International Journal of Learning, Teaching and Educational Research
Vol. 23, No. 4, pp. 354-375, April 2024
https://doi.org/10.26803/ijlter.23.4.19
Received Feb 23, 2024; Revised Apr 8, 2024; Accepted Apr 23, 2024

Effects of Facilitating Condition, Social Influence and Self-Efficacy on Science Teachers' Integration of Digital Technology in South Africa: A Regression-Based Approach

Samuel Jere* and Mamotena Mpeta
Department of Professional and Curriculum Studies, University of Venda
Thohoyandou, South Africa

Abstract. The ongoing failure to raise academic achievement in certain science subjects across rural areas of South Africa necessitates the consideration of technology-enhanced instructional approaches, as such strategies can augment learners' understanding. Therefore, this study aimed to investigate the integration of digital technologies in teaching sciences in a rural district of South Africa. The study was guided by the unified theory of acceptance and use of technology as the theoretical framework. A cross-sectional survey was used to collect quantitative data. The research instrument was a questionnaire related to science teachers' integration of digital technology. The sample size was 158 participants, who were selected using convenience sampling. Data were analysed using descriptive statistics and stepwise multiple linear regression. The study found that science teachers' integration of digital technology was moderate. Stepwise multiple linear regression revealed that facilitating condition (β = 0.446, t = 6.088, p < .05) was the most important predictor of teachers' integration of digital technology, followed by self-efficacy (β = 0.295, t = 4.857, p < .05) and social influence (β = 0.160, t = 2.213, p < .05). The study offers insights to policymakers and educators on improving the integration of digital technology in science education. Suggestions for accelerating the integration of digital technology in economically disadvantaged rural communities are presented. The implications of the study are that improving facilitating conditions, self-efficacy, and social influence can enhance science teachers' integration of digital technology. Future research is required to determine changes over time in the teachers' integration of digital technology through longitudinal studies.

Keywords: Digital technology; Facilitating condition; Self-efficacy; Science; Social influence; Rural communities

* Corresponding author: *Samuel Jere, samuel.jere@univen.ac.za*

1. Introduction

The adoption and integration of digital technologies (IDT) in science education have been proven to improve the quality of teaching and learning through their influence on conceptual understanding, learner engagement, motivation, interest, and attitudes toward science (Olugbade et al., 2024). However, teachers in rural communities encounter various obstacles in integrating digital technologies into their lessons. As a result, the extent of IDT differs from school to school within the same community and even from teacher to teacher within the same school (Phillips, 2015). Some teachers utilise various digital technologies extensively, while others hardly use any form of technology at all.

Despite common acceptance that digital technologies play a critical role in improving the quality of teaching and influencing academic outcomes, barriers continue to prevent its widespread adoption. Ertmer (1999) classified these barriers as first-order and second-order barriers. First-order barriers include limited availability of hardware and software and technical support, while second-order barriers involve teachers’ beliefs regarding their own abilities and the value of technology in instruction (Makki et al., 2018). Certain aspects of first-order barriers, such as the availability of technological resources, have also been referred to as facilitating condition (Wang & Chu, 2023). However, facilitating condition goes beyond the mere availability of physical resources to encompass policies that promote IDT in teaching (Venkatesh et al., 2003). Facilitating condition may partly be addressed by providing the necessary resources and developing policies that support technology integration in teaching.

Although the provision of digital resources impacts their integration in teaching, not all teachers use these resources despite their availability (Lomos et al., 2023). Teachers’ beliefs in their own ability to use digital tools and in the value of digital tools in teaching ultimately play a critical role in determining whether the teacher uses the available digital resources (Rubach & Lazarides, 2021). Second-order barriers, such as teachers’ self-efficacy beliefs about their ability to use digital technology, are pivotal in influencing teachers’ technology integration (Kim et al., 2013). While teachers continue to encounter challenges to the IDT, these technologies continue to evolve.

Digital technologies are advancing rapidly, bringing far-reaching educational transformations worldwide (Jere & Mpeta, 2024). For example, an empirical study found that integrating artificial intelligence (AI) using ChatGPT significantly improved learning outcomes compared to traditional instruction (Alneyadi & Wardat, 2024). Furthermore, AI can enhance personalised and interactive learning by using prompts in formative assessment (AlAli & Wardat, 2024). Among other innovative teaching approaches, researchers are also utilising Augmented Reality (AR) designs such as marker-less AR, marker-based AR, and project-based AR to support the learning of sciences (Hidayat & Wardat, 2023). Immersive virtual reality has also been empirically found to raise learners' academic achievement and motivation (Liu et al., 2022). Therefore, there is a pressing need to accelerate the IDT in teaching, even in resource-constrained rural areas.

In poor communities, low levels of IDT in teaching are caused by teachers' lack of digital competence (Lucas et al., 2021); lack of digital resources (Akram et al., 2022); lack of professional development and technical support (Lomos et al., 2023); absence of or poor implementation of policies on digital technology integration (Lomos et al., 2023); and teachers' resistance to the adoption of digital technologies due to beliefs that are not in line with current knowledge of how children learn (Tondeur et al., 2017). Despite the ever-increasing availability of digital resources such as personal smartphones in communities, these resources have not yet been widely adopted for the purpose of teaching in South African schools. For example, it has been demonstrated that smart mobile devices, such as smartphones, smart pads and tablet computers, have great potential for improving learning outcomes (Leem & Sung, 2019). Nevertheless, it is disturbing to note that a study by Mwapwele et al. (2019) revealed that in South Africa, teachers are resistant to allowing learners to use personal smartphones in schools, despite their potential for advancing learning.

Efforts have been ongoing to improve internet connectivity and increase the availability of digital resources, such as tablets and computers, focusing on rural communities in South Africa (Parliament of the Republic of South Africa, 2016). It can therefore be expected that such efforts would increase teachers' IDT in teaching. In addition, the Professional Development Framework for Digital Learning, a policy document, provides direction for teachers' IDT in South Africa (Department of Basic Education, 2019). Yet despite these efforts, the acceptance and use of technology in teaching and learning remains inconsistent. Thus, it is hoped that the findings of this study will provide both theoretical and practical contributions to research on IDT in the teaching and learning of sciences. They are intended to shed light on the factors that influence science teachers' IDT. Furthermore, this study has practical significance in enabling policymakers to make informed decisions for improving learning outcomes. Hence, it is essential to determine the extent to which science teachers are integrating digital technologies and the factors that influence this.

To date, the extent to which teachers are integrating digital technologies in their teaching and the factors influencing their decisions in this matter have remained obscure (Fernández-Sánchez et al., 2022; Peng et al., 2023). There has been a paucity of empirical studies to explore the combined effects of such variables as self-efficacy, facilitating conditions or information and communication technology (ICT) infrastructure on the IDT in teaching (Kundu et al., 2021). Moreover, little empirical research has been conducted in South Africa on the IDT in science teaching (Mwapwele et al., 2019). Therefore, this study is intended to fill this gap by examining the extent of IDT and the effects of facilitating conditions, social influence, and teachers' self-efficacy on the IDT in science teaching. To this end, the study sought to answer the following research questions: To what extent are science teachers in rural communities integrating digital technology into their teaching? What are the effects of facilitating conditions, social influence, and self-efficacy on teachers' IDT? The Unified Theory of Acceptance and Use of Technology (UTAUT) guided the study.

