Digital Learning in Elementary Education: An Analysis of ICT Familiarity and Student Satisfaction

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Abstract:

The integration of Information and Communication Technology (ICT) in elementary education has been widely recognised as a crucial factor in enhancing teaching effectiveness, learner engagement, and educational equity. Despite policy initiatives and infrastructural investments, many Indian states continue to face substantial challenges in the effective implementation of ICT at the elementary level. This study aims to analyse the level of familiarity with ICT tools and satisfaction with ICT tools in elementary education, with specific reference to government school students in Patna, Bihar. The study adopts a descriptive and analytical research design. Primary data were collected from a sample of elementary school students using a structured questionnaire based on a five-point Likert Scale, ranging from strongly agree to strongly disagree. To achieve the research objectives, both descriptive and inferential statistical tools were employed. Descriptive statistics and Pearson's correlation coefficient were used for data analysis. Pearson's correlation coefficient was used to examine the relationship between familiarity with ICT tools and students' satisfaction levels. The findings indicate a strong positive relationship between familiarity with ICT tools and student satisfaction ($r = 0.945$), suggesting that increased familiarity is associated with higher satisfaction levels. The study concludes that improving familiarity with ICT tools can enhance students' learning experience and satisfaction levels. These findings provide useful insights into improving ICT integration in elementary education.

Keywords: Elementary Education, ICT Integration, Students' satisfaction, Pearson correlation, Digital Literacy.

Introduction:

Information and Communication Technology (ICT) has become an integral component of modern education systems, transforming traditional teaching–learning processes into more interactive, learner-centred and inclusive practices. In elementary education, ICT plays a crucial role in enhancing conceptual understanding, improving student engagement and developing foundational digital skills at an early stage. Governments and educational institutions across the world have, therefore, emphasised the integration of ICT in schools to improve teaching effectiveness and learning outcomes. In the Indian context, several initiatives such as digital classrooms, smart boards and online learning platforms have been introduced to promote the use of ICT in elementary and primary education. Despite these policy efforts, the effective integration of ICT at the elementary school level remains a significant challenge. Elementary school teachers, who play a pivotal role in implementing ICT in classrooms, often face multiple difficulties that hinder the successful adoption of technology in teaching practices.

Previous studies indicate that the challenges associated with integrating ICT are multifaceted and include inadequate infrastructure, a lack of technical support, insufficient training, limited access to digital resources, time constraints and teachers' attitudes and confidence towards the use of technology. At the elementary level, these challenges become more pronounced due to the needs of young learners, curriculum rigidity and teachers' varying levels of digital competence.

Understanding students' perspectives is, therefore, essential for identifying the actual barriers to ICT integration in elementary education. Students' experiences, perceptions, and difficulties directly influence how and to what extent ICT tools are used in the classroom. However, empirical studies focusing specifically on the difficulties faced by elementary school students in integrating ICT remain limited, particularly at the grassroots level.

In this context, the present study seeks to analyse the major challenges related to students' familiarity with ICT and satisfaction with ICT among elementary school students regarding the integration of ICT into classroom learning. Using a structured questionnaire administered to elementary school students, the study attempts to identify the underlying factors associated with infrastructural, pedagogical, technical and personal challenges. The application of statistical techniques, such as factor analysis and analysis of variance, provides a systematic understanding of the dimensions of ICT-related difficulties and their relationship with students. The findings of this study are expected to contribute to educational research by providing insights into the practical challenges of ICT integration at the elementary level and by offering suggestions for policymakers, school administrators and students to strengthen ICT implementation in elementary education.

Objectives of the study:

- To examine the level of familiarity with ICT tools among elementary education students.
- To analyse the satisfaction level of elementary education students regarding ICT tools.
- To determine the relationship between familiarity with ICT tools and satisfaction level among elementary education students.

Hypothesis of the Study:

Null Hypothesis (Ho):
There is no significant relationship between familiarity with ICT tools and satisfaction level among elementary education students.
Alternative Hypothesis (H1):
There is a significant relationship between familiarity with ICT tools and satisfaction level among elementary education students.

