WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

Digital Technology in Teaching and Learning

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A B S T R A C T

Digital technology has become an essential part of modern teacher education, influencing how future educators teach and how students learn. This study explored how teacher trainees in Gandhinagar district use information and communication technology (ICT) in their teaching and learning practices. A survey was conducted with 50 trainees from various teacher education colleges, using a structured questionnaire administered through Google Forms. The questionnaire covered aspects such as accessibility, awareness, skills, and attitudes toward digital tools and showed strong reliability (Cronbach's $\alpha = 0.91$). Data were analysed using descriptive statistics and t-tests to identify differences between undergraduate and postgraduate trainees. Results indicate that teacher trainees widely adopt digital tools for lesson preparation and classroom activities, finding them useful for creating engaging lessons, managing classes, and improving learning outcomes. The study highlights the need to strengthen digital literacy and provide better training and infrastructure in teacher education programs, ensuring future teachers are well-prepared for technology-driven classrooms.

Keywords: Digital Technology, Technology in Education, ICT, Prospective Teachers.

1. Introduction

Teaching and learning are actions necessary to accomplish a goal in Education. Teaching is a method of facilitating student learning. Teaching is the specialised application of knowledge, skills, and attributes designed to provide one-of-a-kind service to meet the needs of students. Individual and societal educational needs influence the selection of learning activities. It is the responsibility of the principal and the teacher to ensure that the educational goals are met in the school. The profession of teaching well is an art based on practical, applied, and behavioural principles. Teaching is seen as stimulating, directing, and guiding the learner in assessing the teaching's learning outcomes.

1.1 Technology in education

According to Van Barak (2004), teachers primarily use computers for two types of professional activities: supportive use of computers and classroom use of computers. Computers are used as a resource when they are integrated into a teacher's professional practice outside of the classroom (Johnson, 2016), assisting in classroom instruction. The study's goal was to learn about how teacher trainees use technology in the teaching-learning process, which was built to assess how Information and Communications Technology (ICT) can impact student learning when teachers are digitally literate and understand how to integrate it into the curriculum.

1.2 What Exactly Is Educational Technology?

Education technology is a type of technology that is used to promote and provide access to education. This can include technology, hardware, software, electronic equipment, and other learning-related objects that educators and students use. These tools assist students in attending classes, gaining knowledge, collaborating, engaging with remote students, or learning in a new way, both within and outside of the classroom. Ed-Tech is frequently used interchangeably with education technology.

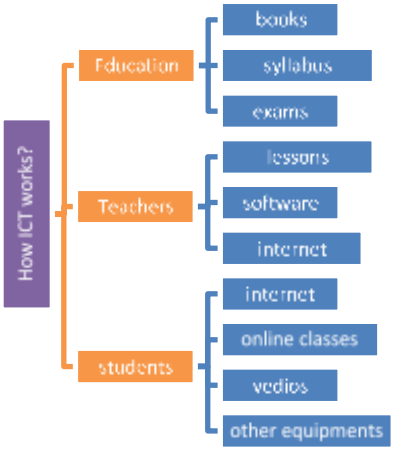


Figure 1: Classification of ICT in Education

1.3 Importance of technology in education:

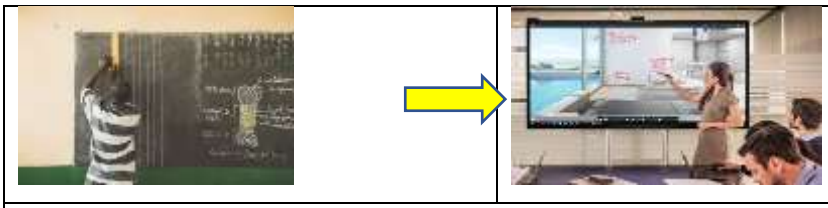
Schools use diverse ICT tools to communicate, create, disseminate, store, and manage information. In some contexts, ICT has also become integral to the teaching-learning interaction, through such approaches as replacing chalkboards with interactive digital whiteboards, using students' smartphones or other devices for learning during class time, and the "flipped classroom" model, where students watch lectures at home on the computer and use classroom time for more interactive exercises. When teachers are digitally literate and trained to use ICT, these approaches can lead to higher-order thinking skills, provide creative and individualised options for students to express their understandings, and leave students better prepared to deal with ongoing technological change in society and the workplace. ICT issues planners must consider include: considering the total cost-benefit equation, supplying and maintaining the requisite infrastructure, and ensuring investments are matched with teacher support and other policies aimed at effective ICT use.

