-service teachers are less inclined to adopt and use it (Attis, 2014). Conversely, if DE is easy

to use and perceived as useful, pre-service teachers could be more willing to use it during more critical situations, such as a lockdown, as well as during their normal experience of teaching. This finding has important implications for software developers who should ensure that any proposed educational technologies are easy to use and align with teachers' digital competencies.

An interesting finding of this study concerns the mixed influence of subjective norm on perceived ease of use and perceived usefulness. Other studies, conducted prior to the pandemic period, showed that social influence (a factor very similar to subjective norm in TAM) did not have any effect on perceived ease of use and perceived usefulness (e.g. Elkaseh et al. 2015). For our pre-service teachers, subjective norm appears to have had a positive effect on the perceived ease of use. This may be due to the collaborative support teachers received during the pandemic, as suggested by Sari and Nayir (2021), which helped them navigate DE more effectively. In contrast, perceived usefulness of DE appears to need direct personal experience by the pre-service teachers, and it may therefore not be a result of an action of social influence as foreseen by the subjective norm factor. Consequently, as highlighted by our findings, only perceived ease of use mediates the effect of subjective norm on the intention to use DE in the future.

The significant impact of facilitating conditions on both perceived ease of use and perceived usefulness, and their subsequent mediation of the intention use of DE, highlights the strategic function of this factor during the pandemic. Findings are consistent with previous studies showing the influence of this factor on the intention to use online education (e.g. Waheed & Jam, 2010). Our results suggest that support from the organization should help to promote DE as useful and avoid any complexity in its implementation and use for teaching.

Relatedly, our results emphasize the need for organizations to offer specific training to encourage and support pre-service teachers to move out of their comfort zone and adopt more digital opportunities. Pre-service teachers involved in our study did not have any experience with DE before the first lockdown; therefore, for most of them, the transition towards this new way of teaching was not supported by specific training on digital skills and/or pedagogy. This point has already been highlighted by similar Italian studies, where a lack of digital training was noted in schoolteachers (Giovannella et al., 2020) and university teacher samples (Cacciamani et al., 2022). The different degrees of intention to use DE in the future were subordinate to previous DE experiences, teaching flexibility, and specific training received. To have a better understanding of this point, pre-service teachers with and without previous experiences of the use of DE should be compared. For now, we can only limit ourselves to emphasizing how the absence of specific training makes the acceptance of technological innovations more complex and recommend that teacher training programs include a specific space for the psycho-pedagogical use of technologies.

The role specific training may play in contributing to teachers' DE use has been previously highlighted (Whalen, 2020) but as yet is not sufficiently considered as relevant within teacher training programs. Teachers' need for specialized training is widely reported in the literature. For instance, McCannon and Crews (2000) found that even teachers already using technology need specific training. Teachers often use technology largely for administrative tasks rather than as an integral part of the student learning process. This use of digital technology may provide teachers with an overly optimistic perspective of their own digital skills and in the case of the teachers sampled by McCannon and Crews (2000), may explain why they did not openly express a training need despite the recommendation from the

researchers that staff required support to integrate technology in their teaching strategies. This highlights that teachers' training should be carefully designed, not as sporadic events, with experts offering sustained learning that encapsulates theories, methods, and experiences. In the Italian context, teachers' training is delivered during meetings lasting a few hours, almost always delivered in a traditional lesson mode—whether online or in person—without giving teachers the possibility of monitoring a real transition from what is covered during the lessons to what actually happens in their classroom. Nevertheless, when teachers can participate in a high-quality training program, results confirm the successful impact of the training course on teachers' acceptance of digital tools and practices (Compagnoni, 2022). It is, therefore, clear that high-quality training is needed to truly change teaching practices, supported by powerful reforms (DeMonte, 2013).

The intention to adopt online teaching also plays a relevant role. This dimension, as Tandon (2021) clarifies, is strongly affected by social influence. It is possible that our pre-service teachers made their decisions on whether to accept DE based on the cultural and social conditions connoting their professional contexts. In general, Italian schools are not encouraging the use of DE due to several reasons. In a comparative study conducted by Trevisan and colleagues (Trevisan et al., 2022), Italian teachers reported being less comfortable with DE than their American colleagues, despite the similarities regarding the relevance assigned to the perceptions of institutional support, specific training, and the value both Italian and American teachers assigned to professional development.