2. Unified Theory of Acceptance and Use of Technology

The UTAUT proposes four factors as the determinants of a teacher's acceptance and IDT in teaching. These factors are facilitating condition, social influence, performance expectancy, and effort expectancy (Venkatesh et al., 2003). In this theory, self-efficacy influences technology acceptance in a mediatory role under certain conditions. This study focuses on the influence of facilitating condition, social influence, and self-efficacy on teachers' IDT in their teaching. In line with this theory, self-efficacy influences the IDT by mediating the influence of facilitating condition.

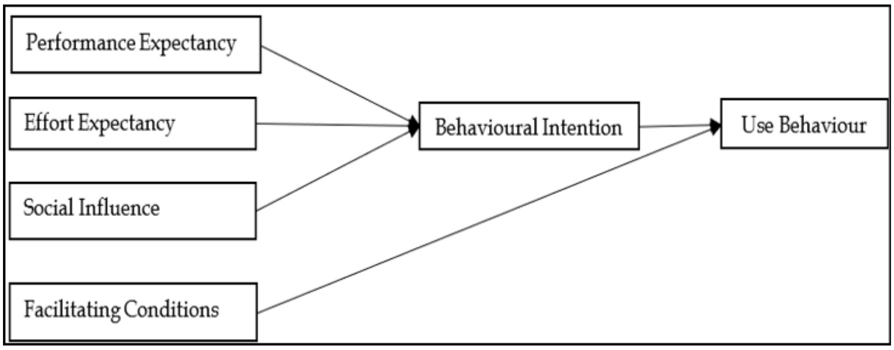

Figure 1. **Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003)**

Although the outcome variable in the UTAUT is behavioural intention or use behaviour, previous studies have equated behavioural intention to actual use because these constructs are highly correlated (Leow et al., 2021). Therefore, this study makes no distinction between behavioural intention and the actual IDT in teaching. Our focus is limited to two of the constructs in the UTAUT: social influence and facilitating condition. Facilitating condition is critical in situations of limited availability of digital resources in education, particularly in developing educational contexts (Lomos et al., 2023).

3. Integration of Digital Technology in Science Teaching

Rehmat and Bailey (2014) describe the IDT in science teaching as the suitable adoption and use of technology within a science lesson to enable or augment the learning of science content. In the same vein, Hennessy et al. (2007) describe the integration of digital technology in science teaching as the exploitation of computer-based technology in supporting science learning. Integrating digital technology in science teaching should encompass all essential aspects of teaching, such as record keeping, lesson planning, lesson delivery and communication.

In science teaching, IDT occurs when the teacher selects and uses appropriate digital technologies within the various phases of instruction. Learning in science occurs when learners conduct scientific investigations, collect data, interpret evidence, and develop explanations, models, and arguments (Hand et al., 2021; Manz et al., 2020). This implies that science learning is enhanced by such enquiry activities as designing and carrying out experiments, formulating and testing hypotheses, interpreting collected data, and using it to draw conclusions (Inkinen et al., 2020). Facilitating the learning of enquiry skills requires a shift from traditional instruction, which focuses on transmitting information from the teachers to the learners and relies on rote memorisation and regurgitation of this information in tests (Bawaneh & Moumene, 2020). It is well documented that meaningful learning occurs through the active construction of knowledge by the learner and that the role of the teacher is as a facilitator of learning (Owens et al., 2020).

Teaching strategies that foster active learning include the use of digital tools such as interactive simulations, virtual laboratories, virtual reality, augmented reality, animations, and other multimedia such as static or dynamic visualisations (Fernandes et al., 2020). Teachers are recommended to use interactive digital resources that create an engaging classroom environment in which learners participate in discussion, reasoning, interpretation, reflection, and argumentation, as these processes are essential in constructing scientific knowledge (Hand et al., 2021). Moreover, teachers should select the teaching strategies depending on the objectives of the lesson. When incorporating digital resources can help to achieve the lesson's objectives, teachers must consider integrating digital technologies into their teaching. The presence of facilitating conditions in the school creates an environment in which teachers can succeed in integrating digital technologies.

4. Facilitating Condition

The term facilitating condition refers to

> *"the degree to which an individual believes that an organisational and technical infrastructure exists to support the use of the system."* (Venkatesh et al., 2003, p.453).

Facilitating condition, therefore, refers to the teacher's belief that the conditions within the school are conducive to the IDT in teaching. Teachers should have access to computer hardware, software, and the internet. However, the literature suggests that teachers working in rural communities often have insufficient access to these digital resources (Habibi et al., 2020). In addition, such teachers may suffer from a lack of technical support.

Schools should have technical support structures to catalyse the effective use of hardware and software facilities (Teo et al., 2012). Unfortunately, insufficient support has been provided to teachers, especially those working in schools that are in rural areas (Habibi et al., 2020). Teachers require ongoing technical support as well as professional development opportunities to develop their competence and confidence in using digital technology for pedagogical purposes (Mannila et al., 2018). Facilitating condition includes access to training programmes, workshops, and mentorship opportunities that empower teachers to leverage digital tools to enhance the teaching and learning within their classrooms.

Numerous studies have explored the effects of facilitating condition on ICT use in teaching, producing contradictory results that justify the need for further research. For example, Cabellos et al. (2024) found that improving facilitating condition increases the use of digital resources in teaching, and Teo et al. (2012) found that facilitating condition indirectly affects technology acceptance. In another study, Teo (2011) found that facilitating condition directly impacted behavioural intention to use technology. It can therefore be expected that a lack of facilitating condition would lead to diminished intention to use technology in teaching. Based on the UTAUT, this study hypothesises that increased facilitating condition increases the IDT in teaching (Venkatesh et al., 2003). In addition to facilitating condition, self-efficacy plays a vital role in teachers' decisions regarding digital tools.

5. Self-efficacy

Self-efficacy refers to individuals' judgements of their ability to perform necessary actions effectively (Bandura, 1982). Teachers who perceive themselves as being capable of integrating digital technologies into their teaching are more likely to persist and ultimately succeed in integrating digital technology. Moreover, a teacher with high self-efficacy exerts more effort when facing obstacles, which determines resilience, persistence and perseverance (Mannila et al., 2018; Pearman et al., 2021). Thus, even when faced with barriers to integrating digital technologies, teachers with high self-efficacy tend not to abandon their efforts. High self-efficacy is required for teachers to explore novel pedagogies in teaching with technology as new software becomes available.

Several empirical studies have investigated the effects of self-efficacy on teachers' IDT. These studies have produced mixed findings, with some showing that self-efficacy directly affects IDT (Kwon et al., 2019), while others have indicated that self-efficacy influences technology integration only by playing a mediatory role. Wong et al. (2020) found that self-efficacy has both direct and mediatory effects on integrating interactive whiteboards as a technological tool in teaching. However, according to Venkatesh et al. (2003), self-efficacy does not directly influence the intention to use digital technology. This is supported by a study by Peng et al. (2023), which found that self-efficacy influences IDT by mediating the effects of facilitating condition, such as digital tools. Hence, in this study, it was hypothesised that self-efficacy influences the IDT through the mediation of facilitating condition; furthermore, we also attempted to determine whether self-efficacy had any direct effects on the IDT.

