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Impact of Technology Integration on Student Learning Outcomes

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Abstract

The study was carried out to determine the Impact of Technology Integration on Student Learning Outcomesas compared to the traditional method of teaching in the subject of Science at school level in Chengalpattu District, Tamilnadu. The dependent variable in the study was the achievement in the academic scores of the students, whereas the independent variable was the teaching strategy. Cluster sampling techniques are used in this study. 33 students were selected from Grade10 for this study. It is a Post Test - Post Test study. These 33 students were first taught Chemical reactions and equations through traditional method of teaching (Control group). The achievement of the student is Assessed immediately. After a week student were taught Acids, Bases and salts through Embibe software application (Technology Integration) and achievement of the student is Assessed immediately (Treatment group). The Achievement tests contained 19 questions in 5 sections for both the groups. The achievement test is prepared to test memory, analysis, synthesis and Evaluation ability of the students. The time duration for the test was fixed as one and half an hour for the both the groups. The maximum marks for the achievement test are allotted as forty. Data collected from both groups was used for the further calculation through IBMSPSS23. The student's achievement in both the group is high. Technology integration has no impact on achievement of the high school students in science subject. Stepwise regression result shows that the Mothers qualification, Parental income and Fathers qualification uniquely accounted for approximately 48%, 22% and 22% of the Treatment group achievement. Inspection of the structure coefficient suggests that, The Parental income and Fathers qualification were relatively less indicator of Treatment group achievement. But the Mothers qualification was relatively strong indicators of Treatment group achievement.

Keywords: *Technology Integration, Teaching Strategy, Parental Income, Achievement.*

1. INTRODUCTION

The rapid evolution of technology has significantly reshaped education systems across the globe. From interactive whiteboards and virtual reality simulations to learning management systems and AI-powered tutoring platforms, the

integration of technology in classrooms has introduced unprecedented opportunities to enhance teaching and learning processes. As education increasingly shifts toward a digital-first approach, understanding the implications of technology on student learning outcomes has become a critical area of research.

This study seeks to examine how the integration of technology in educational settings influences students' academic performance, engagement, and overall learning experience. While proponents of technology integration argue that it fosters personalized learning, collaboration, and critical thinking, critics caution against potential drawbacks, such as digital distractions and the deepening of the digital divide. By exploring these dynamics, this research aims to provide a balanced perspective on the transformative potential of technology in education.

Through a combination of qualitative and quantitative methodologies, this study investigates the relationship between technology usage and student outcomes across diverse educational contexts. It evaluates key factors such as the types of technologies implemented, teacher preparedness, and the socio-economic backgrounds of students. Ultimately, the findings aim to inform educators, policymakers, and stakeholders about the best practices for leveraging technology to maximize student success.

2. NEED OF THE STUDY

Research on the impact of technology integration on student learning outcomes is essential to understand how digital tools can enhance education. It provides evidence on whether technology improves engagement, knowledge retention, and critical thinking. Such research helps identify effective teaching strategies and tools that promote personalized learning, allowing students to progress at their own pace. It also examines how technology fosters collaboration and the development of 21st-century skills, such as communication and problem-solving. Additionally, research addresses challenges like the digital divide and the need for ongoing teacher training. By evaluating the role of technology in different learning environments, including online and hybrid models, research helps shape future educational practices.

It also ensures that technology integration is equitable, reaching all students, regardless of socio-economic status. Insights from this research inform policymaking, guiding decisions on technology investment and resource allocation. Ultimately, it ensures that technology is used to improve learning outcomes and prepare students for future careers in a digital world. Finally, it helps educators adapt to rapid technological advancements, integrating emerging tools like virtual reality, artificial intelligence, and robotics into the curriculum. Overall, research provides a roadmap for leveraging technology to achieve improved and equitable learning outcomes for all students.