Within the cultural dimension, families also play a significant role. Several studies (Author et al., 2022; Cadamuro et al, 2021; Menabò et al, 2022) report that DE in Italy has not been readily accepted by families (Scarpellini et al, 2021) contributing to teacher burnout (Bianchi & Caso, 2022). Furthermore, a recent study (Argentin, 2022) reported that Italian teachers during and after the COVID-19 pandemic recorded a decrease of their job satisfaction, mainly due to a higher workload and a less satisfying relationships with families and colleagues within schools. Nevertheless, teachers demonstrated resilience, as reflected in Argentin's (2022) description of them as "bending but not breaking." While this resilience is encouraging, it does not guarantee that teachers will fully embrace the opportunities offered by DE.

Conclusions

From the perspective of advancing TAM research, this study offers a significant contribution to the influence of facilitating conditions and subjective norms on the acceptance of DE specifically by pre-service teachers. To our knowledge, these factors have not been previously considered in TAM studies with respect to pre-service teachers DE acceptance.

Drawing on our findings and the post-COVID literature concerning Italian teacher's use of DE, and despite the variety in terms of different instructional contexts (e.g. University vs. School) and different degrees of acceptance and use of DE, we can conclude that there is a general convergence between our results and those emerging from the related literature on the following four points:

(a) The relevance of the following four dimensions in promoting future intention of using DE: perceived usefulness, perceived ease of use, facilitating conditions and, in part, subjective norm;

(b) The relevance of high-quality training based on psycho-pedagogical models within which to frame the use of technology (Author et al., 2022; Capperucci et al., 2022; Giberti, 2022; Menabò et al., 2022);

(c) Teachers' capability to face the critical situation is often based on personal resources such as self-efficacy and resilience (Manuti et al., 2022; Guzzo et al., 2002; Porru et al., 2022; Şensin & du Mérac, 2020)

(d) Teachers are more inclined to adopt blended solutions, where DE is integrated in face-to-face teaching strategies rather than pure DE (Menabò et al., 2022; Guzzo et al., 2023; Pozzi et al., 2023; Taglietti et al., 2021).

Taken together, a rather interesting profile of the Italian pre-service teacher emerges. They are open to innovations—such as DE—provided they perceive them as useful, easy to use, attuned to their personal visions of teaching, and their existing skillsets. This implies that the general model of DE acceptance could be enriched by assigning more relevance to more psychological dimensions, such as self-efficacy. From a practical point of view, this conclusion suggests that the four factors, positively influencing DE adoption in this study, namely perceived usefulness, perceived ease of use, facilitating conditions and in part subjective norm, should be considered as crucial to creating a learning environment favorable for DE's long-term adoption by pre-service teachers.

Teachers and, even more importantly, school leaders and educational institutions, should take into consideration these factors when they want to encourage teaching and learning at a distance. Furthermore, the role of cultural context should also be considered. Future research could explore the role played by the general culture of the institution where the teachers work on how DE and the use of digital resources is perceived. Similarly, it could be interesting to consider the point of view of students and parents and how much they may influence teachers' DE acceptance. These dimensions could also be considered by software developers, to design digital environments aimed at encouraging teachers' DE adoption, involving more actively also students and families.

A few recommendations can be drawn from our results. First, a practical recommendation concerns pre-service teachers' training that should consider how technology is perceived by teachers and the conditions that make it more acceptable. It is no longer possible to consider pre-service teacher training separately from the use of technology. To emphasize this aspect, it is necessary to focus not only on digital skills or digital literacy. It is necessary to consider pre-service teachers' conceptual framework regarding the professional use of technology—which often differs from the framework adopted for personal use (Sansone et al., 2024). Furthermore, it is necessary to highlight the contextual conditions surrounding DE, such as logistical, cultural, and relational support.

