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RESISTANCE TO READINESS: STRATEGIES FOR SEAMLESS ICT INTEGRATION IN TEACHER EDUCATION

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ABSTRACT

Information and Communication Technology (ICT) has positively impacted global societal development particularly in education. Education is not merely about using digital tools; it involves enabling the development of critical thinking, creativity, problem-solving skills, and lifelong learning competencies. Knowledge and teaching are vital education components. Education must be high quality. The quality of education depends on teachers' competency. Teachers' competency is improved through quality training. Teacher must be trained to meet the needs of learners. Technology has extended its benefits to education. Teacher educators play an indispensable role in implementing ICT. Despite, having command over their subject, teacher educators lack integrating ICT in their teaching, when it is crucial for the present situation. This study explored the factors that restrict practical ICT usage in teaching-learning. A descriptive survey method was employed and data were collected using a questionnaire developed by the researcher. The study concludes with suitable strategies to overcome the challenges in integrating ICT in teacher education.

Keywords: ICT, ICT Integration, Factors, Teacher Training, Teacher Education, Teaching-Learning

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1. INTRODUCTION

Over the past few decades, ICT has transformed traditional pedagogical practices from teacher-centered to student-centered learning environments. Education is not merely about using digital tools; it involves enabling the development of critical thinking, creativity, problem-solving skills, and lifelong learning competencies. According to the National Policy and Strategy on ICT in Education 2014, integrating ICT in education not only fast-tracks skill acquisition and aligns real-world applications and educational experiences but can also significantly increase student engagement and motivation towards learning (National Policy and Strategy on ICT in Education, 2014). Knowledge and teaching are vital educational components. Education must be of high quality. The quality of education depends on teachers' competency. Teachers' competency is improved through quality training. Teacher must be trained to meet the needs of learners. Technology has extended its benefits education. Technology needs to be integrated as a larger goal in educational processes. Technological interventions are the driving forces that promote teacher preparation, professional

development, and teaching-learning and assessment processes (NEP, 2020). This optimistic view of the impact of ICT on student engagement is a testament to the potential of ICT in education. Rapid advancements in ICT have led educators and policymakers to acknowledge its tendency to transform education, highlighting the importance of its effective integration into teaching and learning processes.

In a technological society, teachers play a crucial role in leveraging ICT in contemporary educational practices, necessitating robust ICT competencies to gain learners' attention, effective instructional delivery and achievement of anticipated educational outcomes. Therefore, pre-service teachers must be skill-full in handling ICT tools and apply their skills in future classroom teaching to enhance student learning.

However, irrespective of the effectiveness of ICT use in teacher education classrooms are prevented by several factors, such as inadequate ICT infrastructure, insufficient training and development, negative attitudes toward technology, and lack of support from institutional leaders. The determinants are often enunciated because of limited infrastructure and resources. Despite numerous studies that have examined factors in different geographical locations, very few studies have been conducted in the Pondicherry. This research raised the following questions, 1). Does inadequate ICT infrastructure, lack of training, attitude, institutional leader support significantly hamper ICT integration in teacher education in the Pondicherry region? 2). What is the relationship between the factors restricting the effective integration of ICT in teacher education. This study examines the determinants that restrict the application of ICT and the relationship among the factors in teacher education classrooms in the Pondicherry Region and proposes strategies for overcoming these factors. This is accomplished by identifying key obstacles to ICT integration and providing suitable recommendations. This study contributes to constant efforts to enhance the quality of education by integrating ICT into teacher education classrooms.

2. THEORETICAL FRAMEWORK

This study adopted the theoretical foundation of the Will-Skill-Tool model (Knezek & Christensen, 2016). This model has been known as the Will-Skill-Tool technology integration model since 2000. Gradually, the model completed higher-order factor analysis to analyze the integrity of technology in pedagogical practices and conducted preliminary tests to separate the construct. The model helps understand the interrelated factors that influence ICT integration in classroom teaching. According to this construct, the will-skill-tool independently influences ICT integration in classroom practices. In this model, 'Will' was referred to as the attitude towards the technology integration in the teaching process; 'Skill' was referred to as the competencies and confidence to adopt ICT in teaching, and 'Tool' was referred to as the accessibility of ICT tools and resources can be deployed for effective teaching-learning process. 37 attributes were initially identified as influencers of technology integration in students' learning. Subsequently, these factors were confined to three major factors. This model is applicable to measuring both student and teacher levels of factors integrating ICT into pedagogical practices. Through this model, it was found that 90-94% of ICT integration is attributed to the Will-Skill-Tool. Hence, this is a perfect match for adopting the model in the present study. *Figure 1* depicts the Will-Skill-Tool Model of technology integration.