Research Methodology:

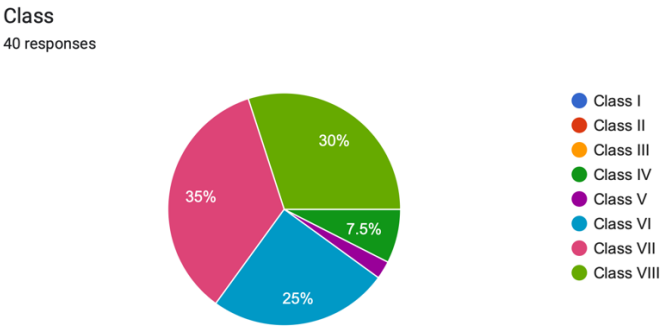
The study used a quantitative correlational research design to determine the relationship between students' familiarity with Information and Communication Technology (ICT) tools and their levels of satisfaction with the use of ICT in classroom learning. The study population was students of Classes I to VIII studying in government schools. The study used Probability Sampling technique (Lottery method) to select 40 elementary school students as the sample.
A structured questionnaire was developed and administered on the selected students for collection of primary data. The questionnaire consisted of two sections, the first section was to collect students' general information and the second section was to measure students' familiarity and satisfaction level with the use of ICT in learning. The questionnaire responses were rated on a five point Likert scale. (1=Strongly Agree, 2=Agree, 3=Neutral, 4=Disagree and 5=Strongly Disagree).

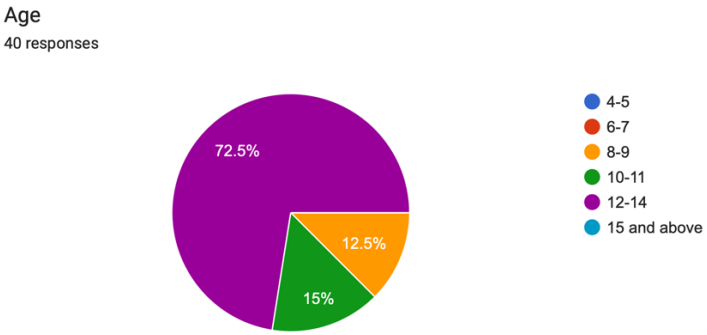
The data collected were systematically organized, coded and analysed using appropriate statistical techniques. Descriptive statistics (mean, standard deviation) were used to break down responses and determine general levels of familiarity and satisfaction. The Pearson correlation coefficient (r) was used to ascertain the relationship between students' familiarity with ICT tools and their levels of satisfaction in terms of nature and strength. Moreover, the hypothesis was tested by independent-samples t-test to determine whether there were statistically significant differences between the groups being considered. The statistical analyses and empirical evidence provided in this study fulfilled the objectives of the study regarding the role of ICT familiarity in students' satisfaction with ICT-based learning.

Data Collection:

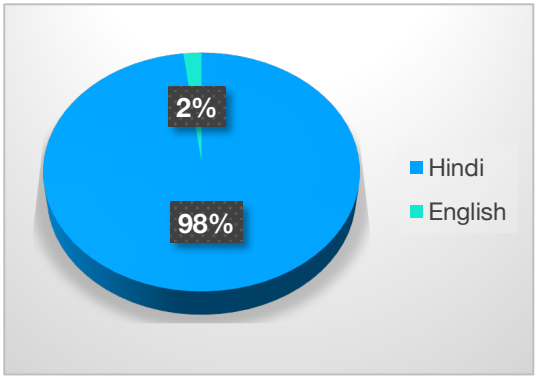
Section A: General Information

Level of Education
Class I
Class II
Class III
Class IV
Class V
Class VI
Class VII
Class VIII





Language of Qualification
40 responses



Section B: Research Question Classification
Set A: Familiarity with ICT Tools
Familiarity (X):
RQ1. Do you use ICT tools to study any subject?
RQ2. Do you feel confident after using digital tools in studies?
RQ3. Do you use a computer or tablet at school to study any subject?
RQ4. Are you familiar with the basic functions of a computer or tablet?
RQ5. Do you use mobile phones or computers at home for learning purposes?

Set B: Satisfaction with ICT Tools
Satisfaction (Y):
RQ6. Do you feel your teachers should use ICT tools more often in the classroom?
RQ7. Do you learn better when teachers use videos or multimedia during lessons?
RQ8. Do ICT tools (like videos, presentations) make the class more interesting?
RQ9. Do ICT tools help explain difficult topics more easily?
RQ10. Do you agree that ICT will help you to become better at studies in the future?

Question Type: Multiple choice
Options for all questions in this section:
1=Strongly Agree
2=Agree
3=Neutral
4=Disagree
5=Strongly Disagree

Data Analysis and Interpretation:

For the purpose of analysis, composite scores were computed for Familiarity (X) and Satisfaction (Y) using a 5-point Likert scale.
Familiarity (X) was calculated as the mean of Q1, Q2, Q3, Q4, and Q5, while Satisfaction (Y) was calculated as the mean of Q6, Q7, Q8, Q9 and Q10. These mean scores were used to compute XY, X^2, and Y^2, and to determine the correlation between the two variables.