This study contributes to understanding the factors that are impacting the adoption of DE by pre-service teachers; nevertheless, a few limitations should be acknowledged. First, the sample is limited and unbalanced from the perspective of gender, since most participants are female. This was unavoidable since Italian teaching staff are composed predominantly of women and our sample reflects this unbalanced national distribution. This is a source of reflection since gender is one of the most investigated factors in relation to technology (Sander, 2005). Most studies concerning attitudes toward technology have found that gender differences are relatively small at younger ages but increase with age (Else-Quest, 2010; Goswami & Dutta, 2015). Since it is almost impossible in our national context to have a

balanced sample in terms of gender, it would be interesting to inquire about changes of attitude for our female teachers along their educational trajectory as well as according to their training and teaching experience. This could seed insights on the socialization processes impacting technology use and its impact on DE acceptance. A longitudinal study should be considered a future research development.

Second, the sample is in a Southern Italian region; this makes the results not generalizable, and we had no intention to do so. Rather, we wanted to obtain an articulated understanding of DE acceptance, whilst also considering cultural and contextual characteristics. The gap between North and South is known in many countries and Italy is no exception, although lately Musolino (2018) has underlined that the "perception gap" is bigger than the "reality gap." The author claims that the Southern Italy stereotype is much too negative and does not reflect reality. Future research should consider the differences between North and South considering teachers' DE acceptance to confirm or not the "digital divide" implied by the stereotype. It should also be noted that the pandemic had heavier effects in the North of Italy compared to the South and this may have influenced DE acceptance more than the regional location. As noted, we recognize the limitation in terms of external validity and generalizability, but the characteristics of our sample allow us to reflect upon cultural, social, and gender-specific factors that are not fully representative of broader populations.

Third, we acknowledge that the data collection for this study was undertaken during the COVID-19 restrictions. The extended periods of enforced online teaching and learning provided a unique opportunity for educators to gain experience of and reflect on DE approaches, and therefore the findings of this study present value in framing potential post-pandemic considerations of DE adoption and integration.

For future research, we will expand the sample and explore contextual dimensions, such as institutional attitudes toward DE, school location (North vs. South), educational level (primary vs. higher education), and subject area. These research directions can deepen our understanding of the conditions necessary for integrating DE education post pandemic. In addition, it will be useful to clarify whether DE and other forms of technology-mediated education—such as blended learning—should be considered as competitive, alternative or overlapping models. Finally, new directions of inquiry may focus also on the design of different kinds of DE or blended learning environments, based, for example, on problem-based learning, project-based learning, and/or knowledge building (e.g. Saputra et al, 2019; Author et al., 2024; Tan et al., 2021), in order to identify which theoretical model can better promote teacher's acceptance of DE.

Declarations

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Al-Alak, B. A., & Alnawas, I. A. M. (2011). Measuring the acceptance and adoption of e-learning by academic staff. *Knowledge Management and E-Learning, 3*(2), 201–221.https://doi.org/10.34105/j.kmel.2011.03.016

Amenduni, F., & Ligorio, M. B. (2022). Blended learning and teaching in higher education: An international perspective. *Education Sciences, 12*(2), 129 https://doi.org/10.3390/educsci12020129

Argentin, G. (2022). Bending but not breaking. The COVID-19 pandemic and teacher job satisfaction. *Rassegna Italiana di Sociologia, 63*(3), 621–648.

Attis, J. (2014). An investigation of the variables that predict teacher e-learning acceptance [Liberty University]. https://doi.org/10.1017/CBO9781107415324.004

Barbaranelli, C. (2002). *Analisi dei Dati. Tecniche Multivariate per la Ricerca Psicologica.* Led: Milano.

Barnová, S., Krásna, S., Gabrhelová, G., & Dušek, J. (2021). Teachers' experiences gained during the second wave of the COVID-19 pandemic. In ICERI2021 Proceedings (pp. 6312–16). IATED.

Bianchi, M. & Caso, D. (2022). Distance learning during COVID-19 pandemic: Italian teachers' well-being and the role of age on ICT adoption. *Italian Journal of Applied Statistic, 33,* 177–198.

