




## PERCEIVED ICT COMPETENCIES OF FEMALE STUDENT TEACHERS IN RELATION TO SELECTED VARIABLES

R. Vinodh Kumar  and P. Menaga Sri 

*The present study intends to determine the perceived level of Information and Communication Technology (ICT) competencies of female student teachers enrolled in a Bachelor of Education (B.Ed.) teacher education programme at six private colleges of education in the Salem district of Tamil Nadu State, India. A convenient sample of 301 female student teachers participated in this study. The researchers used the "Information and Communication Technology Competency Scale (ICTCS)" developed based on existing literature to collect data from female student teachers. The data were collected using a Google form and analysed using descriptive and inferential statistics. The results indicate that female student teachers had competency in most ICT parameters. The study identified several significant factors that influenced the ICT competencies of female student teachers, including locality of residence, education level, possession of a personal computer or laptop, completion of a computer training course, and the number of years of computer usage. However, the major subject of female student teachers did not affect their level of ICT competencies. Policymakers and teacher educators can use these findings to design targeted interventions to enhance the ICT competencies among student teachers in teacher education programmes.*

**KEYWORDS:** Computer Proficiency, Information and Communication Technology, ICT Competency, Teacher Candidates, Women Student Teachers

---

R. Vinodh Kumar   
Assistant Professor, Department of Education, Periyar University, Salem, Tamil Nadu, India.  
Email: [vinodh\\_edu@periyaruniversity.ac.in](mailto:vinodh_edu@periyaruniversity.ac.in). ORCID: <https://orcid.org/0000-0002-5010-919X>

P. Menaga Sri  
Assistant Professor, Kalaimagal College of Education, Dharmapuri, Tamil Nadu, India.  
Email: [mercyrani77@gmail.com](mailto:mercyrani77@gmail.com). ORCID: <https://orcid.org/0009-0009-5963-9763>



## INTRODUCTION

The advancement of information and communication technologies (ICTs) has transformed how people store, process and access information digitally, as well as how they communicate with each other over long distances. The term ICT represents a wide range of hardware and software tools and technologies, including computers, mobile phones, the internet, and various software applications. Over time, scholars have interpreted the concept of ICT in many ways. ICT is defined by [Hennessy et al. \(2005\)](#) as a combination of hardware, software applications, telecommunications, and information systems. [Asabere and Enguah \(2012\)](#) define ICT as “the tools, processes, equipment, and facilities that provide an environment for generating, transmitting, processing, storing, and disseminating information in any form.” According to [Yunus et al. \(2013\)](#), ICT refers to technological tools and resources used for communication, creation, distribution, and management of information. These definitions of ICT have evolved alongside technological advancements and changes in the digital economy. Now, there is more emphasis on skills like digital communication, collaboration, critical thinking, problem-solving, creativity, and digital citizenship ([Alnasib, 2023](#); [Cebi & Reisoglu, 2020](#)).

ICT plays a crucial role in all aspects of human life, including education. ICT transformed traditional ways of teaching and learning and became an essential component of education ([Yusuf, 2005](#)). ICT has many uses in the field of education such as catering to individual learning needs, promoting educational equality, providing high-quality learning materials, increasing students’ self-efficacy and independence, and improving teacher professional development ([Abolade & Yusuf, 2005](#); [Caluza et al., 2017](#)). The integration of ICT into education also increases student participation and improves their academic performance ([Naji, 2017](#)). [Briones \(2018\)](#) also found a relationship between teacher proficiency in the use of ICT and student performance. As a result, ICT is increasingly seen as an essential component of building a 21<sup>st</sup>-century learning environment ([Jegede, 2008](#)). With the growing usage of ICT in education, teachers and student teachers must have adequate ICT competencies to provide quality education ([GuillEn-Gsmez et al., 2020](#)).

Recognising the importance of ICT in today’s world, the Government of India launched the “Digital India” programme to transform the country into a digitally empowered society and knowledge economy. While education is still crucial in this transformation, technology also plays a vital role in improving educational processes and outcomes ([Ministry of Human Resource Development, 2020](#)). The Government of India implemented various programmes to improve digital literacy among students, student teachers, and teachers to support the digital revolution in the education sector, including initiatives such as DIKSHA, e-Pathshala, the National Repository of Open

Educational Resources (NROER), SWAYAM MOOCs, and so on. The state of Tamil Nadu also has been actively promoting the use of ICT in education through various programmes and initiatives, including the distribution of free laptops to student teachers and other students of higher education institutions. However, it is unclear whether these efforts have had a significant impact on the ICT competencies of student teachers and other students in higher education institutions. The COVID-19 pandemic further intensified the use of technology and digital platforms for learning in India, with a substantial increase in the use of online education applications such as Zoom, Google Classroom, Google Meet, and so on. For these reasons, teachers need to have the necessary ICT skills.

However, the success or failure of implementing ICT in teaching and learning depends on how teachers perceive their competency in using ICT in the classroom [Naji \(2017\)](#). As such, this study aims to determine the perceived level of ICT competencies of female student teachers who are currently enrolled in a Bachelor of Education (B.Ed.) teacher education programme at private colleges of education in the Salem district of Tamil Nadu State, India. Additionally, this study examines the impact of several factors such as the locality of residence, major subject, education level, possession of a personal computer or laptop, completion of a computer training course, and the number of years of computer usage on the ICT competencies of female student teachers. While most previous studies focused on the ICT competencies of both male and female student teachers, this study focuses on only female student teachers. The choice to focus on female student teachers is based on their significant population in teacher education programmes and their potential to play a significant role in shaping the future of education in the state.

## REVIEW OF RELATED STUDIES

The researchers reviewed and presented the related studies in three themes: the ICT competencies of teachers, the ICT competencies of student teachers, and the factors that influenced the ICT competencies of teachers and student teachers.