Table: Calculation of Correlation between Familiarity (X) and Satisfaction (Y)

Respondent	Familiarity (X)	Satisfaction (Y)	XY	X^2	Y^2
1	4.0	4.2	16.80	16.00	17.64
2	4.0	4.2	16.80	16.00	17.64
3	3.6	4.0	14.40	12.96	16.00
4	3.6	4.0	14.40	12.96	16.00
5	3.8	4.4	16.72	14.44	19.36
6	3.4	3.8	12.92	11.56	14.44
7	3.8	4.2	15.96	14.44	17.64
8	4.4	4.6	20.24	19.36	21.16
9	4.0	4.2	16.80	16.00	17.64
10	4.2	4.8	20.16	17.64	23.04
11	3.4	3.8	12.92	11.56	14.44
12	3.8	4.2	15.96	14.44	17.64
13	3.6	4.0	14.40	12.96	16.00
14	3.6	4.2	15.12	12.96	17.64
15	4.2	4.8	20.16	17.64	23.04

16	**3.0**	**3.6**	**10.80**	**9.00**	**12.96**
17	**4.0**	**4.4**	**17.60**	**16.00**	**19.36**
18	**4.2**	**4.6**	**19.32**	**17.64**	**21.16**
19	**3.6**	**4.0**	**14.40**	**12.96**	**16.00**
20	**3.8**	**4.2**	**15.96**	**14.44**	**17.64**
21	**4.4**	**4.8**	**21.12**	**19.36**	**23.04**
22	**3.4**	**3.8**	**12.92**	**11.56**	**14.44**
23	**3.0**	**3.6**	**10.80**	**9.00**	**12.96**
24	**4.0**	**4.4**	**17.60**	**16.00**	**19.36**
25	**3.0**	**3.6**	**10.80**	**9.00**	**12.96**
26	**3.8**	**4.2**	**15.96**	**14.44**	**17.64**
27	**3.4**	**3.8**	**12.92**	**11.56**	**14.44**
28	**3.8**	**4.2**	**15.96**	**14.44**	**17.64**
29	**3.8**	**4.2**	**15.96**	**14.44**	**17.64**
30	**3.2**	**3.8**	**12.16**	**10.24**	**14.44**
31	**4.2**	**4.6**	**19.32**	**17.64**	**21.16**
32	**3.6**	**4.0**	**14.40**	**12.96**	**16.00**
33	**4.6**	**4.6**	**21.16**	**21.16**	**21.16**
34	**3.8**	**4.2**	**15.96**	**14.44**	**17.64**
35	**3.2**	**3.8**	**12.16**	**10.24**	**14.44**
36	**4.0**	**4.4**	**17.60**	**16.00**	**19.36**
37	**3.6**	**4.0**	**14.40**	**12.96**	**16.00**
38	**3.6**	**4.0**	**14.40**	**12.96**	**16.00**
39	**4.0**	**4.4**	**17.60**	**16.00**	**19.36**
40	**3.6**	**4.0**	**14.40**	**12.96**	**16.00**
n=40	**∑X=150.00**	**∑Y=166.60**	**∑XY=629.44**	**∑X²=568.32**	**∑Y²=698.12**

Note:

X = Mean score of familiarity items (Q1, Q2, Q3, Q4 and Q5)

Y = Mean score of satisfaction items (Q6, Q7, Q8, Q9 and Q10)

Calculation of Pearson's Correlation Coefficient(r):

Formula

$$r = \frac{n\sum XY - (\sum X)(\sum Y)}{\sqrt{[n\sum X^2 - (\sum X)^2]\,[n\sum Y^2 - (\sum Y)^2]}}$$

Given Values:

- n = 40
- ∑X=150.00
- ∑Y=166.60
- ∑XY=629.44
- ∑X²=568.32
- ∑Y²=698.12

Calculation

$$r = \frac{40(629.44) - (150.00)(166.60)}{\sqrt{[40(568.32) - (150.00)^2]\,[40(698.12) - (166.60)^2]}}$$

$$= \frac{187.60}{198.5}$$

$$= 0.945$$

Therefore, r = 0.945

Interpretation
The calculated correlation coefficient **(r = 0.945)** indicates a **very strong positive relationship between the variables.** This means that as the use of ICT tools increases, students tend to achieve better outcomes and higher satisfaction levels. Since the value is higher than **0.8**, it shows a **high degree of association between the variables.** Thus, ICT tools play a significant role in enhancing students' learning experience and overall performance.

Standard Deviation Calculation

Formula,

$$s = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n-1}}$$

$n-1$ represents Bessel's correction.

It is used because the sample mean may be biased when estimating the population variance. Therefore, dividing by (n-1) gives a better estimate for sample data.

