International Journal on Science and Technology (IJSAT)
E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

Impact of ICT Usage and Academic Performance of High School Students in Chennai City

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Abstract
In today's digital era, Information and Communication Technology (ICT) plays a crucial role in shaping the educational experiences of students. This study explores the impact of ICT usage on the academic performance of high school students. It examines how the integration of digital tools—such as computers, the internet, multimedia, and educational software—enhances learning outcomes. The study also highlights both the advantages and limitations of ICT in the classroom context. Findings suggest that appropriate and strategic use of ICT contributes positively to student engagement, understanding, and academic success. However, the benefits are often influenced by factors like accessibility, teacher support, and students' digital literacy levels.

Keywords: ICT Usage, Academic Performance, High School Students, Digital Tools, Educational Technology, Student Engagement, Learning Outcomes, Accessibility, Teacher Support, Digital Literacy

Introduction

The advancement of Information and Communication Technology (ICT) has revolutionized the field of education, offering new opportunities for teaching and learning. In the high school setting, the use of ICT tools is no longer optional but increasingly essential. From digital classrooms to online assignments, the presence of technology in education has reshaped how students interact with content, peers, and teachers. As students become more tech-savvy, the education system must evolve to meet their needs. This paper investigates the link between ICT usage and academic performance among high school students, focusing on how digital learning tools impact their academic outcomes and motivation.

Meaning of ICT in Education

ICT in education refers to the use of digital technologies to support and enhance the teaching and learning process. It includes a wide range of tools and resources such as computers, internet connectivity, educational software, online platforms, projectors, smartboards, and more. ICT enables interactive learning, easy access to information, and collaboration among students and teachers across different locations.

Definition of ICT

Information and Communication Technology (ICT) is broadly defined as a diverse set of technological

tools and resources used to create, store, manage, and communicate information. According to UNESCO, "ICT is a form of technology that is used to transmit, store, create, share or exchange information through electronic means including computers, the internet, wireless networks, and other digital systems."

Uses of ICT in Education

Interactive Learning: ICT tools enable dynamic and engaging methods such as simulations, animations, and educational games that help clarify complex topics.

Access to Information: Students can access vast amounts of information through digital libraries, online courses, and educational videos.

Collaborative Learning: Platforms like Google Classroom and Microsoft Teams allow students to work together on assignments in real time.

Personalized Education: ICT helps teachers tailor lessons to meet individual learning needs using adaptive learning systems.

Assessment and Feedback: Online quizzes, tests, and platforms provide instant feedback to students and help track their progress effectively.

Statement of the Problem:

In the digital era, Information and Communication Technology (ICT) has become an integral part of education across the globe. With the increasing integration of digital tools in classrooms, especially in urban regions, there is a growing expectation that ICT enhances teaching and learning outcomes.

Given the wide variation in school infrastructure, teacher training, accessibility to digital tools, and student backgrounds, there is a need to examine whether demographic factors such as gender, locality, type of school management, and medium of instruction play a role in students' engagement with ICT. Moreover, it is equally important to understand whether this usage has a measurable effect on academic achievement. Therefore, this study seeks to investigate the differences in ICT usage and its relationship to academic performance among high school students in Chennai District, taking into account key demographic variables. The findings aim to inform educational policy, teacher training, and ICT integration strategies in schools.

Review of Related Literature:

ICT in Education

ICT has transformed traditional education by introducing new avenues for interaction, collaboration, and access to vast learning resources. According to **UNESCO (2020)**, ICT promotes inclusive and equitable education when appropriately implemented. Digital tools like computers, interactive whiteboards, and educational software have shown promise in enhancing learning outcomes and classroom engagement.

ICT Usage and Academic Performance

Numerous studies have investigated the correlation between ICT usage and student achievement. For instance, **Kozma (2005)** found that when students actively use technology for learning, they tend to perform better in academic subjects. **Sivin-Kachala and Bialo (2000)** concluded from their meta-analysis that ICT usage, especially when integrated with instructional objectives, positively influences academic achievement.

However, other studies highlight mixed results. **OECD (2015)** reported that while moderate use of ICT is beneficial, excessive use without guidance can lead to distractions and reduced academic performance.

This suggests that the **context and manner in which ICT is used** are critical in determining its educational impact.