### ICT Competencies of Teachers

The researchers conducted several studies to examine the ICT competencies of teachers. [Adebayo and Fagbohun \(2013\)](#) found that most secondary school teachers had computer and ICT literacy. According to [Ezugwu and Diri \(2014\)](#), most mathematics teachers were proficient in using ICT in the classroom. [Malinina \(2015\)](#) reported that foreign language teachers had sufficient knowledge and skills to integrate ICT into their classroom practices. [Daling](#)

(2017) indicated that secondary school teachers had the competence to incorporate ICT into their teaching. [Briones \(2018\)](#) concluded that grade 8 physics teachers in the Philippines were competent users of ICT for teaching purposes. Furthermore, [Machmud et al. \(2021\)](#) found that Indonesian teachers possessed a higher level of ICT competencies, particularly in terms of curriculum implementation and assessment.

However, some studies suggest that teachers have only basic or moderate ICT skills. [Nagamani and Muthuswamy \(2013\)](#), for example, reported that teachers used ICT for professional purposes moderately. [Caluza et al. \(2017\)](#) found that public school teachers in the Philippines had only basic ICT skills. [DelaFuente and Binas \(2020\)](#) suggested that teachers' information and communication technology proficiency was at an intermediate level. [Joshi et al. \(2021\)](#) reported that while mathematics teachers in Nepal showed prominent ICT competency in the fundamental concepts of computers and the internet, their competency in using computer software and hardware was in the developing stage. [Ikwuka et al. \(2021\)](#) found that English language teachers in Nigeria possessed only basic computer operational skills that are typically for official use and lacked competency in using PowerPoint and interactive whiteboards in the classroom for teaching and learning purposes. Furthermore, [Novela \(2022\)](#) reported that teachers were moderately competent in using office productivity tools and email management, but they had less competency in web browsing, video conferencing, and other online applications.

Previous research also revealed that teachers lacked pedagogical knowledge of how to use ICT tools for teaching ([Obielodan et al., 2020](#)). [Basargekar and Singhavi \(2017\)](#) reported varying levels of ICT competency among teachers, and [Nurhabibah et al. \(2018\)](#) observed that teachers lacked self-confidence in using ICT in their teaching. To sum up, previous studies suggest that teachers require additional training and support to effectively integrate ICT into their teaching practices, even if they have a certain level of ICT competency.

### **ICT Competencies of Student Teachers**

Researchers conducted several studies to investigate the ICT competencies of student teachers. [Danner and Pessu \(2013\)](#) found that student teachers had high proficiency in word processing and file navigation, but only moderate proficiency in internet browsing and email management, with the majority of teachers lacking competence in using presentation tools such as PowerPoint. Similarly, [Singh and Subramaniam \(2014\)](#) reported that Malaysian preservice teachers were well-versed in regularly used applications in the teaching profession, such as word processing, spreadsheets, PowerPoint, and email. [Ahmad et al. \(2016\)](#) showed that teacher trainees exhibited good ICT skills in five of

the seven domains. [Ching \(2016\)](#) in his study revealed that trainee teachers in Mauritius were competent in the use of office software applications such as word processing and spreadsheets. Similarly, [Boholano \(2018\)](#) observed that preservice teachers had a prominent level of information, media, and technology skills. Furthermore, [Alnasib \(2023\)](#) reported that most of the preservice teachers rated their digital competency as excellent. On the other hand, [Cebi and Reisoglu \(2020\)](#) demonstrated that preservice teachers had only a moderate level of digital competence and required additional training and support. In conclusion, previous research on the ICT competencies of student teachers suggests that they have good competency in word processing and basic software tools but may require more attention in other areas, such as internet surfing, emailing, and the latest ICT technologies.

### **Factors Affecting ICT Competencies of Teachers and Student Teachers**

A review of previous studies informed the present study on the factors that influenced the ICT competencies of teachers and student teachers. [Adebayo and Fagbohun \(2013\)](#) and [Danner and Pessu \(2013\)](#) found that student teachers who received formal computer training had greater levels of ICT competency. Similarly, [DelaFuente and Binas \(2020\)](#) reported that teachers who attended more ICT-related training programmes or workshops had better ICT competencies. [Nagamani and Muthuswamy \(2013\)](#) demonstrated that secondary school teachers' use of ICT was influenced by their age and location. [Nurhabibah et al. \(2018\)](#) reported that teachers' gender and age impacted their integration of ICT in classroom instruction. However, [DelaFuente and Binas \(2020\)](#) found that age, gender, highest educational attainment, and teaching position did not have a significant effect on teachers' ICT skills.

[Joshi et al. \(2021\)](#) revealed that age and school types were major factors that influenced teachers' ICT competencies. The possession of a personal laptop, internet use, work experience, and knowledge of software and hardware were also significant predictors of teachers' ICT competency. [Subaveerapandiyan and Nandhakumar \(2021\)](#) concluded that teachers' age influenced their ICT skills and ICT integration in higher education institutions. [Cebi and Reisoglu \(2020\)](#) investigated preservice teachers' ICT competencies and found that gender and major subject influenced their ICT competency.

[Basargekar and Singhavi \(2017\)](#) in their study revealed a positive correlation between teachers' years of experience using computers and their proficiency in using ICT tools. The results also showed that there was no significant difference between technical (physics, chemistry, and mathematics) and non-technical subject teachers (languages and social sciences) in their proficiency in using ICT tools. [Daling \(2017\)](#) found that secondary school teachers who had

higher levels of proficiency with computers and other ICT tools were more effective in their classroom instruction.

Overall, the reviewed studies indicate that various factors influenced teachers' and student teachers' ICT competencies. Any effort aimed at enhancing the ICT competencies of teachers and student teachers should consider these factors and address their specific needs and challenges.

## RESEARCH GAP AND RATIONALE OF THE STUDY

Previous studies have revealed a research gap in the investigation of ICT competencies among female student teachers in India, despite their significant representation in teacher education programmes. In the Salem district of Tamil Nadu State, a majority of student teachers are trained in private colleges of education, where over 90% of the student-teacher population is female. However, there has been limited research on the ICT competencies of female student teachers in these institutions and their relationship with demographic and study-related variables.

Previous research has indicated a lack of studies exploring the relationship between the location of residence and the ICT competencies of teachers and student teachers. With significant variations in ICT access and infrastructure between urban and rural areas, it has been crucial to investigate how the location of residence impacts the ICT competencies of female student teachers.