Cacciamani, S., Villani, D., Bonanomi, A., Carissoli, C., Olivari, M. G., Morganti, L., ... & Confalonieri, E. (2018). Factors affecting students' acceptance of tablet PCs: A study in Italian high schools. *Journal of Research on Technology in Education, 50*(2), 120–133. https://doi.org/10.1080/15391523.2017.1409672

Cacciamani, S., Cesareni, D., Buglass, S. L., & Ligorio, M. B. (2022). The acceptance of distance education by Italian university teachers during the COVID-19 lockdown. *Qwerty-Open and Interdisciplinary Journal of Technology, Culture and Education, 17*(1): 11–27. https://doi.org/10.30557/QW000048

Cacciamani, S., Perrucci, V., Khanlari, A., & Balboni, G. (2023). Sense of community and peer feedback in a blended university course. *Education and Information Technologies,* 113. https://doi.org/10.1007/s10639-023-11982-4

Cadamuro, A., Bisagno, E., Rubichi, S., Rossi, L., Cottafavi, D., Crapolicchio, E., & Vezzali, L. (2021). Distance learning and teaching as a consequence of the COVID-19 pandemic: A survey of teachers and students of an Italian high school taking into account technological issues, attitudes and beliefs toward distance learning, metacognitive skills. *Journal of e-Learning and Knowledge Society, 17*(1), 81–89.

Cairney, P., & Kippin, S. (2022). The future of education equity policy in a COVID-19 world: A qualitative systematic review of lessons from education policymaking. *Open Research Europe, 1*,78. https://doi.org/10.12688/openreseurope.13834.2

Capperucci, D., Scierri, I. D. M., Salvadori, I., Batini, F., Toti, G., Barbisoni, G., & Pera, E. (2022) Remote teaching during COVID-19 emergency: Teaching and assessment strategies and the role of previous training. *Education Sciences 12*(10), 646. https://doi.org/10.3390/educsci12100646

Chuttur, M. (2009). Overview of the technology acceptance model: Origins, developments and future directions. All Sprouts Content, 290. https://aisel.aisnet.org/sprouts_all/290

Compagnoni, I. (2022). The impact of a post-pandemic educational technology training on usability and acceptance by teachers of Italian as a foreign language. *Italiano LinguaDue, 14*(2), 425–444. https://doi.org/10.54103/2037-3597/19623

De Monte, J. (2013). High-quality professional development for teachers: Supporting teacher training to improve student learning. Center for American Progress.

Elkaseh, A. M., Wong, K. W., & Fung, C. C. (2015). The acceptance of e-learning as a tool for teaching and learning in Libyan higher education. *International Journal of Information Technology, 3(*4), 1–11.

Else-Quest, N. M., Hyde, J. S., & Linn, M. C. (2010). Cross-national patterns of gender differences in mathematics: A meta-analysis. *Psychological Bulletin, 136*(1), 103–127. https://doi.org/10.1037/a0018053

Faridah, L., Ekawardhani, S., Wiraswati, H. L., Fauziah, N., Aviani, J. K., & Ramadan, D. (2021). Experiences and challenges of distance learning during COVID-19 pandemic from educators' point of view: A review. *Education Quarterly Reviews, 4*(3), 468–83. https://doi.org10.31014/aior.1993.04.03.354

Kamal, S. A., Shafiq, M., & Kakria, P. (2020). Investigating acceptance of telemedicine services through an extended technology acceptance model (TAM). *Technology in Society, 60,* 101212. https://doi.org/10.1016/j.techsoc.2019.101212

Fussell, S. G., & Truong, D. (2021). Accepting virtual reality for dynamic learning: An extension of the technology acceptance model. *Interactive Learning Environments, 31*(9), 5442–59 https://doi.org/10.1080/10494820.2021.2009880

Giberti, C. (2022). A teacher training project to promote mathematics laboratory during the COVID-19 health crisis in Italy. *European Journal of Science and Mathematics Education, 10*(3), 256–268. https://doi.org/10.30935/scimath/11837

Giovannella, C., Passarelli, M., & Persico, D (2020). The effects of the COVID-19 pandemic on Italian learning ecosystems: The school teachers' perspective at the steady state. *ID&A Interaction Design & Architecture (s), 45*, 264–86. https://doi.org/10.55612/s-5002-045-012

Goswami, A., & Dutta, S. (2015). Gender differences in technology usage—A literature review. *Open Journal of Business and Management, 4*(1), 51-59. https://doi.org/10.4236/ojbm.2016.41006

Guzzo, T., Boffo, S., Ferri, F., Gagliardi, F., & Grifoni, P. (2022). Towards quality digital learning: Lessons learned during COVID-19 and recommended actions—The teachers' perspective. *Sustainability, 14,* 8438. https://doi.org/10.3390/su14148438