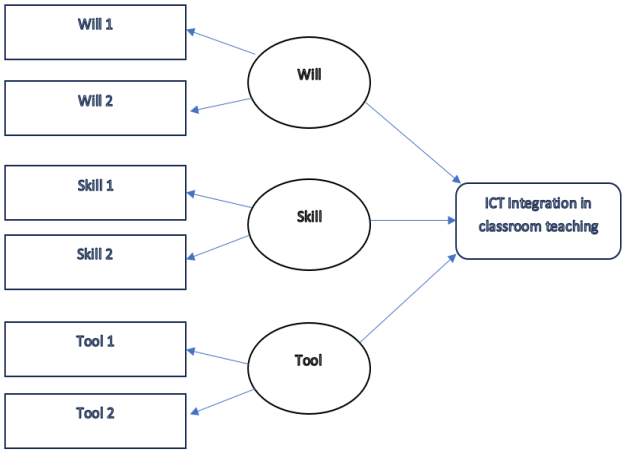

Figure 1. Will-Skill-Tool Model of Technology Integration

3. REVIEW OF RELATED LITERATURE

The precipitous advancement of technology has greatly helped to reach the knowledge landscape. ICT is undeniable for any type of education in the present scenario. Irrespective of education level, ICT has a remarkable influence. However, remarkable benefits of ICT can be experienced when it is fully implemented. Despite these potential benefits, studies still encounter challenges in implementing ICT in educational settings, particularly at the school level. Insufficiencies in ICT facilities, technological support, and teachers' knowledge are significantly hampered at the primary school level (Diwani & Mohammed, 2023; Padayachee, 2017). The lack of infrastructure is a first-order obstacle to the effective implementation of ICT in any institution (Kihoza et al., 2016). An insufficient infrastructure may lead to delays in classroom teaching (Demissie et al., 2022). Employment is not feasible for technology when the infrastructure is not provided, and teachers cannot update themselves with the required ICT skills for the rapid development of technology (Moses et al., 2012). Another study reported that self-efficacy, attitudes, digital competence, and using digital tools were found to be key factors in understanding the factors influencing in-service teachers (Peng et al., 2023). Having a strong ICT base is essential for the successful implementation of ICT in the teaching process; ICT specialization and a variety of ICT training programs develop ICT skills, which is the core component for successful integration of ICT into subject teaching (Bariu & Chun, 2022; Demissie et al., 2022). The absence of digital literacy or proper training in the use of e-education tools among teachers makes it difficult to integrate technology into their teaching practices (Padayachee, 2017). Educational settings demand a positive attitude towards ICT (Bariu & Chun, 2022; Meerza & Beauchamp, 2017). According to Hall (2015), a negative attitude towards technology is a challenge when integrating ICT into teaching and learning. Inadequate technical support leads teachers to delay integrating ICT into practical teaching; the administration should provide teachers with full support through skilled assistants who can handle troubleshoot hardware and software devices (Natriello, 2013; Johnson et al., 2016).

Technology is a vehicle, whereas teachers are drivers heading towards changes in the educational landscape. Having the required ICT environment in the school (or) classroom is not enough to achieve the desired outcome; rather, teachers' attitude towards technology is the driving force to utilize ICT tools on the real ground. In addition, it is understood that teachers' ICT skills and positive attitude towards imbibing ICT tools in their teaching tend to produce better educational outcomes (Rastogi & Malhotra, 2013). Teachers' positive attitudes must be enfolded to successfully implement ICT. Teachers' positive attitudes towards ICT motivate them to thirst for possible ways to utilize suitable ICT tools and resources as teaching materials. Likelihood teachers develop their ICT skills by deploying ICT tools. In other way, a positive attitude is significantly associated with enhanced skills (Bariu & Chun, 2022). ICT skills can be enhanced through continuous practice by utilizing available ICT resources. Adequate training helps teachers to accumulate their attitudes in integrating ICT in teaching, and pedagogical skills, and know how to use the available ICT tools in their teaching-learning process (Adam Natia J. & Al-hassan Seidu, 2015; Mark & Emmanuel, 2019).