6. Social Influence

Social influence, in this study, refers to the teacher's belief that their significant others, such as the school principal, school management team and colleagues, expect them to integrate digital technology into their teaching (Chávez et al., 2023). If other teachers are integrating digital technology into their lessons, it is deemed to be more likely that the teacher will follow suit. Venkatesh et al. (2003) posit that a person's behaviour is influenced by their belief of how others will perceive them due to their use of technology.

If teachers feel that the school managers and other teachers value the use of technology, then the IDT in teaching will be enhanced (Ifinedo & Kankaanranta, 2021). Studies have shown that support from school leadership and teacher collaboration increases the IDT (Xue et al., 2023). Therefore, this study hypothesises that increased social influence will positively affect teachers' IDT in teaching.

7. Proposed Theoretical Model

Based on the reviewed literature and the theoretical framework, a model of the effects of social influence, self-efficacy and facilitating condition on teachers' IDT was proposed (Figure 2). The following hypotheses are illustrated in the proposed model:

H_1: Teachers' self-efficacy has a positive significant effect on teachers' IDT in teaching.

H_2: Facilitating condition positively and significantly influences teachers' IDT in teaching.

H_3: The relationship between facilitating condition and IDT is mediated by self-efficacy.

H_4: Social influence significantly affects teachers' IDT.

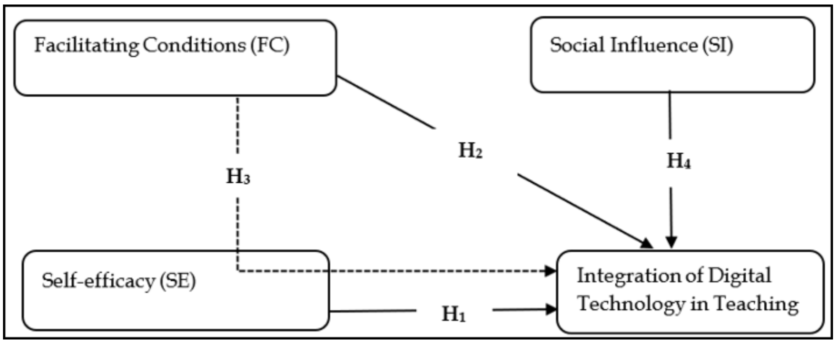

Figure 2 A theoretical model of the effects of SI, SE and FC on teachers' IDT

8. Method

8.1 Research Design

The study used a cross-sectional survey design. A cross-sectional study is an observational study that allows researchers to collect and analyse data from a population at a particular point in time (Wang & Cheng, 2020). In this research, a cross-sectional study was used as it is less time-consuming and inexpensive, as the researchers were constrained by limitations on both financial resources and time. This enabled us to study the associations between the outcome variable and the predictor variables (Wang & Cheng, 2020).

8.2 Sampling

The study was conducted in a rural education district in Limpopo Province of South Africa. The population was comprised of teachers who teach natural sciences at the primary level (grades 1 to 7) or natural science, life sciences, or physical sciences at the secondary school level (grades 8 to 12). Ethical clearance was provided by the university ethics committee, while permission to conduct the study was granted by the Limpopo Department of Education. Participants were selected using convenience sampling, which is a non-probability sampling technique. Convenience sampling was chosen as it enabled us to select participants based on their availability and willingness to participate (Wang &

Cheng, 2020). Researchers had no control over the selection of participants, due to both practical and ethical considerations. Hence, random sampling could not be employed.

There were 158 participants, of whom 53% were male and 47% were female. In terms of their teaching qualifications, 20.2% had a diploma, 77.3% had a bachelor's degree, 1.9% had a master's degree, and 0.6% had a doctoral degree. The percentage of teachers with ten years' experience or less was 52.5%, while 47.5% had more than ten years' teaching experience.

8.3 Data Collection

Data were collected using the Questionnaire of Science Teachers' Integration of Digital Technology in Teaching (Appendix 1). The questionnaire was created using Google Forms. The link to the questionnaire was sent to an official responsible for teaching science subjects in the Department of Basic Education, who transmitted the link to science teachers through their official communication channels. The questionnaire was comprised of two sections, the first of which described the purpose of the study. Participants were informed that the study was to be conducted for academic purposes only and that their responses would be confidential and anonymous. Respondents were asked to indicate their consent if they opted to participate. Furthermore, they were informed that they could withdraw their participation at any time without any adverse effects. The second section presented the questions on the four scales of the questionnaire.

8.4 Data Collection Instrument

The scales in the Questionnaire of Science Teachers' Integration of Digital Technology in Teaching (Appendix 1) were developed by adapting validated scales from instruments that have been used in previous studies. All of the items in the sub-scales on the IDT were adapted from Vannatta and Banister (2009). Items on self-efficacy and facilitating condition were adapted from Wang and Chu (2023), while the items on social influence were adapted from Venkatesh et al. (2003). A panel of four experts reviewed the questionnaire for validity and suggested changes in the wording of some items to improve clarity; these recommendations were then incorporated. An instrument is considered to have an acceptable level of reliability if its Cronbach's alpha value is between 0.70 and 0.95 (Tavakol & Dennick, 2011). The Cronbach's alpha values for the scales in the questionnaire, shown in Table 1, suggest that the instrument had acceptable reliability.

Table 1. Reliability of the Questionnaire

Scale	*N*	Cronbach's Alpha
SI	4	0.888
SE	5	0.829
FC	6	0.811
IDT	10	0.907

All items were based on a five-point Likert scale, ranging from *strongly disagree/never (1)* to *strongly agree/always (5)*. Self-efficacy had five items, facilitating condition had six, and social influence had four. IDT had ten items.

8.5 Data Analysis

The Statistical Package for Social Sciences (SPSS) version 28 was used for all data analyses. The extent of the IDT in science teaching was assessed using descriptive statistics. Descriptive statistics were also used to present the results of the teachers' responses on social influence, self-efficacy, and facilitating condition. In the presentation of descriptive statistics, weighted mean values were interpreted following the suggestion of Pimentel and Pimentel (2019), as shown in Table 2. The relationships between social influence, self-efficacy and facilitating condition as predictor variables and IDT as the response variable were assessed using stepwise multiple linear regression.

Table 2. Interpretation of Weighted Mean Values

Rating Scale	Weighted Mean Range	Interpretation	
		IDT	SE, SI, FC
1	1-1.79	never	strongly disagree
2	1.8-2.59	rarely	disagree
3	2.60-3.39	sometimes	moderately agree
4	3.40-4.19	often	agree
5	4.20-5.00	always	strongly agree

9. Results

9.1 Extent of Integration of Digital Technology in Science Teaching

The extent to which teachers integrated digital technology in their teaching was determined by analysing their responses to the items on the IDT scale on the questionnaire. The items' responses included *never (1), rarely (2), sometimes (3), often (4)*, and *always (5)*. The findings are presented in Table 3.