Guzzo, T., Caschera, M. C.., Ferri, F., &, Grifoni, P. (2023). Analysis of the digital educational scenario in Italian high schools during the pandemic: Challenges and emerging tools. *Sustainability, 15*(2), 1426. https://doi.org/10.3390/su15021426

Hoofman, J., & Secord, E. (2021). The effect of COVID-19 on education. *Pediatric Clinics*, 68(5), 1071–79. https://doi.org/10.1016/j.pcl.2021.05.009

Hong, X., Zhang, M., & Liu, Q. (2021). Preschool teachers' technology acceptance during the COVID-19: An adapted technology acceptance model. *Frontiers in Psychology, 12*, 691492. https://doi.org/10.3389/fpsyg.2021.691492

Ifenthaler, D., & Schweinbenz, V. (2013). The acceptance of Tablet-PCs in classroom instruction: The teachers' perspectives. *Computers in human behavior*, *29*(3), 525–534. https://doi.org/10.1016/j.chb.2012.11.004

Kelly, H. (2014). A path analysis of educator perceptions of open educational resources using the technology acceptance model. *International Review of Research in Open and Distributed Learning, 15*(2), 26–42. https://doi.org/10.19173/irrodl.v15i2.1715

Kenny, D. A., Kaniskan, B., & McCoach, D. B. (2015). The performance of RMSEA in models with small degrees of freedom. *Sociological Methods & Research, 44*(3), 486–507. https://doi.org/10.1177/0049124114543236

Kerres, M., & Buchner, J. (2022). Education after the pandemic: What we have (not) learned about learning. *Education Sciences, 12*(5), 315. https://doi.org/10.3390/educsci12050315

Kumar, A., Krishnamurthi, R., Bhatia, S., Kaushik, K., Ahuja, N. J., Nayyar, A., & Masud, M. (2021). Blended learning tools and practices: A comprehensive analysis. *IEEE Access, 9,* 85151-85197. https://doi.org/10.1109/ACCESS.2021.3085844

Lavidas, K., Petropoulou, A., Papadakis, S., Apostolou, Z., Komis, V., Jimoyiannis, A., & Gialamas, V. (2022). Factors affecting response rates of the web survey with teachers. *Computers, 11*(9), 127. https://doi.org/10.3390/computers11090127

Lee, D. C., Lin, S. H., Ma, H. L., & Wu, D. B. (2017). Use of a modified UTAUT model to investigate the perspectives of internet access device users. *International Journal of Human-Computer Interaction, 33*(7), 549–56. https://doi.org/10.1080/10447318.2016.1261249

Lizana, P. A., & Lera, L. (2022). Depression, anxiety, and stress among teachers during the second COVID-19 wave. *International Journal of Environmental Research and Public Health, 19*(10), 5968. https://doi.org/10.3390/ijerph19105968

Luo, Z. (2024). Factors contributing to teachers' acceptance intention to gamified EFL tools: A scale development study. *Educational Technology Research and Development*, 1–31. https://doi.org/10.1007/s11423-023-10249-6

Manis, K. T., & Choi, D. (2019). The virtual reality hardware acceptance model (VR-HAM): Extending and individuating the technology acceptance model (TAM) for virtual reality hardware. *Journal of Business Research, 100*, 503–13. https://doi.org/10.1016/j.jbusres.2018.10.021

Manuti, A., Giancaspro, M. L., Gemmano, C. G., & Morrelli, F. (2022). Coping with the unexpected: A job demands/resources study exploring Italian teachers' remote working experience during the COVID-19 lockdown. *Teaching and Teacher Education: Leadership and Professional Development, 1,* 100010. https://doi.org/10.1016/j.tatelp.2022.100010

Masalimova, A R., Khvatova, M. A., Chikileva, L. S., Zvyagintseva, E. P., Stepanova, V. V., & Melnik, M. V. (2022). Distance learning in higher education during COVID-19. *Frontiers in Education, 7.* https://doi.org/10.3389/feduc.2022.822958

Megahed, N., & Hassan, A. (2022). A blended learning strategy: Reimagining the post-COVID-19 architectural education. Archnet-*IJAR: International Journal of Architectural Research, 16*(1), 184–202. https://doi.org/10.1108/ARCH-04-2021-0081