4. RESEARCH METHODOLOGY

This study aimed to understand the factors influencing teacher educators' inability to use ICT tools in their classroom practices. Many studies have been conducted and are also being investigated. This is the digital age, and the government has been vigorously trying to implement ICT in teaching for decades, but still focusing on affective factors shows the unintentional failure of effective implementation of the policies. Therefore, the author is motivated to identify functional barriers affecting the effective implementation of ICT in the teaching-learning process at the teacher-education level. The effective implementation of anything, such as policies and, methodologies, is in the hands of teachers because teachers are ground-level workers. Teacher education plays a key role in producing high-quality teachers. To produce quality teachers, teacher education must provide a conducive learning environment for budding teachers. A conducive environment for the learner is adequate infrastructure; a positive attitude of teachers towards the resources, strategies, and methods to be used in their instructions; proper training and extensive support to utilize the resources from the administration. Hence, this study employed teacher educators as the sample, derived from the population of teacher educators working in both Government and Private teacher education institutions in the Pondicherry region. Puducherry is a Union Territory with four districts located in four different states; Pondicherry (Puducherry), Karaikal (Tamilnadu), Mahe (Andhra Pradesh), and Yanam (Kerala). Despite the four districts, the researcher selected only the

Pondicherry district as the study area. As the districts are shared in different geographical locations Pondicherry was selected as a convenient place for this study. All teacher educators working in all teacher education institutions in the Pondicherry region will constitute the population for the proposed study. Since the study is a census in nature, all 120 teacher educators working in all teacher education institutions were considered as a sample. The selected sample adequately represented the population in relation to the study area (Bukhari S. A. R, 2021). This study conducted a descriptive survey by using quantitative research method to lead the study. A survey tool was developed to collect data from the selected sample. The survey questionnaire consisted of 12 items with four significant factors affecting the integration of ICT in classroom teaching. The questionnaire used for the study was dichotomous, distributed to the respondents, and requested to give their responses.

5. RESULTS AND DISCUSSION

Table 1 Responses of Sample

Sl. No	Item	Agree	Disagree
Lack of Infrastructure	Insufficient number of Computers	77%	23%
	Insufficient Internet Bandwidth	59%	41%
	Insufficient Interactive white-board	78%	22%
Lack of training	Skilled in using ICT for teaching learning	82%	18%
	No idea on benefits of integrating ICT into teaching	74%	26%
	Not trained to use gadgets	79%	21%
Attitudes towards ICT	An extra burden to work with ICT tools	75%	25%
	Heath may get affected.	54%	46%
	Technology leads to being more dependent on it.	59%	41%
Lack of institutional support	Not providing permission to integrate ICT for teaching.	68%	32%
	Insufficient technical support for teachers	57%	43%
	Accessible only for office work	64%	36%

Table 1 shows the responses provided by the sample at the time of tool administration on the items addressing the factors that restrict ICT integration into teaching. This section presents the findings covering the research questions of the present study and discusses previous studies that support it. Data were analyzed using descriptive statistics with the help of the Statistical Procedure for Social Sciences.

ICT infrastructure includes a computer, laptop, smart board, TV, Radio, Projector, Scanner, and Printer. Despite all the ICT tools, the researcher took three main tools for the present study: a Computer/Laptop, an Internet connection, and an interactive whiteboard, because these are the essential tools to make an intelligent classroom. The data revealed that inadequate ICT infrastructure significantly hampers the integration of ICT in teacher education. It was revealed that 71% of the sample stated that the lack of institutional ICT infrastructure significantly influenced the integration of ICT in classroom teaching. This finding supports earlier studies conducted by (Kihoza et al., 2016 and Bakari & Ali, 2023). Here it is important thing to note, that since 1986 Indian education policies (National Policy on Education, 1986) have emphasized the importance of amalgamation of technology in teaching and a reasonable amount spent on proving ICT infrastructures in educational institutions. Peprah (2016), also mentioned that there were a good number of quality teachers, but proper infrastructure facilities should be provided. However, it is surprising that, the provision of adequate infrastructure remains esoteric.

