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Knowledge, Attitude and Usage of Information and Communication Technology (ICT) and Digital Resources in Pre-Service Teachers

Abstract

It is important to understand information and communication technology (ICT) and digital resources in classroom teaching and learning processes. Pre-service teachers' attitudes towards ICT and digital resources in teaching and learning processes are important for positive attitudes in students towards these tools. The study employs a mixed methods study targeted teachers who have completed their internship training to understand the knowledge, attitude and usage of ICT and digital resources tries to find a correlation between these three facets. Iat employs a questionnaire with validated tools for measuring attitude, knowledge and usage of ICT and Digital Resources and the results are tabulated. Using statistical analysis of mean and standard deviation, the study affirms a positive correlation between Knowledge, attitude and usage of ICT and Digital Resources by Pre-Service teachers.

Keywords: *ICT, digital resources, pre-service teachers, attitudes*

Introduction

Education has been a pivotal part and is integrated into all walks of life in every society (Nair,& Padmaja, 2023). Though people view education as a tool for determining one's livelihood and means of support through a career, in its truest and most meaningful definition, education serves a much deeper function.

The 21st century is revolving around the advancements made in the field of technology. (Yamin, 2019). Technology makes lives simpler and yet more efficient (Arakelyan, 2021). Misuse of technology can stem negative emotions (Nair, 2021; 2022) but guided use of technology will also lead to the inculcation of safe technological practices. Technology has a significant impact on today's educational landscape. Digital media is being more widely used in the educational sector. Due to this penetration, students and various forums for advancement are constantly connected. It is impossible to overstate how much the Internet and other technology have influenced schooling (Raja & Nagasubramani, 2018).

Teachers have reported that students tend to have increased interest and energy in using technology in classroom settings (Carstens et al., 2021). Teachers are the pillars of the educational setting. Teachers' guiding function transcends instructional activities and extends into students' daily lives rather than being restricted to the classroom and school rules (Flavia & Luiza, 2021). The extension of this influence also determines students' attitudes towards knowledge and usage of digital resources and ICT. The attitude of the teachers towards ICT and digital resources and the attitude of students towards digital resources and ICT are symbiotic. Teachers are pivotal for the development of attitudes and for making learning happen in classrooms (Saloway, 1996). Contemporary research suggests that students' demotivation is significantly influenced by teachers' demoralising attitudes and methods of instruction (Tang & Hu, 2022).

Teachers must recognise their influence on students' lives and, as a result, change to be greater collaborators and stakeholders in their students' educational experiences (Flavia & Luiza, 2021). The current society is geared towards integrating technology with all walks of life. In this regard, the purpose of education is not restricted to educating learners about the proceedings of society but also to contributing to and enriching such integrations with technology in their respective fields. It is necessary to understand the knowledge and attitude of major stakeholders in the field of teaching, the in-service teachers, and the teacher trainees or student teachers regarding the usage of ICT and other digital resources as assets in the classroom teaching-learning processes.

Literature Review

A study conducted by (Christen, 2009) asserted that students will achieve academic success if their learning environment reflects how they interact with the outside world. The instructors' attitudes regarding using ICTs and digital resources in the teaching and learning process significantly impact whether instructional goals in science education are met (Meher et al. 2020). Research studies such as the work by

Higgins and Raskind (2010) and the comprehensive review conducted by Cuban (2001) have consistently demonstrated the positive impact of integrating ICT and digital resources in Social Science/Humanities education, showcasing improved engagement, heightened student interest, and enhanced learning outcomes.

Teachers should utilise technology themselves to help children learn how to use technology appropriately and gain exposure to more sophisticated programmes that they will use independently as they age (DePasquale et al., 2003). According to one study, most teachers have relatively positive attitudes about ICT and other digital resources. However, their attitudes and sentiments towards ICT and digital resources are positively and adversely impacted by their locales (Krishnakumar & Ganesan, 2016). Meanwhile, another study concluded that the location and gender of teacher-trainees (student-teachers) did not affect their attitudes toward using information and communication technologies in the classroom (Dixit & Kaur, 2015).

It is important to cultivate a positive attitude towards the use of ICT and digital resources among student-teachers in order for them to stay up to date on the newest technologies and later integrate them into their professional lives in science education following demand (Ahuja & Agrawal, 2013). A study targeting pre-service teachers of the mathematical subject found that technology helped better disseminate mathematical concepts in the classroom (Ramaa, 1999).

Problem Statement

While a majority of pre-service teachers are familiar with digital resources like online videos, eBooks, and educational apps, a significant proportion remains either unaware or non-utilisers of these tools in the educational context.