Standard deviation for X (SD_X)

$$\Sigma X = 150.0,\ \Sigma X^2 = 568.32,\ n = 40$$

$$SD_X = \sqrt{\frac{568.32 - \frac{(150.0)^2}{40}}{39}}$$

$$SD_X = 0.39$$

Standard deviation for Y (SD_Y)

$$\Sigma Y = 166.60,\ \Sigma Y^2 = 698.12,\ n = 40$$

$$SD_Y = \sqrt{\frac{698.12 - \frac{(166.60)^2}{40}}{39}}$$

$$SD_Y = 0.32$$

SD (Familiarity X) = 0.39
SD (Satisfaction Y) = 0.32
Interpretation
Standard deviation indicates how much the data is spread around the mean. A low standard deviation means that the data points are close to the mean, while a high standard deviation shows that the data are more scattered.
In this study, the standard deviation for Familiarity (X) is **0.39** and for Satisfaction (Y) is **0.32**. Since both values are low, this indicates that the responses are closely clustered around the mean and there is less variability in the data.

Mean and Standard Deviation

Summary Table

Variable	Mean	Standard Deviation
Familiarity (X)	**3.75**	**0.39**
Satisfaction (Y)	**4.17**	**0.32**

Range using Mean ± Standard Deviation

For Familiarity (X):
Mean + S.D. = 3.75 + 0.39 = **4.14**
Mean − S.D. = 3.75 − 0.39 = **3.36**
Most of the data values lie approximately between **3.36 and 4.14.**
For Satisfaction (Y):
Mean + S.D. = 4.17 + 0.32 = **4.49**
Mean − S.D. = 4.17 − 0.32 = **3.85**
Most of the data values lie approximately between **3.85 and 4.49.**

Interpretation
The mean value for familiarity (X) is **3.75** with a standard deviation of **0.39**, indicating that responses are fairly consistent.
The mean value for satisfaction (Y) is **4.17** with a standard deviation of **0.32**, showing high consistency in responses.
Overall, the low standard deviation values indicate less variability and stable responses. The correlation coefficient **(r = 0.945)** shows a **very strong positive relationship**, meaning that increased familiarity with ICT tools leads to **better outcomes and higher satisfaction levels** among students.

HYPOTHESIS TESTING:

Why a t-test is applied
After calculating the correlation coefficient (r), it is necessary to test whether this correlation is statistically significant. The correlation t-test helps determine whether the observed value of r is significantly different from zero. If the correlation is significantly different from zero, it indicates that a real relationship exists between the variables.

Two-Tailed Test
Since the hypothesis does not specify the direction (positive or negative), a two-tailed test is used. The test checks whether there is any significant relationship between familiarity with ICT tools and satisfaction level among elementary education students.

Null Hypothesis (H_0): $\rho = 0$ (No relationship)

Alternative Hypothesis (H_1): $\rho \neq 0$ (Significant relationship)

Formula Used for Correlation t-test

$$t = \frac{r\sqrt{n-2}}{\sqrt{1-r^2}}$$

Where:

r = Pearson correlation coefficient

n = number of observations

(n − 2) = degrees of freedom

r^2 = coefficient of determination

Value:

r = 0.945

n = 40

α = 0.05

$$t = \frac{0.945\sqrt{38}}{\sqrt{1-(0.945)^2}}$$

$$t = 17.83$$

Degree of Freedom and Critical Value
df = n − 2 = 40 − 2 = **38**
α = 0.05 (two-tailed)
$t_{critical} \approx 2.02$

Comparison,
Calculated t-value = **17.83**
Critical value = **2.02**
Since **17.83 > 2.02,** the result is statistically significant.

Decision: The null hypothesis H_0 is **rejected,** and the alternative hypothesis H_1 is **accepted.**
Interpretation: The calculated t-value is **17.83,** which is much higher than the critical value. This indicates that the observed correlation is not due to chance.
The Pearson correlation coefficient **(r=0.945)** shows a **very strong positive relationship** between familiarity with ICT tools and student satisfaction. This means that students who are more familiar with ICT tools tend to achieve **better outcomes and higher satisfaction levels.**

Conclusion

The study confirms that there is a **strong and statistically significant relationship** between ICT familiarity and student satisfaction. The high correlation value and significant t-test result indicate that ICT tools play a crucial role in enhancing students' learning experience. Students with greater exposure to ICT tools tend to perform better and show higher satisfaction. Therefore, increasing the use of ICT in education can lead to improved academic outcomes and overall learning effectiveness.

Limitation

This study is limited by its small sample size of 40 students and the use of convenience sampling, which may affect the wider applicability of the findings. The study is also confined to government schools in Patna, Bihar. The data are based on self-reported responses, which may have minor variations. Additionally, the study focuses only on familiarity and satisfaction and does not include other influencing factors. Therefore, the findings should be interpreted with due consideration.

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