Teachers' training refers to their ability to handle ICT tools, identify or have a clear idea of selecting appropriate ICT tools to support their teaching, and the skills to utilize the identified tool in their pedagogy. "Benefit to students of using new technologies is greatly dependent, at least for the moment, on the technological skill of the teachers and the teacher's

attitude to the presence of the technology in teaching," (Amenyedzi et al., 2011). The present study found that 78% of teacher educators accepted that inadequate training for teachers significantly hinders the integration of ICT in teacher education classrooms. This finding is also supported by previous studies. Despite having proper ICT infrastructure, it is meaningless when teachers are unable to use the provided facilities. Therefore, providing quality training to teacher educators to utilize the available facilities, is a wise action that can be taken by the institution/government.

Attitude refers to the teacher educator's opinion about ICT tool usage in their teaching-learning process. The data revealed that 63% of the respondents accepted that negative attitudes towards technology among teachers significantly hinder ICT's practical integration in teacher education classrooms. Teachers' positive attitude towards ICT tools has a significant relationship with the effective integration of ICT (Basargekar and Singvi, 2017). Ertmer et al.,(2012) articulated that technology integration in teaching is affected by the attitudes and beliefs of other teachers.

Lack of institutional support refers to the encouragement and technical assistance provided to teachers by their colleagues and higher authorities regarding the use of technological tools in classroom teaching. A larger proportion (63%) of the respondents agreed that the paucity of institutional leaders' support significantly hindered the integration of ICT in teacher education classrooms. Ertmer et al., (2012) classified institutional and technical support as external barriers and that influence the integration of ICT in teaching. When teachers receive little support from an institution, they can find more ways to adopt ICT in teaching. Hence, institutional support also plays an important role in boosting teacher educators to find more opportunities to develop their teaching-learning process using ICT. However, there is a need to understand that teachers possess the potentials to integrate ICT into teaching, and institutional support must be ensured.

This study was conducted to delve into the four influencing factors and the results revealed that there was a low level of significant variation in the responses. As illustrated in Table 2, only a slight difference in percentages was observed. This suggests that each factor was closely interdependent. An adequate infrastructure aids teachers in receiving suitable training on how to integrate ICT into their teaching. When teachers are adequately trained to utilize ICT resources effectively, they are expected to enhance their positive attitudes towards integrating ICT into their instructional methods. The axiom "where there is a will, there is a way" applies here; when infrastructure, training, and a positive attitude are lined up, institutional support cannot inhibit the effective integration of ICT into teaching. The critical examination of Ertmer et al., (2012) infers that increasing skills turn the potential change in attitude, and this opens the platform for the successful implementation of the tools. Infrastructure and institutional support are reciprocally reinforcing elements. Institutional support often facilitates endowment of robust infrastructure. Conversely, when an institution is furnished with strong infrastructure, it implies that a high level of cooperation and support is possible from institutional leaders toward utilizing the infrastructure. Consequently, concentrating on a single challenge may lead to unsatisfactory results for achieving the actual incorporation of ICT in teaching. A comprehensive approach to address all pertinent factors is crucial for facilitating the integration of ICT into educational practices. *Table 1* provides a clear overview of these findings.

Table 1 Finding from sample response

Sl. No	Factors	Agree	Disagree
1	Lack of ICT infrastructure	71%	29%
2	Lack of Training	78%	22%
3	Negative Attitude towards ICT	63%	37%
4	Lack of Institutional Support	63%	37%

6. STRATEGIES RECOMMENDATIONS

The availability of ICT infrastructure is necessary to effectively integrate ICT into teaching and learning. Therefore, The Government and Private educational institutions must ensure that ICT infrastructure and resources are available to all learners and educators. UNESCO (2018) recommends that the government prioritize ICT infrastructure development and invest in programmes that promote digital literacy skills. Despite testing the four selected factors, lack of training scored the highest at 73% of respondents' attention. Teacher training using ICT significantly affects teachers' attitudes and beliefs toward integrating ICT. When teachers are not properly trained to utilize available resources, effective