Significance

The identified problem holds significance in the context of preparing future educators to effectively leverage digital resources in the classroom. Understanding and rectifying the disparities in pre-service teachers' engagement with digital resources is crucial for ensuring these educators are well-equipped to navigate education in the digital age.

Hypotheses

H1: There is a significant difference between Pre-Service Teachers' awareness of basic computer elements and other instructional digital resources.

H2: There is a significant difference between using ICT/instructional digital resources and advocating for the same by pre-service teachers.

Research Methodology

Design

The study employs a mixed methods research design, considering quantitative and qualitative data. The quantitative data is analysed through central tendency statistics, whereas the qualitative research is analysed using theme coding and thematic analysis.

Sample

Criteria and convenience sampling procedures were used to select the study group. Certain criteria are defined in criterion sampling, and individuals who meet the requirements are included in the study group (Yildirim & Simşek, 2016). With a convenience sample strategy, participants are individuals who are easiest to reach or contact are considered for the study (Langham, 2007; Büyüköztürk et al., 2015). The respondent had to be a pre-service student-teacher pursuing a teacher education programme at an HEI/TEI in India and have recently completed their course-required internships. Respondents' consent was requested beforehand. A total of 369 student-teachers responded to the survey. The sample included male and female respondents from different disciplines, states, and demographics. The respondents were assured of the standard of confidentiality.

Instruments and Procedures

The questionnaire items were face-validated and sent for content and criterion validation. A group of student-teachers meeting the criteria set for the study pilot-tested the questionnaire. It was then electronically administered to the intended sample. The items of the questionnaire had good consistency ($\alpha > 0.7$). The reliability factor of the questionnaire is ($\alpha = 0.78$). The questionnaire consisted of 4 sections. Most questions used the 5-point Likert scale, and some used binary values. The first section aimed to identify respondents' roles in their organisation/institute. The second section collected data on variables like demography and availability of device avenues. The following section collected data on awareness towards the selected ICT/digital resources, and the final section aimed to collect data on the respondents' attitudes towards ICT/digital resources.

Data Analysis

The responses of the Likert scale tool were coded between 1-5 to gauge the sentiment value of items, and the binary questions were coded between 1-2. The data was tabulated, and the mean and standard deviation across items were derived. The mean is used to determine the attitudinal sentiment within the pre-service teachers towards ICT/digital resources, and the standard deviation is used to determine the sample size that deviates from the mean sentiment value of the overall sample. The correlation between the variables was calculated using Pearson's factor.

Results

Student-teachers' responses**: Total responses **(ΣN) = 369

Table 1. Student-teacher's knowledge of ICT

Sl. No:	Item	Response Range						
		Strongly Agree	Agree	Neutral	Disa-gree	Strongly Disagree	Mean	SD
1.	Awareness on Software and Hardware of Computers	72	189	90	18	0	3.95	0.72
2.	Knowledgeable about MS Office Programs	108	405	81	09	0	4.10	0.88
3.	Do most pre-service teachers possess knowledge of ICT	36	144	126	63	0	2.45	1.20
4.	Awareness about CIETs/ SIETs	36	45	63	171	54	1.91	1.36
5.	Awareness about PM-E Vidya	27	72	81	135	54	2.00	1.52
6.	Awareness about DIKSHA	99	279	36	90	27	3.05	1.84
7.	Awareness about Swayam Prabha TV	54	108	36	126	45	2.26	1.94
8.	Awareness about e-Path-shala	180	144	27	18	0	4.15	1.12
9.	Awareness about DAISY	0	18	72	234	45	2.21	1.47

Sl. No:	Item	Response Range						
		Strongly Agree	Agree	Neutral	Disa-gree	Strongly Disagree	Mean	SD
10.	Awareness about Shiksha Vani Podcast	27	45	63	189	45	2.10	1.50
11.	Awareness about Google Classrooms	270	90	09	0	0	4.68	0.41
12.	Awareness about Moodle	189	171	09	0	0	4.42	0.82
13.	Awareness about OLABS	117	279	63	63	09	2.44	1.34

Student-Teachers' Responses**: Total Responses **(ΣN) = 369

Table 2. Student-teacher's Usage of ICT

Sl. No:	Item	Response Range						
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
1.	Do you frequently use ICT/ digitalresources in teacher training	135	189	45	0	0	4.13	0.68
2.	Does your institute con-duct/aid in ICTknowledge programmes	36	216	72	45	0	3.26	1.18
3.	Participation in any ICT knowledgeprogrammes/ workshops	18	108	108	126	9	2.13	1.39
4.	Usage of PM-E Vidya in training/internship	18	9	81	189	72	1.79	0.86
5.	Use of DIKSHA in training/ internship	54	9	81	171	54	1.85	1.22
6	Use of Swayam Prabha TV in training/internship	9	27	81	189	63	2.35	1.44
7.	Use of e-Pathshala in train-ing/internship	99	90	72	81	27	3.98	1.38
8.	Use of DAISY in training/ internship	0	0	81	243	45	2.52	1.06
9.	Use of Shiksha Vani Podcast in training/internship	0	18	99	198	54	1.90	1.45
10	Use of Google Classroom in training/internship	180	99	27	63	0	4.3	0.88