Demographic Factors Influencing ICT Use

Research also points to significant differences in ICT usage across demographic lines. **Yelland (2001)** emphasized that students in urban and private school settings tend to have more access to digital devices and high-speed internet compared to their rural and government school counterparts. **Gulbahar and Guven (2008)** also reported that English medium students generally demonstrate more proficiency in using ICT tools due to greater exposure.

Indian Context

In the Indian context, **Prensky (2012)** and **National Education Policy (NEP) 2020** emphasize the growing need to integrate ICT in classrooms to bridge learning gaps. However, infrastructure disparities and teacher preparedness continue to be significant challenges. While urban schools have begun adopting smart classes and digital learning platforms, many rural schools still rely heavily on traditional methods.

Methodology:

Research Design

The present study employed a **quantitative survey method** to investigate the impact of ICT usage on the academic performance of high school students in **Chennai District**. The design was chosen for its effectiveness in collecting numerical data and examining statistical relationships between variables.

Sample and Sampling Technique

The sample comprised **400 high school students** selected from different government and private schools in Chennai District using a **stratified random sampling technique** to ensure equal representation across demographic variables such as **gender, locality, type of management, and medium of instruction**. The demographic distribution is as follows:

- **Gender**: 180 Male and 220 Female students
- **Locality**: 220 Urban and 180 Rural students
- **Type of Management**: 190 Government and 210 Private school students
- **Medium of Instruction**: 185 Tamil Medium and 215 English Medium students

Tools Used for Data Collection

1. **ICT Usage Scale** – A standardized questionnaire assessing the frequency and intensity of ICT tools (internet, computers, smartboards, etc.) used for learning.
2. **Academic Performance Index** – Derived from students' average scores in the latest term examinations.
3. **Demographic Schedule** – Collected data on gender, locality, school type, and medium of instruction.

Statistical Techniques Used

Data was analyzed using **SPSS** software. The statistical methods included:

- **Mean and Standard Deviation (SD)**
- **Independent Samples 't'-test** to determine the significance of differences in ICT usage and academic performance across demographic groups.
- **Pearson's Correlation Coefficient (r-value)** to assess the relationship between ICT usage and academic performance.
- Significance was determined at the **0.05 level**.

Table 1: Mean Score Difference in ICT Usage of High School Students in Chennai City Based on Demographic Variables

Demography variable	N	Mean-ICT	SD	t-value (calculated)	t-value (Table)	Significance at 0.05 level
Male	180	3.44	0.53	2.59	1.96	Significant
Female	220	3.65	0.49	1.82	1.96	Not Significant
Urban	220	3.70	0.47	2.60	1.96	Significant
Rural	180	3.45	0.54	2.60	1.96	Significant
Government	190	3.40	0.59	3.00	1.96	Significant
Private	210	3.75	0.44	3.00	1.96	Significant
Tamil medium	185	3.55	0.51	2.15	1.96	Significant
English Medium	215	3.70	0.46	2.15	1.96	Significant
Locality - Urban	220	3.70	0.47	2.60	1.96	Significant

Table 2: Mean Score Difference in Academic Performance of High School Students in Chennai City Based on Demographic Variables and ICT Usage

Demographic Variable	N	Mean Score	SD	t-value (Calculated)	r-value (ICT Usage)	t-value (Table)	Significance at 0.05 level
Gender - Male	180	66.0	8.0	2.20	0.38	1.96	Significant
Female	220	69.2	7.4	2.20	0.38	1.96	Significant
Urban	220	71.0	6.6	3.30	0.38	1.96	Significant
Rural	180	64.0	8.0	3.30	0.38	1.96	Significant
Government	190	63.0	8.8	3.60	0.38	1.96	Significant
Private	210	72.0	6.2	3.60	0.38	1.96	Significant
Tamil medium	185	67.0	7.6	2.85	0.38	1.96	Significant
English medium	215	70.5	6.9	2.85	0.38	1.96	Significant

Summary for Paper Drafting:

- **ICT usage** shows significant mean differences **except for gender**.
- **Academic performance** is significantly influenced by **demographic differences** and shows a **moderate positive correlation** with ICT usage (r = 0.38).
- These results are statistically significant at the **0.05 level**.

Results and Analysis

1. ICT Usage Among High School Students Based on Demographic Variables

The results revealed notable variations in ICT usage across certain demographic groups.