Table 3. Descriptive Statistics of Items on the Integration of Digital Technology

Item	N	M	SD	Interpretation
Overall weighted mean		3.07		sometimes
IDT1	158	3.94	1.187	often
IDT2	158	3.63	1.244	often
IDT3	158	3.46	1.348	often
IDT4	158	3.42	1.459	often
IDT5	158	3.01	1.321	sometimes
IDT6	158	2.87	1.312	sometimes
IDT7	158	2.68	1.360	sometimes
IDT8	158	2.68	1.373	sometimes
IDT9	158	2.56	1.356	sometimes
IDT10	158	2.47	1.324	rarely

N = Sample size; *M* = Weighted mean; *SD* = Standard deviation

The overall mean of 3.07 for IDT implies that the science teachers' IDT is only implemented *sometimes*. There is no evidence that the teachers *often* use technology in their science teaching. This indicates that the integration of digital technology in teaching is at a moderate level. The teachers' use of technology for lesson planning, the creation of instructional materials and assessment was above average, while their use of technology in presenting information to learners, using content-specific educational software, simulations and gamification and creating electronic templates to guide learners in using computers was below average.

9.2 Facilitating Conditions, Social Influence and Self-Efficacy

Descriptive statistics of the teachers' responses on facilitating condition, social influence, and self-efficacy are displayed in Table 4. The mean for facilitating condition is 2.81, below the overall mean of 2.94, implying that the science teachers *moderately agreed* that schools had adequate facilitating conditions. Similarly, the teachers *moderately agreed* that policies were available for enhancing digital competence at the country or district level (FC1, M = 3.09). They also *moderately agreed* about the availability of such policies at the school level (FC2, M = 2.70). The teachers *agreed* that professional development opportunities were available (FC3, M = 3.58). In addition, they *moderately agreed* about the availability of digital resources (FC4, M = 2.86) and facilities such as the internet, computer tablets and interactive whiteboards (FC5, M = 2.72). However, they *disagreed* that educational software, such as Moodle or Google Classroom, was available for them at school (FC6, M = 1.92). In summary, facilitating condition was moderately available in schools.

Social influence had a mean of 2.94, which aligns with the overall mean. This implies that the teachers believed that social influence was significant in their IDT. The teachers *moderately agreed* that they used digital technology because other teachers used it (SI1, M = 2.77). They also *moderately agreed* that the school's senior managers supported them in integrating technology (SI2, M = 2.80), that the senior staff members were very supportive of the use of digital technology (SI3, M = 3.23), and that their school supported the use of digital technology in teaching (SI4, M = 2.96).

SE had a mean of 3.85, which was above the overall mean of 2.94. This implies that the teachers believed that they could integrate digital technology into their teaching. The respondents *agreed* that they could acquire digital technology skills (SE1, M = 4.16), use digital technology effectively in their teaching (SE2, M = 4.09), and overcome the difficulties of using digital technology in their teaching (SE3, M = 3.49). They also believed they would overcome the difficulties of IDT with assistance (SE4, M = 3.80). The participants *agreed* they could respond to various digital technology uses in their teaching (SE5, M =3.75). Therefore, it was concluded that the science teachers had high self-efficacy beliefs.

Table 4. Ratings of Facilitating Conditions, Social Influence and Self-efficacy

Item	***N***	***M***	***SD***	**Interpretation**
Overall weighted mean	158	2.94		moderately agree
Facilitating Conditions (FC)	158	2.81		moderately agree
FC1	158	3.09	1.281	moderately agree
FC2	158	2.70	1.324	moderately agree
FC3	158	3.58	1.327	agree
FC4	158	2.86	1.416	moderately agree
FC5	158	2.72	1.409	moderately agree
FC6	158	1.92	1.224	disagree
Social Influence (SI)	158	2.94		moderately agree
SI1	158	2.77	1.346	moderately agree
SI2	158	2.80	1.430	moderately agree
SI3	158	3.23	1.382	moderately agree
SI4	158	2.96	1.411	moderately agree
Self-efficacy (SE)	158	3.85		agree
SE1	158	4.16	1.105	agree
SE2	158	4.09	1.175	agree
SE3	158	3.46	1.399	agree
SE4	158	3.80	1.245	agree
SE5	158	3.75	1.231	agree
N = Sample size; *M* = Mean; *SD* = Standard deviation				

9.3 Effects of Facilitating Conditions, Social Influence and Self-efficacy on the Integration of Digital Technology

Stepwise multiple linear regression was used to assess the influence of facilitating conditions, social influence, and self-efficiency on the science teachers' integration of digital technology. The data were assessed to determine whether the assumptions of multiple linear regression were not violated. The assumptions assessed were linearity, homoscedasticity, normality of errors, and independence of errors (Flatt & Jacobs, 2019).

The independence of error terms was assessed using the Durban-Watson coefficient, which was found to be 2.056, a value greater than one but less than three, confirming that the error terms were independent (Flatt & Jacobs, 2019). We then ascertained whether the errors were normally distributed through a visual inspection of the histogram of standardised residuals. As can be seen in Figure 3, the error terms were approximately normally distributed.

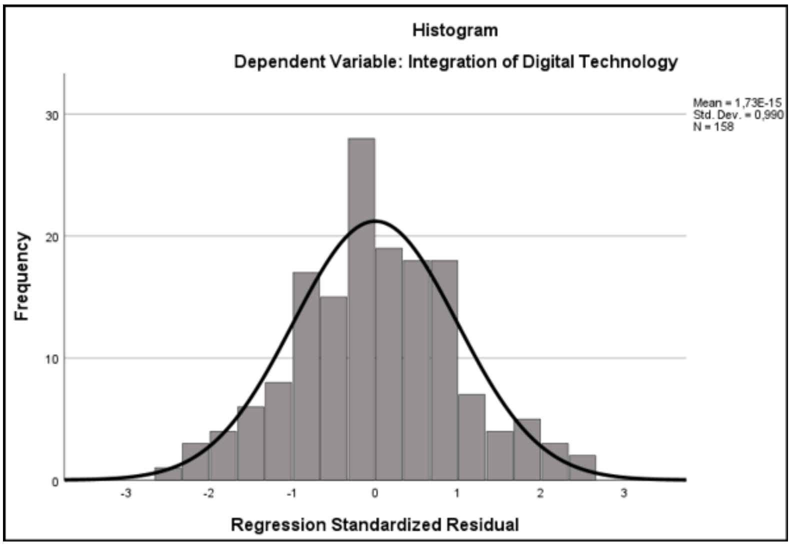

Figure 3. Histogram of Standardised Residuals

The assumption of homogeneity of variance (homoscedasticity) and linearity was checked through a visual inspection of the scatterplots of residuals versus predicted values (Figure 4). As most of the points on the scatterplot had an approximately rectangular shape, with most of the points being concentrated around zero, it was assumed that homogeneity of variance had been met. Figure 4 also shows a random scattering of points around the standardised residual = 0 line with no systematic pattern or curvature in scatterplots; this shows that the linearity assumption was satisfied.