11.	Use of MOODLE in training/internship	90	63	72	135	9	2.05	1.14
12.	Use of OLABS in training/ internship	9	126	45	153	36	2.33	1.29

Student-teachers' responses**: Total responses **(ΣN) = 369

Table 3. Student-teacher's attitude towards ICT

Sl. No:	Item	Response Range						
		Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Mean	SD
1.	Understanding the "National Policy of ICT inSchool Education"	90	153	72	54	0	3.77	1.01
2.	View towards including digital resources alongside classroom resources	198	153	18	0	0	3.61	0.85
3.	Use of ICT contributing to inclusive education	189	126	45	9	0	3.57	0.82
4.	Advocating smart classroom technologies beingembraced	162	162	36	9	0	3.56	0.81
5.	Use of ICT and digital resources will make students self-sufficient	144	180	27	9	9	3.53	0.95
6.	ICT and digital resources can transcend education beyond classrooms and schools	144	207	18	0	0	4.23	0.91
7.	ICT and digital resources are incomplete withoutteachers	126	180	45	18	0	4.34	0.68
8.	ICT and digital resources will one day replaceteachers	36	81	63	126	63	2.64	1.39
9.	All schools be up-scaled to equip ICT and digital resources	153	171	27	9	9	4.19	0.80
10.	Government doing enough for ICT/digital resources in education	54	117	153	36	9	3.4	1.06

Variables:

Student-teachers' responses**: Total responses **(ΣN) = 369-

Gender

Table 4. Sample Gender

Female		Male	
N	%	N	%
27 9	75.6	90	24.4

Stream/Field of study

Table 5. Student-teacher's field of study

Sl. No	Stream/ Discipline	N	%
1	Physical Sciences	54	14.6
2	Mathematics	18	4.8
3	Biological/ LifeSciences	324	87.8
4	Social Studies	27	7.3
5	Humanities	27	7.3

State of Formal Education

Table 6. Student-teacher's state of education

Sl.No	State	N	%
1	Karnataka	306	82.9
2	Kerala	18	4.8
3	Tamil Nadu	27	7.3
4	Telangana	18	4.8
5	Haryana	9	2.4