Although some studies have investigated the influence of education level, personal computer or laptop ownership, and computer training completion on teachers' and student teachers' ICT competencies, little research has been conducted on the relationship between ICT competencies and major subject areas. Because different subjects may necessitate different ICT competencies, this has been a crucial factor to consider. Moreover, there has been little research on the impact of the number of years of computer usage on the ICT competencies of teachers and student teachers.

Therefore, the objective of this study was to address these research gaps and contribute to the existing literature on the ICT competencies of teachers and student teachers, with a specific emphasis on female student teachers in private colleges of education in the Salem district of Tamil Nadu State, India.

## OBJECTIVES OF THE STUDY

The following objectives guided the present study:

- i) To examine the demographic profile of female student teachers surveyed.
- ii) To determine the level of ICT competency of female student teachers.

iii) To determine if there is a difference in female student teachers' ICT competencies based on the location of residence.

iv) To determine if there is a difference in female student teachers' ICT competencies based on the major subject.

v) To determine if there is a difference in female student teachers' ICT competencies based on education level.

vi) To determine if there is a difference in female student teachers' ICT competencies based on the possession of a personal computer or laptop.

vii) To determine if there is a difference in female student teachers' ICT competencies based on the completion of a computer training course.

viii) To determine if there is a difference in female student teachers' ICT competencies based on the number of years of computer usage.

ix) To provide recommendations to policymakers and preservice teacher education institutions for the effective design and integration of ICT training into their curricula to equip student teachers with ICT competencies.

## HYPOTHESES OF THE STUDY

In this study, the following hypotheses were tested:

i) There is no statistically significant difference in ICT competencies between female student teachers from rural and urban areas.

ii) There is no statistically significant difference in ICT competencies among female student teachers of various subjects of study, namely languages, mathematics, science, and social science.

iii) There is no statistically significant difference in ICT competencies between female student teachers with an undergraduate degree and female student teachers with a postgraduate degree.

iv) There is no statistically significant difference in ICT competencies between female student teachers who have possessed a personal computer or laptop and those who have not.

v) There is no statistically significant difference in ICT competencies between female student teachers who have completed a computer training course and those who have not.

vi) There is no statistically significant difference in ICT competencies among female student teachers based on the number of years of computer usage, such as less than one year, one to two years, three to four years, and more than four years of computer usage.

## RESEARCH METHODOLOGY

### Method

In this study, a descriptive survey method was used to assess the ICT competencies of female student teachers with respect to selected demographic and study-related variables.

### Sample for the Study

A convenience sampling technique was employed to select a total of 301 female student teachers enrolled in a Bachelor of Education (B.Ed.) teacher education programme from six private colleges of education located in the Salem District of Tamil Nadu State, India. The age range of participants in this study was between 20 and 35 years old, and only female student teachers were included due to the limited number of male student teachers in the selected colleges of education.

### Research Instrument

We developed an “Information and Communication Technology Competency Scale (ICTCS)” based on existing literature to collect data from female student teachers. It is a five-point scale with 14 items related to ICT competencies such as basic computer operations, use of office and teaching productivity tools, and internet operations and applications. The items on the scale required a response from one of five options, such as excellent competency, good competency, fair competency, low competency, and no competency, with scores ranging from 5 to 1. The scale scores of the female student teachers could range from 14 to 70. A higher scale score indicated a higher ICT competency, whereas a lower scale score indicated a lower ICT competency. The mean of the 14 items on the scale was used to determine the perceived ICT competency of female student teachers. The scale’s content validity was confirmed through expert review. To ensure the scale’s reliability, it was pilot-tested with 20 female student teachers at a college of education, and Cronbach’s alpha was found to be 0.93. This showed that the developed scale was a reliable research instrument.

### Data Collection, Processing, and Analysis

Data for this study were gathered using a “Google Form.” The Google form containing ICT competency parameters was emailed and sent via WhatsApp to female student teachers from six private colleges of education. Detailed



instructions on how to complete the scale were provided in the Google form itself. The data collection process took a month, specifically April 2022 of the academic year 2021–22.

After the required number of responses were received, the data of all female student teachers were downloaded as a Microsoft Excel file. Following that, all scale responses were reviewed and scored by assigning 5 points for excellent competency, 4 points for good competency, 3 points for fair competency, 2 points for low competency, and 1 point for no competency. Then, the spreadsheet containing the data was exported to SPSS (Version 25) and formatted according to the data analysis requirements.

The data were analysed using descriptive and inferential statistics. Descriptive statistics, such as mean, standard deviation, and percentages, were used to describe the demographic characteristics and ICT competencies of female student teachers. To interpret the results of descriptive statistics, we used the following criteria: items with a mean score of 4.20 to 5.00 indicate excellent competency; 3.40 to 4.19 indicate good competency; 2.60 to 3.39 indicate fair competency; 1.80 to 2.59 indicate low competency; and 1.00 to 1.79 indicate no competency (Daling, 2017).

Inferential statistics, including the t-test and F-test, were used to examine the relationship between ICT competencies and demographic and study-related factors. A post-hoc analysis was also performed to determine the significant differences between the groups. A significance level of 0.05 was set for hypothesis testing in the study.

## **Delimitations of the Study**

The present study delimited itself in several ways that required consideration while interpreting the findings. Firstly, it had a narrow focus, as it solely examined female student teachers who were enrolled in a Bachelor of Education (B.Ed.) programme in six private colleges of education located in the Salem district of Tamil Nadu State, India. As a result, the generalisability of the findings to other regions, types of institutions, or male student teachers may be limited. Furthermore, the study examined the perceived ICT competencies of female student teachers in relation to selected demographic and study-related variables such as the location of residence, major subject, education level, possession of a personal computer or laptop, completion of a computer training course, and the number of years of computer usage. However, the study may have excluded other factors that could have influenced the development of ICT competencies among female student teachers.

## RESULTS AND DISCUSSION

The data analysis is divided into two parts: descriptive analysis and inferential analysis.

**Descriptive Analysis**

The descriptive analysis provides a profile of the surveyed female student teachers as well as their perceived ICT competencies.

**Objective 1: To examine the demographic profile of female student teachers surveyed.**

The demographic characteristics of the female student teachers are shown in Table 1, presented as percentages.