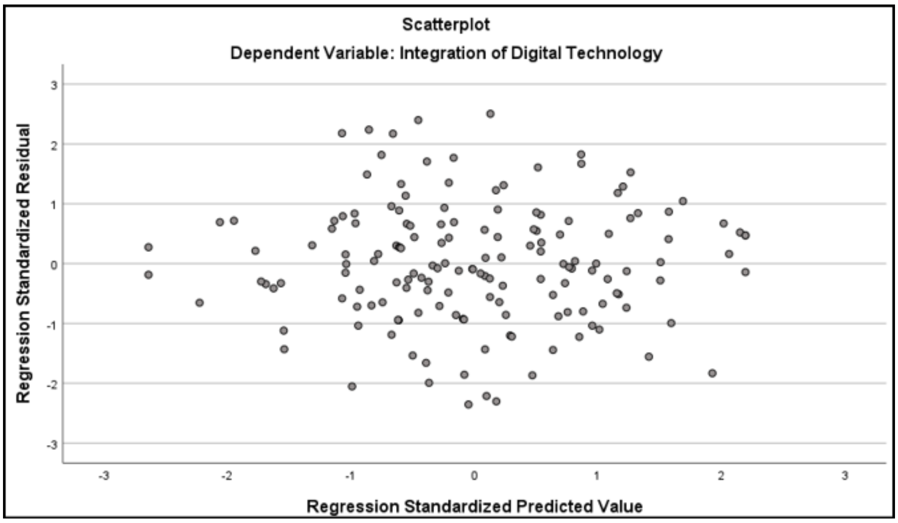

Figure 4. Relationships between Standardised Predicted Value and Regression Standardised Residual

After checking that the assumptions of multiple linear regression were not violated, we used stepwise multiple linear regression to determine the relationship between the predicted variable (integration of digital technology) and the three predictor variables - facilitating conditions, social influence and self-efficacy. We ran the multiple linear regression and used the Casewise diagnostic function in SPSS to identify outliers. One outlier was identified and deleted, reducing the sample size from 159 to 158. Then, we reran the regression. The results are displayed in Table 5.

Table 5. Final Model of Predictive Effects of FC, SE and SI on IDT

Item	*B*	Std Error	*β*	*t*	*p*
Intercept	0.229	0.226		0.990	0.324
FC	0.458	0.075	0.446	6.088	< .05
SE	0.304	0.063	0.295	4.857	< .05
SI	0.131	0.059	0.160	2.213	< .05
$R^2 = 0.567$ Adj $R^2 = 0.558$ $F(1.154) = 4.895$; $p < .05$					

The final regression model included all three predictor variables. The analysis results indicate that 55.8% of the variance in teachers' IDT is collectively accounted for by facilitating conditions, self-efficacy and social influence. In addition, the results reveal that facilitating conditions were a significant positive predictor of the teachers' IDT in teaching ($\beta = 0.446$, $t = 6.088$, $p < .05$). Based on this, H_1 was accepted. Self-efficacy was also found to be a positive significant predictor of the teachers' IDT ($\beta = 0.295$, $t = 4.857$, $p < .05$). Based on this, H_2 was accepted. Similarly, social influence was found to be a positive significant predictor of the teachers' IDT in science teaching ($\beta = 0.160$, $t = 2.213$, $p < .05$). Hence, H_3 was accepted.

The facilitating condition was the most critical predictor of teachers' IDT, as an increase of ten units in facilitating condition was found to increase the teachers' IDT by 4.46 units. In other words, improving facilitating conditions improves the teachers' IDT. Self-efficacy was the second most crucial predictor, as increasing the teachers' self-efficacy by ten units increases their IDT by almost three units. This implies that it is essential to implement measures that improve the teachers' digital self-efficacy in order to improve the IDT in science teaching. The least significant predictor of the teachers' IDT was found to be social influence, with a β value of 0.160; this indicates that that increasing social influence by ten units increases the IDT by only 1.6 units.

In order to test the fourth hypothesis that self-efficacy mediates the effect of facilitating conditions on the teachers' IDT, a moderation analysis was performed using PROCESS SPSS macro (Hayes, 2022). In performing this regression, the variables were centred, and unstandardised *B* coefficients were produced. As in the previous regression, self-efficacy ($B = 0.0341$, $t = 5.187$, $p < .05$) and facilitating condition ($B = 0.548$, $t = 8.586$, $p < .05$) were found to be positive significant predictors of the teachers' IDT. However, the interaction effect ($p = 0.653$) was not found to be a statistically significant predictor of the teachers' IDT (Table 6). Based on this, H_4 was rejected. We found no evidence that self-efficacy is a significant moderator of the relationship between facilitating condition and the teachers' IDT in teaching science.

Table 6. SE as a Moderator of FC and IDT

	B	Std Error	*t*	*p*	95% CI	
					Low	High
Intercept	3.063	0.057	53.416	0.000	2.949	3.175
FC (A)	0.548	0.064	8.586	0.000	0.422	0.675
SE (B)	0.341	0.066	5.187	0.000	0.211	0.470
AXB	0.025	0.055	0.450	0.653	-0.84	0.134
$R^2 = 0.554$; F(3.154) = 63.681; $p < .05$						

The results suggest that social influence, self-efficacy, and facilitating conditions significantly positively affect teachers' IDT in teaching. The relationship between facilitating conditions and the IDT is not mediated by self-efficacy.

10. Discussion

The study revealed that the extent of digital technology integration in rural communities in science teaching is moderate, as the participants did not integrate digital technology frequently. In line with previous studies (Valverde-Berrocoso et al., 2021), the teachers reported that they used technology in lesson preparation to gather information, in the creation of instructional and assessment handouts and in record keeping, as well as using Microsoft Word for various purposes. The study showed that there was a low frequency of technology use in terms of the presentation of information to learners, the adaptation of activities to learners' individual needs, and the integration of multimedia, simulations, and games in instruction. This also supports the study by Guillén-Gámez et al. (2021), which revealed that teachers have an excellent knowledge of digital tools, but that their use in teaching is low.

The low levels of integration of multimedia, simulations and gamification revealed in this study have severe ramifications and contribute to the failure to raise academic achievement in sciences in rural areas. Particularly in science subjects, concepts are both abstract and complex, requiring visualisation to make them accessible to learners (Liu et al., 2022). Therefore, teachers in rural schools should use visual digital tools in lesson presentations more frequently to raise academic achievement.

The multiple linear regression analysis results revealed that self-efficacy has a positive, significant effect on teachers' integration of digital technology. This finding supports the results of Peng et al. (2023), who found that self-efficacy influences pre-service teachers' ICT integration ($\beta = 2.00$, $p < .05$). However, in addition to self-efficacy having a direct effect on ICT integration, Peng et al. (2023) also found that self-efficacy was a mediator of ICT integration through attitudes, digital competence, and digital tool utilisation. Our study did not support the hypothesis that self-efficacy mediated the effects of facilitating conditions on the teachers' integration of digital technology.

The results of this study support the findings of Cabellos et al. (2024) that facilitating condition has a significant positive effect on teachers' integration of digital technology. However, Teo (2010) found that facilitating conditions did not directly affect pre-service teachers' intention to use digital technology. Our results support the findings made by Teo (2011) and Sharma and Saini (2022) that facilitating conditions directly impact teachers' intention and actual use of digital technology in teaching. In addition, we found that social influence significantly impacts teachers' integration of digital technology, which aligns with the results of Buraimoh et al. (2023). Improving facilitating conditions, self-efficacy, and social influence will likely lead to enhanced integration of digital technology by science teachers.