Fig. 1. Accessibility to devices

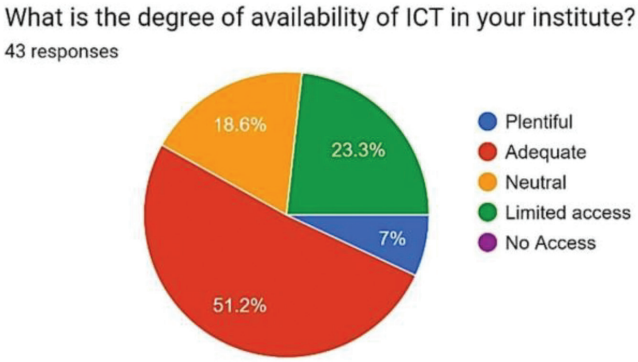


Fig. 2. Availability of Devices in Institute

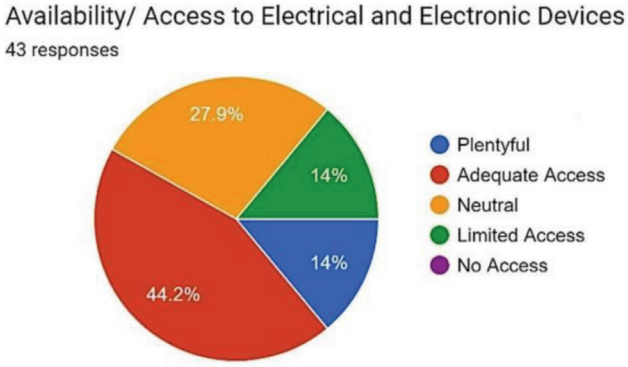


Fig. 3. Frequency of ICT Usage

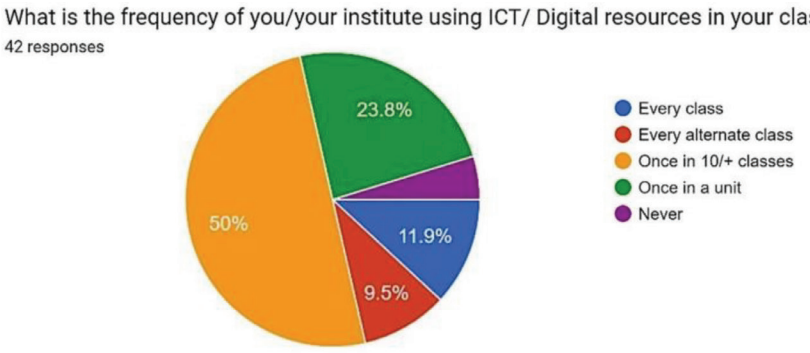
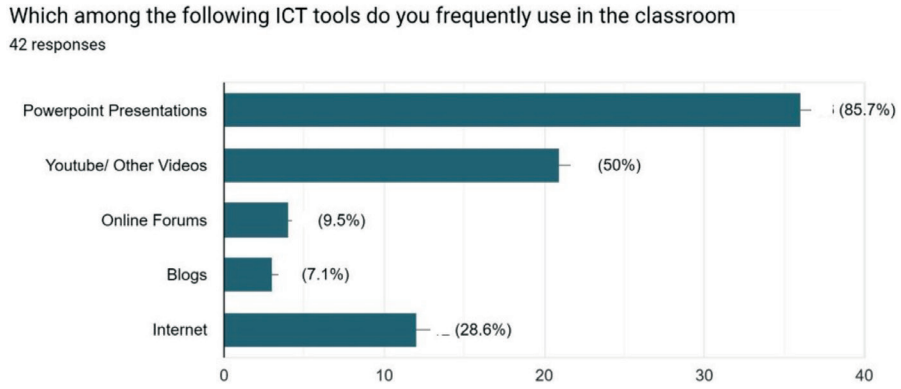


Fig. 4. Types of ICT Tool Usage



Thematic Analysis Item No. 36:

Practical experience and enough facilities: Respondents recommended that students get practical computer experience and that adequate facilities be supplied and maintained.

ICT integration into regular classrooms: Several respondents recommended integrating ICT into regular classes to increase its effectiveness.

Training for teachers: The respondents stressed the need for more workshops for in-service and pre-service teachers and better and more efficient teacher ICT training.

Importance and benefits of ICT: Respondents said that more ICT should be used in the classroom since it helps pupils learn topics more clearly and improves understanding.

Creating awareness: Holding workshops, funding institutions appropriately, and teaching instructors about using ICT were ideas put up by respondents. They asserted that the COVID pandemic lockdown's effect on using ICT and digital resources for online classes is a major reason for awareness.

Equipment and resources: Respondents recommended installing enough equipment and ICT resources in schools, together with well-outfitted functional labs and qualified teachers.

Balanced use: Some respondents recommended using technology in a balanced way, avoiding becoming overly reliant or ignorant, while others recommended starting with the fundamentals.

In order to make daily sessions more effective, respondents generally underlined the necessity for adequate teacher training, suitable facilities and equipment, and the incorporation of ICT. They also emphasised the value and advantages of ICT in education and the need for knowledge and instruction regarding its use.

Findings

Based on the data analysed, it is evident that the respondents have varying levels of familiarity and experience with ICT/digital resources in education. While most respondents seem to be familiar with digital resources like online videos, eBooks, and educational apps, a significant number of respondents are either unaware or have not used digital resources in education. It is also interesting to note that the respondents have different opinions on the effectiveness of ICT/digital resources in education. While some respondents believe that using ICT/digital resources can lead to better learning outcomes and make concepts clearer, others believe that it should be used appropriately and should not replace teachers. Pre-service teachers' response range and attitude are not influenced by gender, and males and females have expressed similar attitudes towards the items questioned. The attitude of the science teachers was affected by the state of their professional education. Pre-service teachers in Karnataka and Haryana showed a positive attitude towards private digital resources, but they were negatively affected by pre-service teachers in Kerala and Tamil Nadu.

Discussion

From the data, we can see that the mean knowledge scores for computer components, MS Office programs, and private digital resources are relatively high, with scores ranging from 2.62 to 4.55 out of 5.0. It suggests that the respondents have good knowledge about these digital resources. On the other hand, the mean usage scores for basic computer components, private digital resources, and digital resources of GOI are relatively high, with scores ranging from 2.38 to 4.13 out of 5.0. It suggests that the respondents use these digital resources frequently. However, the mean awareness scores for CIET/SIETs and participation in ICT workshops are relatively low, ranging from 2.13 to 3.26 out of 5.0. It suggests that the respondents may not have a good level of awareness about these digital resources or may not participate in ICT workshops frequently.