3. SIGNIFICANCE OF THE STUDY

Research on the impact of technology integration in the classroom is significant because it provides evidence-based insights into how digital tools affect student learning outcomes. It helps identify effective strategies for using technology to enhance engagement, knowledge retention, and critical thinking. This research also sheds light on how technology supports personalized learning, catering to diverse student needs and learning styles. It can inform educators on the best practices for integrating technology into lessons, ensuring that tools are used effectively to improve instruction. Moreover, research highlights the challenges of technology integration, such as access disparities and the need for teacher training. It guides policymakers in making informed decisions about investing in technology and creating equitable learning environments. The research also explores how technology fosters 21st-century skills like collaboration, problem-solving, and digital literacy, preparing students for future careers. Additionally, it provides valuable insights into the effectiveness of online and hybrid learning models, especially in the post-pandemic era. Ultimately, this research helps create a framework for integrating technology in a way that supports all learners and promotes educational equity.

4. STATEMENT OF THE PROBLEM

The problem of the study was states as a Study on the Impact of Technology Integration on Student Learning Outcomes.

5. OPERATIONAL DEFINITION

- Technology Integration: Embibe software application was integrated to teach Chemistry.
- Impact: is the capability of producing an increase in achievement of students in chemistry
- Students: Those who are studying 10 standards in high schools.
- Control group: While teaching Science to the Grade10 in CBSE school studentsOral inputs are given through lecture method of teaching.
- Treatment Group: While teaching Science to the Grade10 in CBSE school students Embibe software application was used to teach.
- Achievement: Marks scored by the students in the achievement test conducted by the researcher.

6. OBJECTIVES

- To find the effective method of teaching.
- To assess the level of achievement of the control group and treatment group.
- To find the relationship between subsample of treatment group.
- To find the impact of technology integration over traditional teaching
- To find the predictor of achievement in treatment group.

7. HYPOTHESIS

- There is no effective method of teaching
- The level of achievement of the control group and treatment group is low.
- There is no impact of technology integration over traditional teaching
- There is no relationship between subsample of treatment group
- There is no predictor of achievement in treatment group.

8. METHODOLOGY

The study was carried out to determine the impact of technology integration as compared to the traditional method of teaching in the subject of Science at school level. The dependent variable in the study was the achievement in the academic scores of the students, whereas the independent variable was the teaching strategy. The tool contains 2 parts, Part one included only personal information and part 2 contains achievement test questions. An achievement test was prepared by the researchers with the consultation of experienced Chemistry faculty in the same school form the topic Chemical reactions and equations (in Annexure 1). from CBSE syllabi for control group and Acids, Bases and salts for Treatment group (in Annexure 2).

The Achievement tests contained 19 questions in 5 sections for both the groups. The achievement test is prepared to test memory, analysis, synthesis and Evaluation ability of the students. The time duration for the test was fixed as one and half an hour for the both the groups. The maximum marks for the achievement test are allotted as forty.There are 40 CBSE schools in Chengalpattu district. Approximately 30000 students are perusing Grade10.Cluster sampling techniques are used in this study. 33 students were selected from Grade10 in Sri Kanchi Mahaswami Vidhyamandir, Thambaram. Same set of students were used for both control and treatment group but topic and method of teaching was changed.

9. DESCRIPTIVE ANALYSIS

Control group students were first taught Chemical reactions and equations through traditional method of teaching. Treatment group student were taught Acids, Bases and salts through Embibe software application. The achievement test contains FIVE subsections. The maximum marks allotted were Forty. The school students were considered as for as sample and population by including, Gender, Age, Mothers qualification, Fathers qualification, Parent occupation, Parent income, Achievement test mark as sub-samples.

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Table- 1: Percentage Analysis of Achievement among Control Group And Treatment Group

S.No	Level of Achievement		Score		Percentage	
	Level	Score	Control group	Treatment group	Control group	Treatment group
1	**Very Low**	0-8	0	0	0	0
2	**Low**	9-16	2	0	6	0
3	**Moderate**	17-24	5	6	15.2	18
4	**High**	25-32	13	9	39.4	27
5	**Very High**	33-40	13	18	39.4	55
Total			33	33	100	100

From the table 1 it is clear that 79% of control group and 83% of treatment group of students have high level of achievement in Science, 15% of control group and 18% of treatment group students have moderate level of achievement in Science and 6% of control group and 0% of treatment group of students have low level of achievement in Science. Thus, it is concluded that both method of teaching brings high achievement in Science.