**Table 1**

**Profile of the Female Student Teachers (N = 301) .**

| S. No. | Variables                                   | Categories  | n   | %  |
|--------|---|---|-----|----|
| 1      | Locality of Residence                       | Rural   | 192 | 64 |
|        |   | Urban   | 109 | 36 |
| 2      | Major Subject                               | Languages (Tamil and English)   | 109 | 36 |
|        |   | Mathematics   | 74  | 24 |
|        |   | Science   | 101 | 34 |
|        |   | Social Science  | 17  | 6  |
| 3      | Education Level                             | Student teachers with an undergraduate degree                         | 191 | 63 |
|        |   | Student teachers with a postgraduate degree                           | 110 | 37 |
| 4      | Possession of a personal computer or laptop | Student teachers with their computer or laptop                        | 186 | 62 |
|        |   | Student teachers without their computer or laptop                     | 115 | 38 |
| 5      | Completion of a computer training course    | Student teachers who have completed a formal computer training course | 50  | 17 |

*Continued on next page*

Table 1 continued

|   |                                   |  |     |    |
|---|-----------------------------------|--|-----|----|
|   |                                   | Student teachers who have not completed a formal computer course | 251 | 83 |
| 6 | Number of years of computer usage | Less than 1 year of computer usage                               | 98  | 32 |
|   |                                   | Computer usage between 1 and 2 Years                             | 71  | 24 |
|   |                                   | Computer usage between 3 and 4 Years                             | 53  | 18 |
|   |                                   | More than 4 Years of computer usage                              | 79  | 26 |

Table 1 shows that most of the female student teachers surveyed (64%) resided in rural areas, while the remaining 36% lived in urban areas. The language disciplines (Tamil and English) had the highest percentage (36%) of female student teachers surveyed, followed by science (34%), mathematics (24%), and social science (6%) in terms of their major subject.

Of the female student teachers surveyed, more than half (63%) had an undergraduate degree, while the remaining 37% had a postgraduate degree. Regarding possession of a personal computer or laptop, 62% of the female student teachers owned their devices, while 38% did not.

When it comes to computer training, only 17% of the female student teachers had completed a computer training course, while 83% had not. Among the surveyed student teachers, the highest percentage (26%) had been using computers for more than four years, while 18% had been using computers for 3 to 4 years, 24% had been using computers for 1 to 2 years, and 32% had been using computers for less than a year.

Overall, these findings suggest that the surveyed female student teachers had varied backgrounds in terms of their locality of residence, major subject, education level, possession of a personal computer or laptop, computer proficiency, and the number of years of computer usage. This information could help design training programmes or interventions aimed at improving the ICT competencies of female student teachers.

**Objective 2: To determine the level of ICT competency of female student teachers.**

We analysed the total ICT competency scale scores of all female student teachers using descriptive statistical techniques such as mean and standard deviation to determine their level of ICT competency. The details of the same

are given in Table 2.

**Table 2**

**Female Student Teachers' Perceived ICT Competency (N = 301) .**

| S. No. | Parameters of ICT Competency   | M    | SD   | Interpretation  |
|--------|--|------|------|-----------------|
| 1      | Installing software in the computer.   | 3.32 | 1.32 | Fair Competency |
| 2      | Organising and managing computer files, folders, and directories.  | 3.52 | 1.30 | Good Competency |
| 3      | Using storage devices (i.e., hard disk, diskette, CD, flash drive, etc.) for storing and sharing computer files. | 3.56 | 1.39 | Good Competency |
| 4      | Using the scanner and printer.   | 3.45 | 1.38 | Good Competency |
| 5      | Manipulating an LCD projector.   | 3.08 | 1.41 | Fair Competency |
| 6      | Using Microsoft Word to enter, edit, and align a text document.  | 3.85 | 1.22 | Good Competency |
| 7      | Printing, saving, and retrieving text documents in Microsoft Word.   | 3.63 | 1.30 | Good Competency |
| 8      | Using Microsoft Excel to enter, sort, format, and store data tables.   | 3.58 | 1.25 | Good Competency |
| 9      | Creating charts/diagrams/graphs using Microsoft Excel.   | 3.54 | 1.30 | Good Competency |
| 10     | Creating class presentations using Microsoft PowerPoint.   | 3.72 | 1.25 | Good Competency |

*Continued on next page*

*Table 2 continued*

|                   |   |             |      |                        |
|-------------------|---|-------------|------|------------------------|
| 11                | Download and install relevant applications including freeware, updates, and other support applications. | 3.46        | 1.24 | Good Competency        |
| 12                | Using search engines for searching the required information.  | 3.52        | 1.29 | Good Competency        |
| 13                | Sending and managing e-mails.   | 4.08        | 1.13 | Good Competency        |
| 14                | Using videoconferencing applications (i.e., Google Meet, zoom, etc.) for undertaking online classes.    | 4.07        | 1.19 | Good Competency        |
| <b>Grand Mean</b> |   | <b>3.59</b> |      | <b>Good Competency</b> |

From Table 2, it can be noted that female student teachers had good competency in most of the ICT parameters, with a grand mean score of 3.59. The standard deviation (SD) for each parameter ranges from 1.13 to 1.41, indicating that there was some variability in the perceived ICT competency scores.

Looking at the individual parameters, the female student teachers were most confident in their ability to send and manage emails and use videoconferencing applications, with mean scores of 4.08 and 4.07, respectively. This suggests that they were comfortable using these tools for communication and online teaching.

Other areas where female student teachers had good competency (mean scores above 3.5) include organising and managing computer files, using storage devices to store and share files, using Microsoft Word and PowerPoint to create documents and presentations, and using search engines to find information.

On the other hand, female student teachers had a lower competency (mean scores below 3.5) in manipulating an LCD projector and installing software on the computer. While these areas may not be as crucial for teaching, it may still be important for teachers to develop competencies in these areas to effectively use technology in the classroom.

On the whole, the results suggest that the female student teachers had good ICT competency, but there is still room for improvement in certain areas. The

results of this study may be useful for teacher education institutions to identify areas where additional support and training could be provided.

