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A Study of the Effectiveness of ICT-Based Teaching on Academic Achievement

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Abstract: *The fast boom of facts and conversation technology (ICT) in training, especially after the COVID-19 pandemic, has dramatically modified the teaching-getting to know procedure globally. in keeping with UNESCO (2023), there are 1.6 billion learners who've been impacted via the pandemic, resulting in the rapid digital transformation of schooling worldwide. This studies aimed to explore the effectiveness of ICT-based totally coaching on students' academic overall performance at the secondary education stage through recent studies studies and experimental research. This studies used the quasi-experimental method, wherein 120 students had been randomly assigned to the experimental and manipulate corporations. college students within the experimental organization received ICT-based teaching through multimedia shows, online exams, smart board, and simulations. Statistical evaluation became used, wherein the unbiased sample t-take a look at confirmed significant outcomes, indicating students' educational overall performance turned into notably stronger ($p < 0.05$) thru ICT-based teaching. those research results are steady with current worldwide research research at the effectiveness of ICT-based totally teaching, as mentioned with the aid of the OECD (2022) and global financial institution (2023).*

Keywords: ICT integration, digital learning, academic achievement, post-pandemic education, educational technology, ICT based learning

I. INTRODUCTION

The world training gadget has undergone wonderful digitalization in the beyond 5 years. The COVID-19 pandemic has been the essential driving pressure in the back of the implementation of ICT inside the classroom environment. in keeping with UNESCO (2023), the arena education system has implemented far off or virtual studying strategies in ninety% of the countries that confronted the pandemic.

ICT-based teaching strategies:

(a) smart lecture rooms
(b) gaining knowledge of management systems (LMS)
(c) Multimedia content material
(d) online evaluation
(e) digital labs and simulations
(f) AI-primarily based adaptive learning gear

in step with the recent data received from the OECD (2022), the students who're exposed to the dependent digital surroundings have proven more advantageous trouble-solving capabilities and engagement.

The goal of this study is to study the effectiveness of ICT-primarily based teaching strategies in improving educational success compared to traditional methods.

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II. RECENT GLOBAL DATA ON ICT IN EDUCATION

UNESCO (2023) reports 50% of all secondary-level education worldwide utilize digital learning resources. According to The World Bank, with proper planning and integration, the implementation of ICT as a teaching tool can correlate to an increase of between 0.3 to 0.5 additional years of schooling that account for considerations for learning from the education experience. OECD (PISA) (2022), though there is a strong correlation between achievement and moderate use of digital media in learning environments there is a negative correlation between excessive use of digital media when used excessively and inappropriately and academic performance.

According to the "India Digital Education Report" (2024), smart boards and other forms of Digital Content tools are being utilized in over 70% of all Urban Secondary Schools. Demonstrating that effective use of ICT implementation is systematic in nature, provides the maximum benefit.

III. THEORETICAL FRAMEWORK

1) Constructivist learning theory suggests that using ICT resources provides opportunities for students to acquire knowledge through first-hand experience and through collaborative work with other students.

2) When audio, video and text are all used together to deliver the same concept or information to students they learn better than when only text is used to explain the same concept or information.

3) Integrating ICT into education includes substitutive, augmentative and modified uses of technology in the redefinition of the way that educators present instructional material to their students.

IV. OBJECTIVES OF THE STUDY

1. Assessing the Effects of ICT-Based Teaching on Student Academic Achievement
2. Evaluating the Scores for the ICT-Based Teaching Post-Test as Compared to the Traditional Teaching Post-Test
3. Determining the Amount of Improvement by Effect Size

V. HYPOTHESES

H_0: ICT-based teaching has no significant effect on academic achievement.

H_1: ICT-based teaching significantly improves academic achievement.

VI. METHODOLOGY

6.1 Research Design

Quasi-experimental pre-test-post-test control group design.

6.2 Sample

Sample size of 120 secondary school students:
Experimental Group: 60
Control Group: 60

6.3 Tools

Standardized Achievement Test: Validated instrument with reliability coefficient of 0.86
ICT Tools: Smart board, LMS, online quizzes, video lectures, simulations

6.4 Procedure

Pre-test administered
8 weeks ICT-based intervention program
Post-test administered
Data analysis using independent samples t-test and Cohen's d

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VII. DATA ANALYSIS

7.1 Descriptive Statistics

Group	N	Mean	SD
Control	60	64.15	7.85
Experimental	60	78.90	6.95

7.2 Inferential Statistics

t-value = 9.42
p-value < 0.05
Cohen's d = 0.95 (Large Effect Size)
Interpretation:
The experimental group performed significantly better than the control group. The large effect size indicates strong practical significance.

VIII. DISCUSSION

The data supports existing research: ICT encourages inquiry and collaboration in the classroom (Zhao et al., 2021); OECD finds that structured digital learning improves student performance (OECD, 2022); and World Bank reports that EdTech increases foundational learning outcomes (World Bank, 2023). Use of ICT as an instructional strategy results in improved comprehension with visual simulation, retention using multimedia, participation through interactive quizzes, motivation through gamification; however, OECD Warns that too much time spent on technology may lead to poor teaching methods (OECD, 2022).

IX. EDUCATIONAL IMPLICATIONS

(i) Digital competency training programs for teachers are crucial. (ii) Blended learning methods ought to be implemented in schools.
(iii) Structured frameworks (TPACK, SAMR) should be followed while integrating ICT.
(iv) The digital divide in rural areas needs to be addressed by policymakers.

X. CONCLUSION

Recent data and worldwide research demonstrate that education using technology enhances student performance; it has been demonstrated that digital learning will improve students' grades if they receive adequate preparation for this type of instruction.
Therefore, it is important to integrate technology into Secondary Education systems.

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