1. **ICT Usages of High School Students Based on Demographic Variables and Academic Performance**

Demographic Variable	Mean-ICT Usage	SD	t-value (Calc.)	t-value (Table)	Significance (0.05 level)
Male vs Female	3.50 vs 3.65	0.56 / 0.49	1.82	1.96	Not Significant
Urban vs Rural	3.70 vs 3.45	0.47 / 0.54	2.60	1.96	Significant
Govt. vs Private school	3.40 vs 3.75	0.59 / 0.44	3.00	1.96	Significant
Tamil vs English Medium	3.55 vs 3.70	0.51 / 0.46	2.15	1.96	Significant

Interpretation: ICT usage was **significantly higher** among students in urban areas, private schools, and English medium backgrounds. No significant difference was observed between male and female students.

2. Academic Performance of High School Students Based on Demographic Variables and ICT Usage

Demographic Variable	Mean Score	SD	t-value (Calc.)	r-value (ICT Usage)	t-value (Table)	Significance
Male vs Female	66.0 vs 69.2	8.0 / 7.4	2.20	0.38	1.96	Significant
Urban vs Rural	71.0 vs 64.0	6.6 / 8.0	3.30	0.38	1.96	Significant
Govt.vs Private school	63.0 vs 72.0	8.8 / 6.2	3.60	0.38	1.96	Significant
Tamil vs English Medium	67.0 vs 70.5	7.6 / 6.9	2.85	0.38	1.96	Significant

Interpretation:

- Academic performance was significantly higher among female, urban, private school, and English medium students.
- A moderate positive correlation (r = 0.38) was observed between ICT usage and academic performance, indicating that students who use ICT tools more frequently tend to perform better academically.

Findings:

Based on the analysis of ICT usage and academic performance among high school students in Chennai District, the following key findings emerged:

1. **ICT Usage and Demographics**:
   - There is **no significant difference** in ICT usage between **male and female** students.
   - Students from **urban schools**, **private institutions**, and **English medium backgrounds** reported **significantly higher levels of ICT usage** compared to their rural, government school, and Tamil medium counterparts.
2. **Academic Performance and Demographics**:
   - Female students demonstrated **slightly better academic performance** than male students.
   - Students from **urban areas**, **private schools**, and **English medium** instruction had **significantly higher academic scores**.

3. **Relationship Between ICT Usage and Academic Performance**:
   - A **moderate positive correlation** was found between ICT usage and academic performance, indicating that students who make better use of ICT resources tend to perform better academically.
   - The data suggests that while ICT alone is not the sole determinant of academic success, it plays a supportive and enhancing role.

Recommendations:

Based on the findings of this study, the following recommendations are proposed:

1. **Expand ICT Infrastructure**: Government and school authorities should ensure **equitable access to ICT facilities**, especially in **rural and government schools** where such resources are limited.
2. **Teacher Training**: Provide continuous **professional development** programs to teachers on the effective integration of ICT in teaching and learning processes.
3. **Curriculum Integration**: ICT should be **systematically embedded** into the curriculum across subjects to promote active learning and improve digital literacy.
4. **Language Accessibility**: Develop more **ICT learning tools in regional languages** (like Tamil) to support students in non-English medium schools.
5. **Parental Awareness**: Conduct workshops to encourage **parental involvement** in supporting students' responsible ICT usage at home.

Scope for Further Study:

While this study provides valuable insights, it also opens up avenues for further research:

- Future studies can explore **qualitative aspects** such as **student attitudes and motivation** toward ICT usage.
- A **longitudinal study** can be conducted to examine how sustained ICT integration affects learning outcomes over time.
- Comparative studies across **different districts or states** could offer a broader perspective on regional disparities.
- Further investigation can be made into the **role of teachers' digital competency** and its influence on students' ICT engagement and learning.

Conclusion

The study highlights the growing importance of ICT in shaping the academic journey of high school students in Chennai District. While ICT is not a magic solution, it clearly serves as a **valuable enabler** of better academic performance when used purposefully. However, disparities in access and usage remain a concern, particularly along the lines of **school type, locality, and language medium**. Bridging these gaps through inclusive policies, infrastructure upgrades, and targeted teacher support can help ensure that **ICT benefits all learners**, regardless of their background. Ultimately, the effective integration of technology into education requires a **collective effort from educators, policymakers, parents, and students**.

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