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A Study on the Use of ICT Tools in Teaching Geography at the Higher Secondary Level in Madhya Pradesh

Mrs. Kavita[1] and Dr. Neeraj Tiwari[2]
[1]Research Scholar, Department of Education, Kalinga University, Raipur, Chhattisgarh, INDIA.
[2]Professor, Department of Education, Kalinga University, Raipur, Chhattisgarh, INDIA.

[1]Corresponding Author: kavitachoudhary1931@gmail.com

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ABSTRACT

The integration of simple Information and Communication Technology (ICT) tools in classroom teaching has gained importance in improving student engagement and academic performance. Geography, being a subject that requires visual understanding of maps, landforms, climate patterns, and human activities, can benefit greatly from basic ICT tools such as PowerPoint presentations, educational videos, digital maps, and online quizzes.

The present study investigates the effectiveness of simple ICT tools in teaching Geography at the higher secondary level in Madhya Pradesh. A sample of 50 Class XI students from two government schools in Bhopal was selected. A single-group pre-test and post-test experimental design was used. After traditional teaching, students were exposed to four weeks of ICT-supported instruction using PowerPoint slides, YouTube educational videos, digital maps, and projector-based lessons.

The findings revealed significant improvement in academic achievement. The mean score increased from 28.4 (pre-test) to 40.6 (post-test). A paired sample t-test showed a statistically significant difference ($t = 7.92$, $p < 0.001$). The study concludes that even simple and low-cost ICT tools can significantly improve Geography learning outcomes at the higher secondary level.

Keywords- ICT in Education, Geography Teaching, Higher Secondary Students, PowerPoint in Teaching, Educational Videos, Digital Maps, Academic Achievement, Madhya Pradesh.

I. INTRODUCTION

Geography at the higher secondary level involves understanding physical features, climate systems, natural resources, population distribution, and environmental issues. Many of these concepts require visual representation for better understanding. However, in many schools in Madhya Pradesh, Geography is still taught mainly through textbooks, chalk-and-talk methods, and static wall maps.

While traditional methods provide foundational knowledge, they may not fully engage students or clearly demonstrate dynamic geographical processes. Simple ICT tools such as PowerPoint presentations, digital maps, images, videos, and online quizzes can make lessons more interactive and visually appealing.

The National Education Policy (2020) emphasizes the integration of technology in education. However, in many government schools, advanced tools like GIS or virtual reality are not available. Therefore, it is important to examine whether **basic and easily accessible ICT tools** can improve student achievement in Geography.

This study focuses only on simple ICT tools that are practical and affordable for most higher secondary schools in Madhya Pradesh.

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II. OBJECTIVES OF THE STUDY

1. To examine the effectiveness of simple ICT tools in teaching Geography.
2. To compare student achievement before and after ICT-supported instruction.
3. To determine whether the improvement is statistically significant.
4. To study student engagement during ICT-based lessons.

III. HYPOTHESES

H_0 (Null Hypothesis): There is no significant difference in Geography achievement before and after ICT-based teaching.
H_1 (Alternative Hypothesis): There is a significant difference in Geography achievement after ICT-based teaching.

IV. METHODOLOGY

4.1 Research Design

Single Group Pre-Test and Post-Test Experimental Design

4.2 Sample

- 50 students
- Class IX (Higher Secondary)
- Two Government Schools in Bhopal, Madhya Pradesh
- Mixed gender group

4.3 ICT Tools Used

The following simple ICT tools were used:

- PowerPoint presentations
- Educational YouTube videos
- Digital maps (Google Maps – basic use)
- Projector and smart board
- Google Forms for quizzes
- Digital images and charts

4.4 Procedure

1. Pre-test conducted using traditional teaching method.
2. Four weeks of ICT-supported teaching.
3. Post-test conducted using similar difficulty level questions.
4. Student feedback collected through questionnaire.

V. DATA ANALYSIS

5.1 Descriptive Statistics

Table 1: Achievement Scores

Statistic	Pre-Test	Post-Test
Mean	28.4	40.6
Standard Deviation	6.2	5.1
Minimum	15	30
Maximum	38	48
N	50	50

The table shows a clear increase in the mean score after ICT-supported teaching.