The findings of the present study are consistent with previous research studies that indicate that teachers had adequate knowledge and skills to use ICT in classroom instruction (Alnasib, 2023; Briones, 2018; Daling, 2017; Ezugwu & Diri, 2014; Machmud et al., 2021; Malinina, 2015) . However, some studies reported varying levels of ICT competency among teachers, with some possessing proficient skills, while others had only basic operational skills (Caluza et al., 2017; DelaFuente & Binas, 2020; Ikwuka et al., 2021; Joshi et al., 2021; Nagamani & Muthuswamy, 2013; Novela, 2022). In the same way, previous research conducted by Ahmad et al. (2016); Boholano (2018); Ching (2016); Danner and Pessu (2013) and Singh and Subramaniam (2014) reported that preservice teachers had demonstrated a reasonable level of ICT proficiency.

In contrast, the studies by Cebi and Reisoglu (2020) suggest that preservice teachers may need further training and support to integrate technology into their teaching practices as they possess only moderate levels of digital competency. Despite the findings of the present study, previous research has identified challenges and barriers that impede the integration of ICT in teaching practices, such as teachers' lack of pedagogical knowledge, varied levels of ICT competency, and lack of self-confidence in using ICT in their teaching (Basargekar & Singhavi, 2017; Nurhabibah et al., 2018; Obielodan et al., 2020). These findings contradict the results of the present study.

### **Inferential Analysis**

The null hypotheses framed were tested using an independent samples t-test and one-way ANOVA to determine the impact of selected demographic and study-related variables on the ICT competencies of female student teachers. The results of the t-test and one-way ANOVA are shown in Tables 3 to 9.

#### **Objective 3: To determine if there is a difference in female student teachers' ICT competencies based on the location of residence.**

An independent sample t-test was conducted to investigate whether there was a significant difference in ICT competencies among female student teachers based on their locality of residence, and the results are presented in Table 3.

In Table 3, the mean score for urban female student teachers ( $M = 52.78$ ,  $SD = 13.27$ ) is considerably higher than the mean score for female student teachers residing in rural areas ( $M = 49.11$ ,  $SD = 13.49$ ), with a t-value of 2.28 ( $df = 299$ ,  $p < .05$ ), suggest that female student teachers residing in urban areas had better

**Table 3**

**Results of the t-test on the Differences in ICT Competencies of Female Student Teachers based on the Locality of Residence.**

| Variable              | Sub-Variables | n   | M     | SD    | df  | t    | p    |
|-----------------------|---------------|-----|-------|-------|-----|------|------|
| Locality of Residence | Rural         | 192 | 49.11 | 13.49 | 299 | 2.28 | .023 |
|                       | Urban         | 109 | 52.78 | 13.27 |     |      |      |

ICT competencies compared to those residing in rural areas. Therefore, the null hypothesis that there is no significant difference in ICT competencies among female student teachers based on their location of residence was rejected. This difference in ICT competencies of rural and urban female student teachers might have been due to significant disparities in ICT access and infrastructure between urban and rural areas. The findings of this study are consistent with the research of [Nagamani and Muthuswamy \(2013\)](#), which shows that the location of residence had a significant impact on the use of ICT by secondary school teachers.

**Objective 4: To determine if there is a difference in female student teachers' ICT competencies based on the major subject .**

A one-way ANOVA has been performed to determine whether there was a significant difference in the ICT competencies of female student teachers based on their major subject, and the results are presented in Table 4.

**Table 4**

**Results of one-way ANOVA on the Differences in ICT Competencies of Female Student Teachers based on the Major S ubject.**

| Source of Variation | Sum of Squares | df  | Mean Sum of Squares | F    | p    |
|---------------------|----------------|-----|---------------------|------|------|
| Between groups      | 848.637        | 3   | 282.87              | 1.55 | .200 |
| Within groups       | 53931.815      | 297 | 181.58              |      |      |
| Total               | 54780.452      | 300 |                     |      |      |

In Table 4, the differences in ICT competencies among female student teachers of various subjects such as languages (Tamil and English), mathematics, science, and social science are presented. As highlighted in Table 4, the F-ratio

of 1.55 is not significant at the 0.05 level of significance ( $p > .05$ ), indicating that there was no significant difference in the ICT competencies of female student teachers based on their major subject. Therefore, the null hypothesis was accepted, and it can be concluded that the major subject of female student teachers did not significantly influence their ICT competencies.

The results are consistent with the findings obtained by [Basargekar and Singhavi \(2017\)](#), who reported that non-technical subject teachers (languages and social sciences) and technical subject teachers (physics, chemistry, and mathematics) had similar levels of ICT proficiency. However, the results of this study did not confirm the previous research by [Cebi and Reisoglu \(2020\)](#), which reported that the major subject of preservice teachers influenced their ICT competency levels.

**Objective 5: To determine if there is a difference in female student teachers' ICT competencies based on education level.**

An independent sample t-test was conducted to investigate whether there was a difference in ICT competencies among female student teachers based on their education level such as those with undergraduate degrees and those with postgraduate degrees, and the results are presented in Table 5.

**Table 5**

**Results of the t-test on the Differences in ICT Competencies of Female Student Teachers based on Education Level.**

| Variable        | Sub-Variables                                 | n   | M     | SD    | df  | t    | p    |
|-----------------|---|-----|-------|-------|-----|------|------|
| Education level | Student teachers with an undergraduate degree | 191 | 48.67 | 13.74 | 299 | 3.05 | .002 |
|                 | Student teachers with a postgraduate degree   | 110 | 53.53 | 12.56 |     |      |      |

In Table 5, it is noted that there was a significant difference in ICT competencies between female student teachers with undergraduate and postgraduate degrees ( $t(299) = 3.05, p < .05$ ). Female student teachers with postgraduate degrees had significantly higher ICT competencies ( $M = 53.53, SD = 12.56$ ) than those with undergraduate degrees ( $M = 48.67, SD = 13.74$ ). As a result, the null hypothesis stated was rejected. The findings suggest that education level is a significant factor in determining the ICT competencies of female student



teachers, with postgraduate education being associated with higher ICT competencies. The difference in mean scores could be attributed to the higher level of education and experience in working with computers and other ICT tools that postgraduate degree holders typically possessed. However, the results are not in line with those of [DelaFuente and Binas \(2020\)](#) who found no significant impact of the highest educational attainment on teachers' ICT competency.