Menabò, L., Sansavini, A., Brighi, A., Skrzypiec, G., & Guarini, A. (2021). Promoting the integration of technology in teaching: An analysis of the factors that increase the intention to use technologies among Italian teachers. *Journal of Computer Assisted Learning, 37*(6), 1566–77. https://doi.org/10.1111/jcal.12554

Menabò, L., Skrzypiec, G., Sansavini, A., Brighi, A., & Guarini, A. (2022). Distance education among Italian teachers: Differences and experiences. *Education and Information Technologies, 27(*7), 9263–92. https://doi.org/10.1007/s10639-022-11008-5

McCannon, M., & Crews, T. B. (2000). Assessing the technology training needs of elementary school teachers. *Journal of Technology and Teacher Education, 8*(2), 111–121.

Mushtaha, E., Dabous, S. A., Alsyouf, I., Ahmed, A., & Abdraboh, N. R. (2022). The challenges and opportunities of online learning and teaching at engineering and theoretical colleges during the pandemic. *Ain Shams Engineering Journal, 13*(6), 101770. https://doi.org/10.1016/j.asej.2022.101770

Musolino, D. (2018). The north-south divide in Italy: Reality or perception?. *European Spatial Research and Policy, 25*(1), 29-53. https://doi.org/10.18778/1231-1952.25.1.03

Nurkhin, A., & Saputro, I. H. (2021, February). Teacher's intention to use online learning; An extended technology acceptance model (TAM) investigation. *Journal of Physics: Conference Series* (Vol. 1783, No. 1, p. 012123). IOP Publishing. https://doi.org/10.1088/1742-6596/1783/1/012123

Papadakis, S. (2023). MOOCs 2012–22: An overview. *Advances in Mobile Learning Educational Research, 3*(1), 682–693. https://doi.org/10.25082/AMLER.2023.01.017

Porru, A., Dicataldo, R., Leo. I., Roch, M., & Lucangeli, D. (2022). Back to school: Italian teachers' perceptions of the impact of COVID-19 on personal and social well-being and teaching methods. *International Journal of Environmental Research and Public Health, 19*(18), 11652. https://doi.org/10.3390/ijerph191811652

Pozzi, F., Manganello, F., & Persico, D. (2023). Collaborative learning: A design challenge for teachers. *Education Sciences, 13*(4), 331. https://doi.org/10.3390/educsci13040331

Rizun, M., & Strzelecki, A. (2020). Students' acceptance of the COVID-19 impact on shifting higher education to distance learning in Poland. *International Journal Of Environmental Research and Public Health*, *17*(18), 6468. https://doi.org/10.3390/ijerph17186468

Saputra, M. D., Joyoatmojo, S., Wardani, D. K., & Sangka, K. B. (2019). Developing critical-thinking skills through the collaboration of jigsaw model with problem-based learning model. *International Journal of Instruction, 12*(1), 1077–94. https://doi.org/10.29333/iji.2019.12169a

Sanders, J. (2005). *Gender and technology in education: A research review*. Seattle: Center for Gender Equity. https://doi.org/10.4135/9781848607996.n23

Sansone, N., Fabbri, M., & Bortolotti, I. (2024). Boundary devices for reflexive teachers. *Education Sciences, 14,* 60. https://doi.org/10.3390/educsci14010060

Sari, T., & Nayır, F. (2020). Challenges in distance education during the (COVID-19) pandemic period. *Qualitative Research in Education, 9*(3), 328–360. https://doi.org/10.17583/qre.2020.5872

Scarpellini, F., Segre, G., Cartabia, M., Zanetti, M., Campi, R., Clavenna, A., & Bonati, M. (2021). Distance learning in Italian primary and middle school children during the COVID-19 pandemic: A national survey. *BMC Public Health 21*(1): 1035. https://doi.org/10.1186/s12889-021-11026-x

Şensin, C., & du Mérac, É. R. (2020). A good scare is worth more than good advice: Educational regulations in Italy and Turkey after COVID-19. *International Journal of Social Sciences and Education Research, 6*(3), 42–42. https://doi.org/10.24289/ijsser.785757