11. Implications of the Study and Recommendations for Future Research

A critical finding of this study was that the facilitating conditions in schools, in terms of the availability of the necessary resources and support, were deemed to be moderate. School policies allowing learners to utilise personal digital devices such as smartphones and laptops at school would improve facilitating conditions (Mwapwele et al., 2019). Although the teachers moderately agreed regarding the availability of some digital resources, they disagreed that they had access to educational software including Learning Management Systems (LMS) such as Moodle, Google Classroom and Canvas. LMS are e-learning systems that enable learners to access content, assignments and assessments from their teachers anywhere and at any time, as long as they are connected to the internet (Ifliadi et al., 2024). Hence, schools and the education department should prioritise the acquisition of software that supports teachers using digital resources to improve educational outcomes. The level of social influence was found to be moderate. The teachers believed that people who were significant to them, such as principals and district officials, valued and expected them to use digital technology in their teaching. Therefore, education leaders and policymakers should leverage this by employing influential teachers to champion the integration of digital technology to encourage their peers. The study found that science teachers had high self-efficacy. Therefore, education leaders should reinforce teachers' professional development efforts to maintain high levels of self-efficacy. In summary, teacher training, ICT infrastructure development, the provision of quality digital content, the development of policies that support IDT, and financial resources (Ifliadi et al., 2024) are the critical requirements for enhancing the IDT in science teaching.

We recommend that prospective studies examine the long-term effects of integrating digital technology on learning outcomes through longitudinal studies. Such studies can consider other variables, such as the classroom's emotional climate, in rural resource-constrained environments while integrating digital technology. The use of other research designs to investigate teachers' integration of digital technology, such as longitudinal, qualitative, and mixed methods approaches, will advance a more comprehensive understanding of teachers' integration of digital technology in science teaching in developing nations.

12. Conclusion

The extent to which science teachers are integrating digital technology in teaching was found to be moderate. Facilitating condition, self-efficacy, and social influence were found to be positively and significantly correlated with the teachers' IDT. Facilitating condition was the most critical predictor of IDT, followed by self-efficacy, with social influence being the least significant. Teachers indicated that facilitating conditions were moderately available, indicating that it is imperative to improve the provision of facilitating conditions in rural areas of South Africa. Governments should invest in improving schools' ICT infrastructure, work with parents to equip learners with personal computing devices and find ways to subsidise learners' acquisition of such devices. Additionally, governments must implement initiatives to improve connectivity and the availability of computing devices for learners to accelerate the transition from physical classrooms centred on traditional knowledge transmission to digital classrooms. Furthermore, in poor rural communities, support through continuous professional development would help teachers to update their skills and raise their levels of self-efficacy.

Limitations existed in this study in relation to the population of science teachers studied, the sampling method techniques and research design. Therefore, this affected the generalisability of the results to the entire population. The sampling could have included other critical educational stakeholders such as principals, education officials, and pupils to expand the scope of the study and obtain a more nuanced understanding. Also, the results may not be generalised to all teachers as the study was based only on science teachers in rural communities. Moreover, the study relied on self-reporting, and the teachers' actual integration of digital technology may differ from their reported use of digital technology.

Acknowledgements
We would like to thank the participants for the contributions they made, the University of Venda Research Ethics Committee for providing ethical clearance and the Limpopo Department of Education for granting permission to conduct the study.

Conflict of Interest
The authors declare that no conflict of interest exists.

Informed Consent
Informed consent was obtained from all of the participants involved in the study.

13. References

Akram, H., Abdelrady, A. H., Al-Adwan, A. S., & Ramzan, M. (2022). Teachers' perceptions of technology integration in teaching-learning practices: A systematic review. *Frontiers in Psychology*, *13*, 1-9. https://doi.org/10.3389/fpsyg.2022.920317

AlAli, R., & Wardat, Y. (2024). How ChatGPT will shape the teaching learning landscape in future? *Journal of Educational and Social Research*, *14*(2), 336-345. https://doi.org/10.36941/jesr-2024-0047

Alneyadi, S., & Wardat, Y. (2024). Integrating ChatGPT in grade 12 quantum theory education: An exploratory study at Emirate school (UAE). *International Journal of Information and Education Technology*, *14*(3), 398-410. https://doi.org/10.18178/ijiet.2024.14.3.2061

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, *37*(2), 122-147. https://doi.org/10.1037/0003-066x.37.2.122

Bawaneh, A. K., & Moumene, A. B. H. (2020). Flipping the classroom for optimizing undergraduate students' motivation and understanding of medical physics concepts. *Eurasia Journal of Mathematics, Science and Technology Education*, *16*(11), 2-16. https://doi.org/10.29333/ejmste/8561

Buraimoh, O. F., Boor, C. H., & Aladesusi, G. A. (2023). Examining facilitating condition and social influence as determinants of secondary school teachers' behavioural intention to use mobile technologies for instruction. *Indonesian Journal of Educational Research and Technology*, *3*(1), 25-34. https://doi.org/10.17509/ijert.v3i1.44720

Cabellos, B., Siddiq, F., & Scherer, R. (2024). The moderating role of school facilitating conditions and attitudes towards ICT on teachers' ICT use and emphasis on developing students' digital skills. *Computers in Human Behavior*, *150*, 107994. https://doi.org/10.1016/j.chb.2023.107994

Chávez, H. D., Cladellas P. R., & Castelló T. A. (2023). Habit and social influence as determinants of PowerPoint use in higher education: A study from a technology acceptance approach. *Interactive Learning Environments*, *31*(1), 497-513. https://doi.org/10.1080/10494820.2020.1799021

Department of Basic Education. (2019). *Professional development framework for digital learning*. Department of basic education. https://www.education.gov.za/Portals/0/Documents/Publications/Digital%20Learning%20Framework.pdf?ver=2018-07-09-101748-953

Ertmer, P. A. (1999). Addressing first-and second-order barriers to change: Strategies for technology integration. *Educational Technology Research and Development*, *47*(4), 47-61. https://doi.org/10.1007/bf02299597

Fernandes, G. W. R., Rodrigues, A. M., & Ferreira, C. A. (2020). Professional development and use of digital technologies by science teachers: A review of theoretical frameworks. *Research in Science Education*, *50*, 673-708. https://doi.org/10.1007/s11165-018-9707-x

Fernández-Sánchez, M. R., Garrido-Arroyo, M. C., & Porras-Masero, I. (2022). Curricular integration of digital technologies in teaching processes. *Frontiers in Education, 7*, 1-16. https://doi.org/10.3389/feduc.2022.1005499

Flatt, C., & Jacobs, R. L. (2019). Principle assumptions of regression analysis: Testing, techniques, and statistical reporting of imperfect data sets. *Advances in Developing Human Resources*, *21*(4), 484-502. https://doi.org/10.1177/1523422319869915