**Objective 6: To determine if there is a difference in female student teachers' ICT competencies based on the possession of a personal computer or laptop.**

An independent sample t-test was conducted to examine whether there exists a significant difference in the ICT competencies of female student teachers based on the possession of a personal computer or laptop, and the findings are illustrated in Table 6.

**Table 6**

**Results of the t-test on the Differences in ICT Competencies of Female Student Teachers based on the Possession of a Personal Computer or Laptop.**

| Variable                                    | Sub-Variables                                     | n   | M     | SD    | df  | t    | p    |
|---|---|-----|-------|-------|-----|------|------|
| Possession of a personal computer or laptop | Student teachers with their computer or laptop    | 186 | 51.93 | 12.61 | 299 | 2.44 | .015 |
|   | Student teachers without their computer or laptop | 115 | 48.04 | 14.59 |     |      |      |

The results presented in Table 6 indicate that the mean ICT competency score of female student teachers who possessed their computer or laptop ( $M = 51.93$ ) is higher than that of those who did not possess their computer or laptop ( $M = 48.04$ ). The difference in mean scores was statistically significant at the 0.05 level of significance ( $t(299) = 2.44, p < .05$ ), suggesting that female student teachers who owned a computer or laptop had a higher level of ICT competencies than those who did not. Consequently, the stated null hypothesis was rejected. The findings imply that owning a computer or laptop is associated with a higher level of ICT competencies among female student teachers.

Individuals who own a computer or laptop tend to have more familiarity and practical experience with a range of ICT-related tasks, such as creating Word documents, preparing presentation slides, using the internet, and other

similar skills, compared to those who do not own a computer or laptop. This could be a reasonable explanation for why female student teachers who owned a computer or laptop demonstrated a higher level of ICT competency. Consistent with the observations of [Joshi et al. \(2021\)](#), the results indicate that the possession of a personal computer or laptop is a significant predictor of the ICT competency of student teachers.

**Objective 7: To determine if there is a difference in female student teachers' ICT competencies based on the completion of a computer training course.**

An independent sample t-test has been performed to investigate whether there was a significant difference in the ICT competencies of female student teachers based on the completion of a computer training course, and the results are presented in Table 7.

**Table 7**

**Results of the t-test on the Differences in ICT Competencies of Female Student Teachers based on the Completion of a Computer Training Course.**

| Variable                                 | Sub-Variables | n   | M     | SD    | df  | t    | p    |
|--|---------------|-----|-------|-------|-----|------|------|
| Completion of a computer training course | Completed     | 50  | 58.46 | 10.09 | 299 | 4.75 | .000 |
|  | Not completed | 251 | 48.85 | 13.55 |     |      |      |

As displayed in Table 7, it can be noted that female student teachers who completed a computer training course ( $M = 58.46$ ) had a significantly higher mean ICT competency score than those who did not complete the course ( $M = 48.85$ ). This difference in mean scores was statistically significant at the 0.05 level of significance ( $t(299) = 4.75, p < .05$ ), suggesting that female student teachers who completed a computer training course had higher ICT competencies than those who did not complete the course. Therefore, the null hypothesis stated was rejected. The results indicate that completing a computer training course is associated with a higher level of ICT competency among female student teachers. Generally, individuals who have completed a formal computer training course at the certificate, diploma, or postgraduate diploma level exhibit superior knowledge and skills in ICT-related tasks compared to those who have not completed a formal computer training course.

The results are in line with those obtained by [Danner and Pessu \(2013\)](#) that student teachers who received formal computer training reported higher

levels of ICT competency compared to those who did not receive such training. Similarly, [Adebayo and Fagbohun \(2013\)](#) and [DelaFuente and Binas \(2020\)](#) demonstrated that attending computer and ICT-related training programmes or workshops had a significant positive effect on teachers' ICT competencies.

**Objective 8: To determine if there is a difference in female student teachers' ICT competencies based on the number of years of computer usage.**

A one-way ANOVA has been conducted to examine the differences in ICT competencies of female student teachers based on the number of years of computer usage, and the results are presented in Table 8.

**Table 8**

**Results of One-way ANOVA on the Differences in ICT Competencies of Female Student Teachers based on the Number of Years of Computer Usage.**

| Source of Variation | Sum of Squares | df  | Mean Sum of Squares | F     | p    |
|---------------------|----------------|-----|---------------------|-------|------|
| Between groups      | 7885.02        | 3   | 2628.34             |       |      |
| Within groups       | 46895.42       | 297 | 157.89              | 16.64 | .000 |
| Total               | 54780.45       | 300 |                     |       |      |

The one-way ANOVA results presented in Table 8 suggest that there was a significant difference in the mean ICT competencies among different groups of female student teachers based on the number of years of computer usage ( $F(3, 297) = 16.64, p < .05$ ). The results indicate that the number of years of computer usage had a significant impact on the ICT competencies of female student teachers. As a result, the null hypothesis stated was rejected. To determine which treatment pair had a statistically significant difference, Tukey's HSD post-hoc test was applied to each of the six pairs, and the results are illustrated in Table 9.

According to the results presented in Table 9, there were no statistically significant differences between the pairs of "less than one year of experience in using computers and one to two years of experience in using computers" and "one to two years of experience in using computers and three to four years of experience in using computers."

However, the remaining pairs of "less than one year of experience in using computers and three to four years of experience in using computers," "less than one year of experience in using computers and more than four years of experience in using computers," "one to two years of experience in using computers and more than four years of experience in using computers," and

**Table 9****Results of Tukey's HSD Post-Hoc Test for Multiple Comparisons.**

| Treatment Pairs  | Q     | p    | Result |
|--|-------|------|--------|
| Less than 1 year vs. 1 to 2 years of computer usage      | 4.03  | .169 | NS     |
| Less than 1 year vs. 3 to 4 years of computer usage      | 6.13  | .023 | Sig.   |
| Less than 1 year vs. More than 4 years of computer usage | 13.25 | .000 | Sig.   |
| 1 to 2 years vs. 3 to 4 years of computer usage          | 2.10  | .793 | NS     |
| 1 to 2 years vs. More than 4 years of computer usage     | 9.21  | .000 | Sig.   |
| 3 to 4 years vs. More than 4 years of computer usage     | 7.11  | .009 | Sig.   |

NS: Not Significant Sig: Significant at 0.05 Level

“three to four years of experience in using computers and more than four years of experience in using computers” showed statistically significant differences with p-values less than 0.05.