Schermelleh-Engel, K., Moosbrugger, H., & Müller, H. (2003). Evaluating the fit of structural equation models: Tests of significance and descriptive goodness-of-fit measures. *Methods of Psychological Research Online, 8*(2), 23–74

Son, C., Hegde, S., Smith, A., Wang, X., & Sasangohar, F. (2020). Effects of COVID-19 on college students' mental health in the United States: Interview survey study. *Journal of Medical Internet Research, 22* (9), e21279. https://doi.org/10.2196/21279

Syahruddin, S., Yaakob, M. F. M., Rasyad, A., Widodo, A. W., Sukendro, S., Suwardi, S., ... & Syam, A. (2021). Students' acceptance to distance learning during Covid-19: the role of geographical areas among Indonesian sports science students. *Heliyon*, *7*(9). https://doi.org/10.1016/j.heliyon.2021.e08043

Tabachnick, B. G., & Fidell, L.S. (1989). *Using multivariate statistics.* New York: Harper Collins.

Taglietti, D., Landri, P., & Grimaldi, E. (2021). The big acceleration in digital education in Italy: The COVID-19 pandemic and the blended-school form. *European Educational Research Journal, 20*(4), 423–41. https://doi.org/10.1177/14749041211021246

Tan, S. C., Chan, C., Bielaczyc, K., Ma, L., Scardamalia, M., & Bereiter, C. (2021). Knowledge building: Aligning education with needs for knowledge creation in the digital age. *Educational Technology Research and Development, 69*, 2243–66. https://doi.org/10.1007/s11423-020-09914-x

Tandon, U. (2021). Factors influencing adoption of online teaching by schoolteachers: A study during COVID-19 pandemic. *Journal of Public Affairs, 21*(4), e2503. https://doi.org/10.1002/pa.2503

Teo, T. (2010a). Development and validation of the e-learning acceptance measure (ElAM). *The Internet and Higher Education, 13*(3), 148–152. https://doi.org/10.1016/j.iheduc.2010.02.001

Teo, T. (2010b). The development, validation, and analysis of measurement invariance of the technology acceptance measure for preservice teachers (TAMPST*). Educational and*

Psychological Measurement, 70(6), 990–1006. https://doi.org/10.1177/0013164410378087

Trevisan, O., De Rossi, M., Christensen, R., & Knezek, G. (2022, June). Towards a new normalcy: Faculty responses to distance education in Italy and the USA. In *EdMedia+ Innovate Learning* (pp. 872–78). Association for the Advancement of Computing in Education (AACE).

Waheed, M., & Jam, F. A. (2010). Teacher's intention to accept online education: Extended TAM model. *Interdisciplinary Journal of Contemporary Research in Business, 2*(5), 330–44.

Veiga, F. J. M., & Andrade, A.M. V. D. (2021). Critical success factors in accepting technology in the classroom. *International Journal of Emerging Technologies in Learning, 16*(18), 4–22. https://doi.org/10.3991/ijet.v16i18.23159

Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research, 11*(4), 342–65. https://doi.org/10.1287/isre.11.4.342.11872

Venkatesh, V., & Davis, F. D. (1996). A model of the antecedents of perceived ease of use: Development and test. *Decision Sciences, 27*(3), 451–481. https://doi.org/10.1111/j.1540-5915.1996.tb01822.x

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science, 46*(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926

Venkatesh, V., Thong, J. Y. L., & Xu, X. (2012), Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology. *MIS Quarterly, 36*(1), 157–178. https://doi.org/10.2307/41410412

Xie, K., Di Tosto, G., Chen, S. B., & Vongkulluksn, V. W. (2018). A systematic review of design and technology components of educational digital resources. *Computers & Education, 127*, 90–106. https://doi.org/10.1016/j.compedu.2018.08.011

Whalen, J. (2020). Should teachers be trained in emergency remote teaching? Lessons learned from the COVID-19 pandemic. *Journal of Technology and Teacher Education, 28*(2), 189–99. https://doi.org/10.70725/307718pkpjuu

Yee, M. L. S., & Abdullah, M. S. (2021). A review of UTAUT and extended model as a conceptual framework in education research. *Jurnal Pendidikan Sains Dan Matematik Malaysia, 11*, 1–20. https://doi.org/10.37134/jpsmm.vol11.sp.1.2021