Guillén-Gámez, F. D., Mayorga-Fernández, M. J., Bravo-Agapito, J., & Escribano-Ortiz, D. (2021). Analysis of teachers' pedagogical digital competence: Identification of factors predicting their acquisition. *Technology, Knowledge and Learning*, *26*, 481-498. https://doi.org/10.1007/s10758-019-09432-7

Habibi, A., Mukminin, A., & Hadisaputra, P. (2020). Science teachers' integration of digital resources in education: A survey in rural areas of one Indonesian province. *Heliyon*, *6*(8). https://doi.org/10.1016/j.heliyon.2020.e04631

Hand, B., Chen, Y. C., & Suh, J. K. (2021). Does a knowledge generation approach to learning benefit students? A systematic review of research on the science writing heuristic approach. *Educational Psychology Review*, *33*(2), 535-577. https://doi.org/10.1007/s10648-020-09550-0

Hayes, A. F. (2022). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. Guilford Publications. https://books.google.co.za/books?id=-P-BzgEACAAJ

Hennessy, S., Wishart, J., Whitelock, D., Deaney, R., Brawn, R., La Velle, L., McFarlane, A., Ruthven, K., & Winterbottom, M. (2007). Pedagogical approaches for technology-integrated science teaching. *Computers & Education*, *48*(1), 137-152. https://doi.org/10.1016/j.compedu.2006.02.004

Hidayat, R., & Wardat, Y. (2023). A systematic review of augmented reality in science, technology, engineering and mathematics education. *Education and Information Technologies*, 1-26. https://doi.org/10.1007/s10639-023-12157-x

Ifinedo, E., & Kankaanranta, M. (2021). Understanding the influence of context in technology integration from teacher educators' perspective. *Technology, Pedagogy and Education*, *30*(2), 201-215. https://doi.org/10.1080/1475939x.2020.1867231

Ifliadi, I., Prasetyo, I., Mendrofa, L. I., & Hendrawati, E. S. (2024). Utilization of digital-based learning media in the independent curriculum in elementary schools. *Proceedings of International Conference on Education*, 140-149. https://jurnal.serambimekkah.ac.id/index.php/ice/article/view/1348/1016

Inkinen, J., Klager, C., Juuti, K., Schneider, B., Salmela-Aro, K., Krajcik, J., & Lavonen, J. (2020). High school students' situational engagement associated with scientific practices in designed science learning situations. *Science Education*, *104*(4), 667-692. https://doi.org/10.1002/sce.21570

Jere, S., & Mpeta, M. (2024). Evaluation of Pre-service Teachers' Digital Competence in Limpopo Province, South Africa. *Ebangi Journal of Social Sciences and Humanities*, *21*(1), 314-325. https://doi.org/10.17576/ebangi.2024.2101.27

Kim, C., Kim, M. K., Lee, C., Spector, J. M., & DeMeester, K. (2013). Teacher beliefs and technology integration. *Teaching and Teacher Education*, *29*, 76-85. https://doi.org/10.1016/j.tate.2012.08.005

Kundu, A., Bej, T., & Dey, K. N. (2021). Investigating effects of self-efficacy and infrastructure on teachers' ICT use, an extension of UTAUT. *International Journal of Web-Based Learning and Teaching Technologies (IJWLTT)*, *16*(6), 1-21. https://doi.org/10.4018/ijwltt.20211101.oa10

Kwon, K., Ottenbreit-Leftwich, A. T., Sari, A. R., Khlaif, Z., Zhu, M., Nadir, H., & Gok, F. (2019). Teachers' self-efficacy matters: Exploring the integration of mobile computing device in middle schools. *TechTrends*, *63*, 682-692. https://doi.org/10.1007/s11528-019-00402-5

Leem, J., & Sung, E. (2019). Teachers' beliefs and technology acceptance concerning smart mobile devices for SMART education in South Korea. *British Journal of Educational Technology*, *50*(2), 601-613. https://doi.org/10.1111/bjet.12612

Leow, L. P., Phua, L. K., & Teh, S. Y. (2021). Extending the social influence factor: Behavioural intention to increase the usage of information and communication technology-enhanced student-centered teaching methods. *Educational Technology Research and Development*, *69*(3), 1853-1879. https://doi.org/10.1007/s11423-021-10017-4

Liu, R., Wang, L., Koszalka, T. A., & Wan, K. (2022). Effects of immersive virtual reality classrooms on students' academic achievement, motivation and cognitive load in science lessons. *Journal of Computer Assisted Learning*, *38*(5), 1422-1433. https://doi.org/10.1111/jcal.12688

Lomos, C., Luyten, J., & Tieck, S. (2023). Implementing ICT in classroom practice: What else matters besides the ICT infrastructure? *Large-Scale Assessments in Education*, *11*(1), 1-28. https://doi.org/10.1186/s40536-022-00144-6

Lucas, M., Bem-Haja, P., Siddiq, F., Moreira, A., & Redecker, C. (2021). The relation between in-service teachers' digital competence and personal and contextual factors: What matters most? *Computers & Education*, *160*, 104052. https://doi.org/10.1016/j.compedu.2020.104052

Makki, T. W., O'Neal, L. J., Cotten, S. R., & Rikard, R. (2018). When first-order barriers are high: A comparison of second-and third-order barriers to classroom computing integration. *Computers & Education*, *120*, 90-97. https://doi.org/10.1016/j.compedu.2018.01.005

Mannila, L., Nordén, L. Å., & Pears, A. (2018). Digital competence, teacher self-efficacy and training needs. *Proceedings of the 2018 ACM Conference on International Computing Education Research*, 78-85. https://doi.org/10.1145/3230977.3230993

Manz, E., Lehrer, R., & Schauble, L. (2020). Rethinking the classroom science investigation. *Journal of Research in Science Teaching*, *57*(7), 1148-1174. https://doi.org/10.1002/tea.21625

Mwapwele, S. D., Marais, M., Dlamini, S., & Van Biljon, J. (2019). Teachers' ICT adoption in South African rural schools: A study of technology readiness and implications for the South Africa connect broadband policy. *The African Journal of Information and Communication*, *24*, 1-21. https://doi.org/10.23962/10539/28658

Olugbade, D., Oyelere, S. S., & Agbo, F. J. (2024). Enhancing junior secondary students' learning outcomes in basic science and technology through PhET: A study in Nigeria. *Education and Information Technologies*, 1-23. https://doi.org/10.1007/s10639-023-12391-3

Owens, D. C., Sadler, T. D., Barlow, A. T., & Smith-Walters, C. (2020). Student motivation from and resistance to active learning rooted in essential science practices. *Research in Science Education*, *50*, 253-277. https://doi.org/10.1007/s11165-017-9688-1

Parliament of the Republic of South Africa. (2016). *Analysis of Basic Education's Report on the Provision of Information and Communication Technologies (ICT) and e-Education with a Focus on Connectivity*. Parliament of the Republic of South Africa Research Unit. https://static.pmg.org.za/160301analysis.pdf

Pearman, C., Bowles, F., & Polka, W. (2021). Teacher educator perceptions of characteristics of self-efficacy. *Critical Questions in Education*, *12*(1), 81-99. https://files.eric.ed.gov/fulltext/EJ1287249.pdf