integration is not achieved (Chigona & Chigona, 2010). Hence, educational institutions must provide adequate training to prospective teachers to develop the necessary skills and knowledge to integrate ICT effectively into their teaching practices (Soma et al., 2021). Teacher training programs focus on integrating ICT for teaching and learning, developing digital literacy skills, and using technology-enhanced learning activities (Mathevula & Uwizeyimana, 2014). In education, ICT has positively impacted lesson preparation, instructional delivery, individualized, collaborative learning, autonomous learning, shared learning resources, shared learning spaces, etc. In this regard, Indian educators and policymakers prepared a curriculum and implemented a subject named Understanding of ICT and its Application. The objective of the curriculum is to move beyond computer literacy and, ICT-aided learning and adapt ICTs to understand educational aims and principles. It is a good start, but the investigator's observation is that rather than applying ICT in one subject, deploying ICT in perspectives and pedagogical subjects will also provide an effective outcome. Even (NCF, 2005) states that technology needs to be put more weight into integrating it as a larger goal and process of educational programs rather than viewed in isolation. Some may forget what they have learned by focusing on other subjects and practicum work where there is no need to depend on technology. Therefore, there is no guarantee that every student (student-teacher) will continue practising with technological tools even after finishing a particular subject in that semester or course. They may continue practising and become familiar with technological tools when they use technological assistance in all subjects. There is no confusion about integrating ICT tools when they become natural classroom teachers. Educators must design curricula that support meaningful ways of integrating ICT to meet their learning objectives. Educational institutions should encourage the integration of ICT in teaching and learning. Attitudes and beliefs significantly impact the effective integration of ICT into teaching and learning (Ertmer et al., 2012). Therefore, fostering positive attitudes toward technology among teachers and students is essential. Training programs should be provided to realize the benefits of incorporating information communication technology in teaching and learning. Moreover, the understanding of teacher educators and institutional leaders should be widened, as the factors are interdependent. Hence keeping it in mind, one should realize overcoming the potential barriers gradually but all. The encouragement of institutional leaders can be a source of strength for teachers regarding the integration of ICT tools in teaching. Encouragement can be in the form of incentives, rewards, awards, etc., which can help teachers, professional development, institutional development, and prospective teacher educators. However, every teacher and institutional leader must realize their responsibility for preparing quality teachers.

7. DELIMITATIONS OF THE STUDY

The researcher selected only one district as the study area, and the study was confined to only teacher educators who are preparing for future teachers.

8. CONCLUSION

The successful integration of ICT in instructional delivery is crucial, and teacher education classrooms are no exception. However, several factors limit the effective integration of ICT in teacher education classrooms, including inadequate ICT infrastructure, lack of training and development opportunities, negative attitudes towards technology, and lack of support from institutional leaders. This study aimed to explore these factors and propose strategies for overcoming them, promoting the effective use of ICT in teacher education classrooms. By understanding these factors and implementing the recommended procedures, teacher educators and institutional leaders can understand the possible ways to overcome the challenges and ensure that ICT is used effectively in teacher education classrooms.

DATA AND AVAILABILITY OF MATERIAL

The datasets generated and analyzed Panneer Pugazh (2024), "Coded & edited data", Mendeley Data, V1, DOI: 10.17632/3spfk55nk2.1 Coded & edited data - Mendeley Data. The current study is available in the Mendeley Data Repository. Owing to privacy concerns, raw data cannot be publicly shared; however anonymized data are available from the corresponding author upon reasonable request.

AUTHORS CONTRIBUTION SECTION

Author 1 conceptualized the study, designed the research framework, conducted the data collection and fieldwork, performed the data analysis and interpreted the findings and wrote the initial draft of the manuscript. Authors 1, & 2 reviewed and edited the manuscript critically for important intellectual content. Author 2 supervised the research and provided guidance throughout the project. Author 1 secured the funding for the study. All authors have read and approved the final manuscript.

ETHICS STATEMENT

This study was conducted with a focus on ethical practices to ensure the integrity and welfare of the participants. While formal ethical approval was not sought from an institutional ethics committee, the research adhered to the general ethical principles outlined in the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Participants were fully informed about the purpose of the study and their involvement, and informed consent was obtained prior to their participation. Confidentiality and anonymity were strictly maintained throughout the research process, and no personally identifiable information was collected or disclosed. The research was conducted solely for academic purposes and posed no risk or harm to the participants.

CONFLICT OF INTERESTS

None.

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