Figure 2: *Use of ICT by Different Sources*

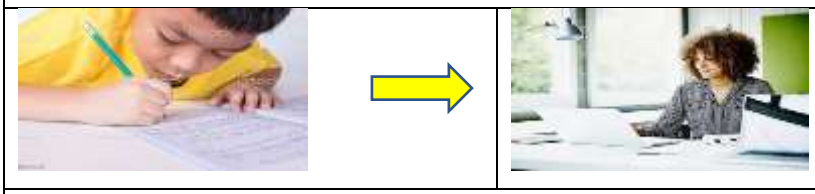
Source:https://www.google.com/search?q=use+of+technology+in+teaching+and+learning&rlz

Digital educational materials replace the traditional ones.

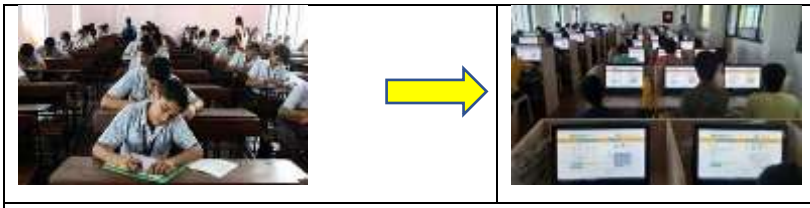
Figure 3: Traditional Education vs Digital Education



Blackboard teaching Vs Digital Teaching Learning



Pen and Paper Home Work Vs Digital Homework



Class Exams Vs Online (Digital Exams)

1.4 Components of Items

The questionnaire made by the researcher is based on the components below:

- Accessibility
- Teacher's point of view
- Technological skills
- Awareness of ICT
- Teaching- learning ability

2. Statement of the Study

Effectiveness of Digital Technology Integration in Teaching and Learning: A Study on Teacher Trainees.

3. Objective of the Study

To find out the use of ICT by teacher trainees in educational colleges of Gandhinagar District.

4. Hypothesis of the Study

Ho_1:There is no significant difference between the use of ICT by post-graduate students and undergraduate students.

5. Population of the study

The population of the study was teacher trainees of Gandhinagar District.

6. Sample and Sampling Technique

As respondents, fifty teacher candidates from Gandhinagar district educational colleges took part in the survey. The questionnaire was distributed at random to the respondents, regardless of their location, caste, age, gender, or ethnicity. The researcher is impartial regardless of whether the respondents are from the cities, rural areas, or slums in the Gandhinagar district. Because the study's target respondents are individuals with prior teaching experience, the researcher specifically looked for teacher candidates from Gandhinagar's public and private institutions. Consequently, teacher applicants from public and private colleges receive varying numbers of questionnaires.

Table 1: The demographic background of the Sample

Factors		**Frequency**	**Percentage (%)**
Gender	Female	29	58.00%
	Male	21	42.00%
Academic Qualification	B.Sc. B.Ed.	35	70.00%
	M.Sc. M.Ed.	15	30.00%

7. Research Design

This study used a quantitative research approach to collect and analyze data from all teacher applicants. Before being sent to the target response population, the researchers developed and improved the questionnaire. The objectives of the ICT integration research were notably addressed in a few of the questionnaire's sections. Consequently, Google Forms was utilized to disseminate the survey and gather information from answers.

8. Research Tool

A survey questionnaire with a total of 20 items served as the main instrument in this study to investigate how teacher candidates use ICT for teaching and learning. After reading the statements, each respondent was asked to rate their agreement or disagreement using a 4-point Likert scale, where 4 meant "strongly disagree," 3 disagree, 2 agree, and 1 strongly agree. Twenty questions in all were submitted via a Google Form. The questionnaires were divided into four pieces. Section A discusses ICT utilization. The respondents were asked five questions: how they teach, how much education they have, and how well they use ICT in the classroom. The following three sections of the questionnaire focus on teacher applicants' perceptions and the elements of effective ICT integration. The researcher has designed and produced some of the items in accordance with the chosen title so that they would provide the answers needed for the study hypothesis. .