Peng, R., Abdul Razak, R., & Hajar Halili, S. (2023). Factors influencing in-service teachers' technology integration model: Innovative strategies for educational technology. *PloS One*, *18*(8), 1-19. https://doi.org/10.1371/journal.pone.0286112

Phillips, M. (2015). Digital technology integration. *In H. Henderson (Ed.), Teaching and Digital Technologies: Big Issues and Critical Questions*, 318-331. Cambridge University Press. https://doi.org/10.1017/cbo9781316091968.031

Pimentel, J. L., & Pimentel, J. (2019). Some biases in Likert scaling usage and its correction. *International Journal of Science: Basic and Applied Research (IJSBAR)*, *45*(1), 183-191. https://core.ac.uk/outputs/249336645?source=oai

Rehmat, A. P., & Bailey, J. M. (2014). Technology integration in a science classroom: Preservice teachers' perceptions. *Journal of Science Education and Technology*, *23*, 744-755. https://doi.org/10.1007/s10956-014-9507-7

Rubach, C., & Lazarides, R. (2021). Addressing 21st-century digital skills in schools–Development and validation of an instrument to measure teachers' basic ICT competence beliefs. *Computers in Human Behavior*, *118*, 106636. https://doi.org/10.1016/j.chb.2020.106636

Sharma, S., & Saini, J. R. (2022). On the role of teachers' acceptance, continuance intention and self-efficacy in the use of digital technologies in teaching practices. *Journal of Further and Higher Education*, *46*(6), 721-736. https://www.tandfonline.com/doi/full/10.1080/0309877X.2021.1998395

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53. https://doi.org/10.5116/ijme.4dfb.8dfd

Teo, T. (2010). Examining the influence of subjective norm and facilitating conditions on the intention to use technology among pre-service teachers: A structural equation modeling of an extended technology acceptance model. *Asia Pacific Education Review*, *11*, 253-262. https://doi.org/10.1007/s12564-009-9066-4

Teo, T. (2011). Factors influencing teachers' intention to use technology: Model development and test. *Computers & Education*, *57*(4), 2432-2440. https://doi.org/10.1016/j.compedu.2011.06.008

Teo, T., Ursavaş, Ö. F., & Bahçekapili, E. (2012). An assessment of pre-service teachers' technology acceptance in Turkey: A structural equation modeling approach. *Asia-Pacific Education Researcher*, *21*(1), 191-202. https://researchportal.murdoch.edu.au/esploro/outputs/journalArticle/An-assessment-of-pre-service-teachers-technology/991005544964207891

Tondeur, J., Van Braak, J., Ertmer, P. A., & Ottenbreit-Leftwich, A. (2017). Understanding the relationship between teachers' pedagogical beliefs and technology use in education: A systematic review of qualitative evidence. *Educational Technology Research and Development*, *65*, 555-575. https://doi.org/10.1007/s11423-016-9481-2

Valverde-Berrocoso, J., Fernández-Sánchez, M. R., Revuelta Dominguez, F. I., & Sosa-Díaz, M. J. (2021). The educational integration of digital technologies preCovid-19: Lessons for teacher education. *PloS One*, *16*(8), e0256283. https://doi.org/10.1371/journal.pone.0256283

Vannatta, R., & Banister, S. (2009). Validating a measure of teacher technology integration. *Society for Information Technology & Teacher Education International Conference*. https://works.bepress.com/savilla_banister/5/

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 425-478. https://doi.org/10.2307/30036540

Wang, X., & Cheng, Z. (2020). Cross-sectional studies: strengths, weaknesses, and recommendations. *Chest*, *158*(1), S65-S71. https://doi.org/10.1016/j.chest.2020.03.012

Wang, Z., & Chu, Z. (2023). Examination of higher education teachers' self-perception of digital competence, self-efficacy, and facilitating conditions: An empirical study in the context of China. *Sustainability*, *15*(14), 10945. https://doi.org/10.3390/su151410945

Wong, K. T., Muhammad, M., & Abdullah, N. (2020). Exploring the drivers of intention to use interactive whiteboards among Malaysia university students: Does technology self-efficacy matter? *International Journal of Emerging Technologies in Learning (iJET)*, *15*(1), 163-175. https://doi.org/10.3991/ijet.v15i01.11497

Xue, S., Du, J., & Yang, Y. (2023). Institutional influences on teachers' classroom technology integration: A multi-case study of teachers' uses of mobile social media at universities in China. *Asia Pacific Journal of Education*, *43*(4), 1306-1327. https://doi.org/10.1080/02188791.2021.1996332

Appendix 1: Questionnaire of Science Teachers' Integration of Digital Technology in Teaching

Rate the statements in Sections 1, 2, and 3 from *Strongly disagree (1), Disagree (2), Neither agree nor disagree (3), Agree (4)* to *Strongly agree (5)*

1. **Social Influence (**Venkatesh et al., 2003)

SI1. I use digital technology because many other teachers use it.

SI2. The senior management of the school (principal and school management team) has been helpful in the use of digital technology for teaching.

SI3. My supervisor (principal/deputy principal/HOD) is very supportive of the use of digital technology in my teaching.

SI4. The school, circuit, and district have generally supported using digital technology in teaching.

2. **Self-Efficacy (**Wang and Chu, 2023)

SE1. I can obtain digital technology skills if I try hard enough.

SE2. I can use digital technology in teaching effectively if I have enough time.

SE3. I can overcome the difficulties of using digital technology in teaching if no one is around to tell me what to do as I go.

SE4. I can overcome the difficulties of using digital technology in teaching by asking someone for help.

SE5. No matter what happens, I can easily respond to various situations that use digital technology in teaching.

3. **Facilitating Conditions (**Wang and Chu, 2023)

FC1. There are policies for enhancing teachers' digital competence in my country/province/district to support teachers' integration of digital technologies in teaching.

FC2. My school has related policies to encourage teachers to use digital technology effectively.

FC3. I can access professional development training opportunities on digital competence enhancement from my school/circuit/district/province.

FC4. My school has provided good support for my free access to digital resources.

FC5. My school has adequate digital facilities e.g. the Internet, computers, tablets, and interactive whiteboards.

FC6. There is adequate software for digital teaching in my school, such as online teaching software e.g. Nearpod, Moodle, or Google Classroom.

Rate the statements in Section 4 from *Never (1), Rarely (2), Sometimes (3), Often (4),* to *Always (5)*

4. **Integration of Digital Technology in Teaching (**Vannatta and Banister, 2009)

IDT1. I use the internet to gather information for lesson planning.

IDT2. I use the computer to create instructional handouts or assessments for learners.

IDT3. I use a spreadsheet (or a grading scheme) to record marks and/or attendance.

IDT4. I use word processors such as Microsoft Word for lesson planning, preparation of assessment tasks, and other teaching/learning materials.

IDT5. I use technology to present information to learners.

IDT6. I use technology to adapt an activity to learners' individual needs.

IDT7. I use content-specific software/applications such as YouTube and Khan Academy Videos for concept reinforcement.

IDT8. I integrate multimedia that use digital images, videos, and audio in teaching to enhance conceptual understanding.

IDT9. I use simulations/gaming software to teach learners to visualise scientific concepts.

IDT10. I create electronic templates to guide the learner in using the computer.