Therefore, it could be inferred that female student teachers with more than four years of experience in using computers had higher ICT competencies compared to those with less than one year or between one and two years of experience in using computers. Furthermore, female student teachers with three to four years of experience in using computers had higher ICT competencies than those with less than one year of experience in using computers.

Individuals who have worked with computers for more years tend to acquire more knowledge and skills in ICT-related tasks than those who have fewer years of experience with computers. The results confirmed previous research findings. For instance, [Daling \(2017\)](#) reported that secondary school teachers who had more experience in using computers and other ICT tools were more effective in their teaching. Similarly, [Basargekar and Singhavi \(2017\)](#) established a positive relationship between teachers' years of experience working with computers and their proficiency in using ICT tools. [Joshi et al. \(2021\)](#) also reported that teachers' experience in working with computers was a significant predictor of their ICT competency.

## RECOMMENDATIONS

The study indicates that female student teachers from rural areas and those with undergraduate degrees demonstrated lower ICT competencies. Hence, institutions offering teacher education programmes should provide targeted ICT training and support to these groups of student teachers to enhance their ICT competencies. Additionally, possession of a personal computer or laptop, completion of a computer training course, and the number of years of computer usage are significant factors in determining the ICT competency of female student teachers in this study. Therefore, teacher education institutions should provide their students with access to computers and internet connectivity to facilitate their acquisition of ICT skills. Furthermore, teacher education institutions should design and integrate ICT training into their curricula to equip student teachers with the necessary ICT skills.

In terms of future research, it is recommended that researchers use a larger sample size, apply random sampling techniques to increase the generalisability of the findings, and include both male and female student teachers to determine gender differences in ICT competencies. Additionally, since completing a computer training course is a significant factor in determining the ICT competency of female student teachers, future studies could examine the efficacy of various modes of ICT training such as online courses, blended learning, and flipped classrooms to enhance their ICT competencies.

## CONCLUSIONS AND LIMITATIONS

The present study provides important insights into the ICT competencies of female student teachers enrolled in the Bachelor of Education (B.Ed.) teacher education programme in private colleges of education located in the Salem district of Tamil Nadu State, India. The results of this study suggest that female student teachers had a good competency in most ICT parameters, which is a positive development. However, the study also highlights the need for more comprehensive training in certain areas, such as manipulating an LCD projector and installing software on a computer, to improve the overall ICT competencies of these student teachers.

Additionally, the study identified several significant factors that influence the ICT competencies of female student teachers, including the location of residence, education level, possession of a personal computer or laptop, completion of a computer training course, and the number of years of computer usage. To meet the demands of 21<sup>st</sup>-century learners, teacher education programmes should focus on developing student teachers' ICT competencies by considering these factors since the use of ICT in education is crucial in enhancing the quality of teaching and learning. Policymakers and teacher educators can use these

findings to design targeted interventions to enhance the ICT competencies of female student teachers in teacher education programmes. Overall, this study provides a useful baseline for future research on ICT competencies among student teachers in India and other similar contexts.

It is important to note that the present study has several limitations. To begin with, the sample size of the study is small, with only 301 female student teachers from selected private colleges of education. This makes it difficult to generalise the findings to a larger population. Additionally, the research instrument used in the study only contains 14 ICT competency parameters, which could exclude other relevant factors. Finally, this study relies on self-reported data to assess the ICT competencies of female student teachers, which may be subject to biases and inaccuracies. Therefore, future research could use more objective measures to assess the ICT competencies of teachers and student teachers.

## REFERENCES

- Abolade, A. O., & Yusuf, M. O. (2005). Information and communication technologies (ICTs) and the Nigerian teacher education program. *African Journal of Educational Studies*, 3(1), 1-19.
- Adebayo, O., & Fagbohun, M. (2013). An assessment of computer and ICT skills among secondary school teachers in Ota Ogun State. *Library Philosophy and Practice*, 846. Retrieved from <https://digitalcommons.unl.edu/libphilprac/846>
- Ahmad, M., Badusah, J., Mansor, A. Z., Karim, A. A., Khalid, F., Daud, M. Y., ... others (2016). The application of 21st century ICT literacy model among teacher trainees. *The Turkish Online Journal of Educational Technology*, 15(3), 151-161.
- Alnasib, B. N. M. (2023). Digital competencies: Are pre-service teachers qualified for digital education. *International Journal of Education in Mathematics*, 11(1), 96-114. <https://doi.org/10.46328/ijemst.2842>
- Asabere, N., & Enguah, S. (2012). Integration of expert systems in mobile learning. *International Journal of Information and Communication Technology Research*, 2(1), 55-61.
- Basargekar, P., & Singhavi, C. (2017). Factors affecting teachers' perceived proficiency in using ICT in the classroom. *IAFOR Journal of Education*, 5(2), 67-84. <https://doi.org/10.22492/ije.5.2.03>
- Boholano, H. B. (2018). IMT skills of the pre-service teachers in Cebu City. *International Journal of Evaluation and Research in Education*, 7(3), 212-220. <https://doi.org/10.11591/ijere.v7i3.14203>
- Briones, C. B. (2018). Teachers' competency on the use of ICT in teaching physics in the junior high school. In *Proceedings of the 4th International*