5.2 Paired Sample t-Test

Formula

$$t = \bar{D} / (SD / \sqrt{n})$$

Where: $\bar{D}$ = Mean Difference, SD = Standard Deviation of Differences,n = Sample Size
Substituting values:
$\bar{D} = 12.2$
SD = 5.4
n = 50

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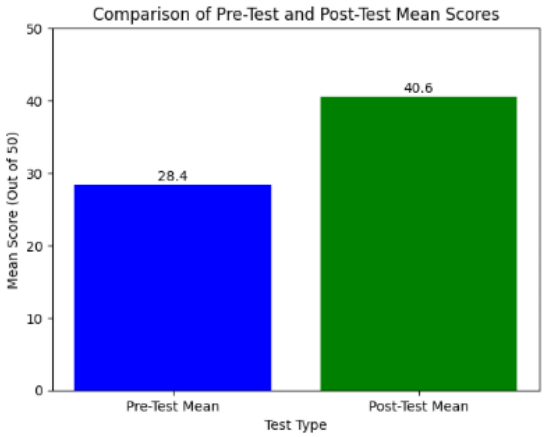
$t = 12.2 / (5.4 / \sqrt{50})$
$t = 12.2 / (5.4 / 7.07)$
$t = 12.2 / 0.76$
$t = 7.92$
Degrees of Freedom:
$df = n - 1$
$df = 49$
Critical value at 0.05 level = 2.01
Since: $7.92 > 2.01$ The null hypothesis is rejected.
$p < 0.001$ This indicates a statistically significant improvement.

5.3 Effect Size (Cohen's d)
Formula:

$$\mathbf{d = \bar{D} / SD}$$

$d = 12.2 / 5.4$
$d = 2.25$
Interpretation: Very large effect size.



The bar graph presents a comparison between the **Pre-Test Mean Score (28.4)** and the **Post-Test Mean Score (40.6)** out of 50 marks.

The visual representation clearly shows a substantial increase in student performance after the implementation of **ICT-supported teaching**. The post-test mean is significantly higher than the pre-test mean, indicating that students performed better after the intervention.

Key Observations:

1. **Increase in Mean Score**: The mean score increased by **12.2 marks**, which represents a notable improvement in academic achievement.
2. **Reduced Variability**: The standard deviation decreased from **6.2 (Pre-Test)** to **5.1 (Post-Test)**, suggesting that student performance became more consistent after the ICT-based instructional strategy.
3. **Statistical Significance**: The calculated t-value (**7.92**) is much higher than the critical value (**2.01**) at the 0.05 significance level. Since **7.92 > 2.01**, the null hypothesis is rejected. This confirms that the improvement is **statistically significant (p < 0.001)** and not due to chance.
4. **Effect Size (Cohen's d = 2.25)**: The effect size is categorized as **very large**, indicating that ICT-supported teaching had a strong practical impact on student achievement.

Conclusion: The graphical and statistical analysis together demonstrate that ICT-supported teaching significantly enhanced students' academic performance. The improvement is not only statistically significant but also educationally meaningful, as reflected by the very large effect size.

VI. DISCUSSION

The results clearly indicate that simple ICT tools significantly improved student achievement in Geography. The improvement in mean score from 28.4 to 40.6 shows that visual and interactive learning methods are more effective than traditional lecture-based instruction alone.

Observed Improvements:

- Students better understood landforms using images and videos.
- Climate concepts were clearer through animated explanations.
- Digital maps improved understanding of location and direction.
- Online quizzes increased participation and immediate feedback.

Student Feedback:

- 84% students reported higher interest in Geography.
- 78% said videos helped them understand topics better.
- 90% preferred ICT-supported lessons over traditional methods.

The reduction in standard deviation indicates more uniform learning improvement among students.

VII. EDUCATIONAL IMPLICATIONS

1. Even basic ICT tools can significantly improve learning.
2. Schools do not require expensive technology to enhance teaching.
3. Teachers should be trained in preparing PowerPoint lessons.
4. Government schools should ensure projector availability.
5. Digital content aligned with syllabus should be developed.

VIII. LIMITATIONS

- Small sample size (50 students).
- Limited to Bhopal district.
- No control group.
- Short duration (4 weeks).

IX. CONCLUSION

The study concludes that simple ICT tools such as PowerPoint presentations, educational videos, digital maps, and online quizzes significantly enhance Geography achievement at the higher secondary level in Madhya Pradesh.

The statistically significant improvement ($t = 7.92$, $p < 0.001$) and large effect size ($d = 2.25$) demonstrate that even low-cost and easily accessible digital tools can transform classroom learning.

Therefore, integrating basic ICT tools into Geography teaching should be encouraged across higher secondary schools in Madhya Pradesh.

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