8.1 Reliability Testing of the Questionnaire

Cronbach's Alpha reliability testing is used to assess an instrument's and its items' internal consistency. It is considered a scale dependability metric as well. At this stage, ten to twelve teacher candidates took a pre-pilot test to check for minor typos or grammatical issues with the inventory. At this stage, the researcher can uncover the hidden flaws. Based on the experiment, the researcher has added the components required for the pilot study. This study uses the Likert scale, where 4 means strongly disagree, 3 disagree, 2 agree, and 1 strongly agree. According to George (2003), the most often accepted value of alpha is greater than 0.7, and an alpha value of greater than 0.6 is considered acceptable. The reliability test's alpha result of more than 0.6 indicates that the items are considered appropriate and can be considered an instrument for the responders. However, the researcher might take note of this and change the items to increase the alpha value and reinforce the instrument's reliability. The alpha value for reliability is greater than 0.7, which suggests that the items are sufficient and dependable and that the respondents feel comfortable using them as a research tool. There are several methods to determine the test's reliability and correctness. The accuracy and reliability of the test are evaluated using one or more of these methods.

Table 2: Variance of each Item

No. of Item	Variance	No. of Item	Variance
1	0.244518	8	0.25067
2	0.180334	9	0.248561
3	0.240101	10	0.248033
4	0.249623	11	0.243177
5	0.250612	12	0.218772
6	0.248033	13	0.22431
7	0.243639	14	0.250209

8.2 Reliability test by Cronbach's alpha Method

Cronbach's alpha = 0.9167

According to Cronbach's alpha method for reliability, a coefficient level of more than 0.90 is excellent, and a level between 0.80 and 0.89 is good; the tool needs at least a 0.8 level. In this questionnaire, the researcher achieved a reliability level of more than 0.8, making it a more effective and accurate tool for the Research.

8.3 Validity of the Test

Necessary calculations were made to determine the reliability and accuracy of the test based on the results obtained after the test was carried out. This is called a reliable test. If the purpose for which the test is designed is verified by that test, then the test is said to be valid.

9. Data Collection Procedure

Before distributing the questionnaire to the target respondent audience, the researcher made the necessary changes after speaking with more than three experts. The data was collected in two weeks after the questionnaires were randomly sent to the email addresses of the responders. In order to assess the data, the respondents were given three to five days to complete the survey and send it back to the researcher. Two weeks later, all of the completed questionnaires were gathered by the researcher for further data processing to produce the research findings.

10. Data Analysis and Interpretation

All of the data collected from the respondents was compiled and examined using Excel. Numerical analysis is incorporated into the study after it has been converted to descriptive. It is also used to compute the mean, standard deviation, frequency, and percentage in order to determine the usefulness of ICT and how students use it to study.

Finding out how undergraduate and graduate students use ICT from a prospective perspective is the researcher's aim. As a result, the statistical methods for the data analysis were the standard deviation and the "t" test, both of which have been applied in studies. The t-value and standard deviation were shown below.

Table 3: *t-test table*

Mean	3.27443609
Variance	0.202931418
Observations	15
Hypothesised Mean Difference	0
df	25
t Stat	4.145187896
P(T<=t) one-tail	0.000170485
t Critical one-tailed	1.708140761
P(T<=t) two-tail	0.00034097
t Critical two-tailed	2.059538553

Note: t-Test: Two-Sample Assuming Unequal Variances

11. Discussion and Conclusion

The results of the study show how successful technology-based education is in the current day. These days, prospective teachers prefer digital resources over conventional classroom environments. Using these tools and equipment will result in an active learning environment that is both productive and interesting for both teachers and students. The results align with the researcher's conclusions. This proved that using digital technology in the classroom would enhance students' learning. Nonetheless, most of the teacher candidates in this study agree that ICT improves classroom management since the children are more attentive and well-behaved. This study also showed that students learn more effectively when ICT-enabled lesson designs are more engaging and fascinating. As a result, the participants agreed that using ICT can enhance students' learning.

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