Enhancing Global Relevance

While this research focuses on the attitudes and values of pre-service teachers in India towards ICT and digital resources, broadening the study's scope to include comparative insights from global contexts would undoubtedly enhance its international relevance. Studies conducted in the US, Europe, and various Asian countries offer valuable benchmarks and contrasting perspectives.

Contrasting Perspectives: United States

For instance, research in the United States, such as the study by Anderson et al. (2015), indicates a more uniform and widespread integration of ICT in teacher education programmes. Unlike the varied attitudes found in the Indian context, the US pre-service teachers generally exhibit a high level of familiarity and positive attitudes towards digital resources. This difference may be attributed to differences in the educational infrastructure, policies, and the historical integration of technology in classrooms.

European Insights

Contrastingly, studies in Europe, such as the work by Schmidt and Thompson (2018), emphasise a nuanced approach. European pre-service teachers often navigate a diverse educational landscape with varying degrees of access to technology. The attitudes and values in Europe may highlight the impact of cultural and regional disparities, shedding light on how differing educational systems shape perceptions towards ICT.

Asian Variances

Exploring Asian perspectives, the research aligns with findings in Singapore, as seen in Tan's study (2017), where pre-service teachers similarly showcase diverse attitudes towards digital resources. However, the study also reveals unique challenges in integration, emphasising the influence of cultural and pedagogical factors on technology adoption.

Synthesis and Global Implications

By incorporating these global perspectives, the research gains a more comprehensive understanding of the attitudes and values of pre-service teachers

towards ICT. Recognising the nuanced variations across different regions strengthens the study's external validity and provides a basis for cross-cultural insights, fostering a global dialogue on effective ICT integration in teacher education.

Implications

Based on this analysis, we can infer that there is a positive relationship between the respondents' knowledge of digital resources and their usage of the same. Furthermore, their attitudes towards these resources, as measured by their awareness and participation, also appear to influence their usage. Overall, this suggests that promoting awareness and participation in ICT workshops among pre-service teachers could lead to increased usage of digital resources in the classroom.

Using the mean scores, we can calculate the correlation coefficient between attitude and usage using Pearson's correlation coefficient to measure the strength and direction of the relationship between attitude and usage. The correlation coefficient between attitude and usage is ($r = 0.65$), which indicates a moderate to strong positive relationship between the two variables. It suggests that pre-service teachers with positive attitudes towards digital resources are likelier to use them frequently in their teaching practices. Overall, this finding emphasises the importance of promoting positive attitudes towards digital resources among pre-service teachers to encourage their usage in the classroom.

Accessibility to ICT devices has also affected the attitude of pre-service teachers. Most student- teachers who had excess and adequate access to devices displayed a positive attitude, whereas the student-teachers who had no access to devices showed a positive attitude towards inclusion but were not aware of many digital resources. These findings help bring about policy reforms within the country's teacher education curriculum, including technology integration courses that bring about a more positive attitude of pre-service teachers.

Conclusions

In conclusion, it is evident that while there is a general familiarity with ICT/digital resources in education, there is still room for improvement regarding awareness and effective usage. The suggestions provided by the respondents can be used to improve the integration of ICT/digital resources in education and ensure that they are used to their full potential in enhancing students' learning outcomes.

The respondents have provided suggestions for improving the usage of ICT/ digital resources in education. The most common suggestion is to provide teachers with better training and awareness of using digital resources effectively. Other suggestions include incorporating more usage of ICT in classrooms, improving infrastructure and facilities, conducting more workshops and training programmes, and balancing technology usage. The pandemic lockdown has likely impacted the attitude and results of this study. The lockdown has forced many educational institutions to move their activities online, which may have increased the use and awareness of digital resources among pre-service teachers. Additionally, the lockdown may have led to increased interest and advocacy for using digital resources in education, as it has become more evident that such resources can be a valuable tool for remote teaching and learning.

On the other hand, the lockdown may have also led to decreased participation in ICT workshops or other forms of professional development, as such activities may have been postponed or cancelled due to the pandemic. It could impact the overall knowledge and awareness levels of pre-service teachers regarding digital resources. Overall, while it is difficult to say with certainty how the pandemic lockdown has specifically affected the results of this study, it is likely that it has had some impact on the attitudes and knowledge of pre-service teachers regarding digital resources. Further studies can focus on a correlation between the attitudes and usage of ICT and digital resources among pre-service teachers of varying disciplines and draw a more compelling understanding of knowledge, attitude, and usage of ICT and digital resources among pre-service teachers.

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