- Research Conference on Higher Education* (p. 177-204). KnE Social Sciences. <https://doi.org/10.18502/kss.v3i6.2380>
- Caluza, L. J. B., Verecio, R. L., Funcion, D. G. D., Quisumbin, L. A., Gotardo, M. A., Laurente, M. L. P., ... others (2017). An assessment of ICT competencies of public school teachers: Basis for community extension program. *IOSR Journal of Humanities and Social Science*, 22(3), 1-13. <https://doi.org/10.9790/0837-2203040113>
- Cebi, A., & Reisoglu, I. (2020). Digital competence: A study from the perspective of pre-service teachers in Turkey. *Journal of New Approaches in Educational Research*, 9(2), 294-308. <https://doi.org/10.7821/naer.2020.7.583>
- Ching, C. L. L. (2016). Competencies of trainee secondary school teachers in using common ICT tools and office software packages and the implications for successful integration of ICT in the Mauritian education system. *Training and Profession: International Scientific Journal in Education*, 24(1), 56-65. <https://doi.org/10.18162/fp.2016.67>
- Daling, R. F. (2017). Secondary school teachers' competency in information and communication technology. *International Journal of Education and Research*, 5(11), 117-122.
- Danner, R. B., & Pessu, C. O. A. (2013). A survey of ICT competencies among students in teacher preparation programmes at the University of Benin. *Journal of Information Technology Education Research*, 12, 33-49. <https://doi.org/10.28945/1762>
- DelaFuente, J. A., & Binas, L. C. (2020). Teachers' competence in information and communications technology (ICT) as an educational tool in teaching: An empirical analysis for program intervention. *Journal of Research in Education, Science and Technology*, 5(2), 61-76.
- Ezugwu, J. J. O., & Diri, E. A. (2014). Mathematics teachers' competencies in the use of information and communication technology (ICT) in classroom instructions in Bayelsa State of Nigeria: A case study of Yenagoa education zone. *International Journal of Statistika and Matematika*, 11(2), 91-97.
- GuillEn-Gsmez, F. D., Fernandez, M. J., Bravo-Agapito, J., & Escribano-Ortiz, D. (2020). Analysis of teachers' pedagogical digital competence: Identification of factors predicting their acquisition. *Technology, Knowledge and Learning*. <https://doi.org/10.1007/s10758-019-09432-7>
- Hennessy, S., Ruthven, K., Brindley, S., et al. (2005). Teacher perspectives on integrating ICT into subject teaching: Commitment, constraints, caution, and change. *Journal of Curriculum Studies*, 37(2), 155-192. <https://doi.org/10.1080/0022027032000276961>
- Ikwuka, O. I., Okoye, C. C., Udenwa, V. C., Adigwe, J. H. E., Nkemjika, O., Uzoegbo, U. H., ... others (2021). ICT competencies needed

- by teachers for effective teaching of English language in secondary schools. *Journal of Advances in Education and Philosophy*, 5(8), 249-254. <https://doi.org/10.36348/jaep.2021.v05i08.003>
- Jegede, P. O. (2008). ICT attitudinal characteristics and use level of Nigerian teachers. *Issues in Informing Science and Information Technology*, 5, 261-266. Retrieved from <https://www.informingscience.org/Journals/IISIT/Overview>
- Joshi, D. R., Chitrakar, R., Belbase, S., Khanal, B., et al. (2021). ICT competency of mathematics teachers at secondary schools of Nepal. *European Journal of Interactive Multimedia and Education*, 2(1), Articlee02107. <https://doi.org/10.30935/ejimed/10847>
- Machmud, M. T., Fadhilatunnisa, D., Fakhri, M. M., Rosidah, et al. (2021). Indonesia teacher competencies in integrating information and communications technology for education. *Athens Journal of Technology and Engineering*, 8(4), 331-348. <https://doi.org/10.30958/ajte.8-4-4>
- Malinina, I. (2015). ICT competencies of foreign language teachers. *Procedia - Social and Behavioral Sciences*, 182, 75-80. <https://doi.org/10.1016/j.sbspro.2015.04.740>
- Ministry of Human Resource Development. (2020). *National education policy 2020*. Retrieved from [https://www.education.gov.in/sites/upload\\_files/mhrd/files/NEP\\_Final\\_English\\_0.pdf](https://www.education.gov.in/sites/upload_files/mhrd/files/NEP_Final_English_0.pdf)
- Nagamani, D., & Muthuswamy, P. (2013). Teacher's professional use of information and communication technology in secondary schools in Tamil Nadu. *India. International Education Studies*, 6(12), 64-73. <https://doi.org/10.5539/ies.v6n12p64>
- Naji, S. (2017). The impact of ICT on schools. *IOSR Journal of Business and Management*, 19(1), 83-85. <https://doi.org/10.9790/487x-1901078385>
- Novela, L. G. (2022). Teachers' competency in information and communications technology (ICT) in the new normal. *United International Journal for Research and Technology*, 3(4), 1-10.
- Nurhabibah, Setiawan, A., Yanti, H., Miraj, Y. Z., Yannuar, et al. (2018). Analysis of ICT literacy competence among vocational high school teachers. In *Proceedings of the IOP Conference Series: Materials Science and Engineering* (Vol. 306, p. 1-7). <https://doi.org/10.1088/1757-899X/306/1/012097>
- Obielodan, O. O., Omojola, E. A., Tijani, O. K., & Samuel, N. (2020). Assessment of teachers' pedagogical knowledge on the utilization of information and communication technology in Kwara State. *Nigeria. International Journal of Education and Development Using Information and Communication Technology*, 16(1), 62-71.
- Singh, T. K. R., & Subramaniam, S. V. (2014). Pre-service teachers' ICT literacy: A case study in a Malaysian teachers' training



- institution. *Global Journal of Interdisciplinary Social Sciences*, 3(4), 61-67. Retrieved from <https://www.walshmedicalmedia.com/global-journal-interdisciplinary-social-sciences.html>
- Subaveerapandiyar, A., & Nandhakumar, R. (2021). A study of teacher educators' skill and ICT integration in online teaching during the pandemic situation in India. *Library Philosophy and Practice, Article*, 5938. <https://doi.org/10.2139/ssrn.3899657>
- Yunus, M. M., Nordin, N., Salehi, H., Choo, H. S., Embi, M. A., et al. (2013). Pros and cons of using ICT in teaching ESL reading and writing. *International Education Studies*, 6(7), 119-130. <https://doi.org/10.5539/ies.v6n7p119>
- Yusuf, M. O. (2005). Information and communication technology and education: Analysing the Nigerian national policy for information technology. *International Education Journal*, 6(3), 316-321. Retrieved from <http://iej.cjb.net>