10. ANALYSIS OF THE LEVEL OF ACHIEVEMENT AMONG CONTROL GROUP AND TREATMENT GROUP

One of the important objectives of the study is to assess the impact of technology integration over traditional teaching among school student's achievement. For that the mean standard deviation values have been calculated for entire and subsamples which include Gender, Age, Mothers qualification, Fathers qualification, Parent occupation, Parent income, Achievement test mark as sub-samples.

Table 2: Mean and Standard Deviation of Achievement

Group	Mean	N	Standard Deviation
Control Group	28.83	33.00	6.94
Treatment Group	31.20	33.00	5.93

The above table 2 shows the mean score and standard deviation of control group and treatment group in science achievement of school students. It is found to be 28.83 and 6.94 respectively for control group. It is found to be 31.20 and 5.93 respectively for treatment group. It is concluded that the student's achievement in both the group is high (25-32).

Table 3: Descriptive Analysis of the Achievement of Treatment Group score

S. No	Variables		N	Treatment Mean	t/f value	Result
1	**Gender**	Male	23	30.20	-1.500	NS
		Female	10	**33.50**		
2	**Age**	14	21	**31.86**	.842	NS
		15	12	30.04		
3	**Mothers Qualification**	School Level	8	23.69	5.905	S
		College Level	25	**33.60**		
4	**Fathers Qualification**	School Level	8	24.81	4.383	S
		College Level	25	**33.24**		
5	**Parental Employment**	Self- employment	11	30.82	.842	NS
		Business	22	**31.38**		
6	**Parental**	0-50k	8	**35.81**	3.784	S

	Income	50K-1L	27	31.63		
		1L-1.5L	6	29.25		
7	**Number of Family Members**	1-5	27	**31.63**	.886	NS
		6-10	6	29.25		
8	**Family Type**	Nuclear	30	30.72	-3.9546	S
		Joint	3	**36.00**		

Gender: According to the computed t-value, there isn't much of a difference in male and Female student's achievement in Treatment group. The calculated t-value of 1.500 indicates that it is not significant at the 5% level. Consequently, the null hypothesis is accepted and the alternative hypothesis is rejected. Therefore, it may be concluded that in Treatment Group Male and Female students not differ in their achievement in science subject.

Age: According to the computed t-value, there isn't much of a difference in 14 Years and 15 Years student's achievement in Treatment group. The calculated t-value of 0.842 indicates that it is not significant at the 5% level. Consequently, the null hypothesis is accepted and the alternative hypothesis is rejected. Therefore, it may be concluded that in Treatment Group 14 Years and 15 Years students not differ in their achievement in science subject.

Mothers qualification: According to the computed t-value, there is much of a difference in College level and School level educated mothers children's achievement in Treatmentgroup. The calculated t-value of 5.905 indicates that it is significant at the 5% level. Consequently, the alternative hypothesis is accepted and the null hypothesis is rejected. Therefore, it may be concluded that in Treatment group College level and School level educated mothers children differ in their achievement in science subject.

Fathers qualification: According to the computed t-value, there is much of a difference in College level and School level educated fathers children's achievement in Treatmentgroup. The calculated t-value of 4.383 indicates that it is significant at the 5% level. Consequently, the alternative hypothesis is accepted and the null hypothesis is rejected. Therefore, it may be concluded that in Treatment group College level and School level educated fathers children differ in their achievement in science subject.

Parental Occupation: According to the computed t-value, there isn't much of a difference in Business and Self-Employed parent's children's achievement in Treatment group. The calculated t-value of 0.842 indicates that it is not significant at the 5% level. Consequently, the null hypothesis is accepted and the alternative hypothesis is rejected. Therefore, it may be concluded that in Treatment Group Business and Self-Employed parent's childrennot differ in their achievement in science subject.

Parental Income: The obtained f-value suggests that there is a significant variation in the Achievement based on Parental Income in Treatment Group. Considering that the computed f-value (3.784) is significant at the 5% level. As a result, the Alternate hypothesis is acknowledged. Therefore, in Treatment group the achievement differs based on the Parental Income of the school students.

Family members: According to the computed t-value, there isn't much of a difference in 1-5 Member Family and 6-10 Member Family children's achievement in Treatment group. The calculated t-value of 0.886 indicates that it is not significant at the 5% level. Consequently, the null hypothesis is accepted and the alternative hypothesis is rejected. Therefore, it may be concluded that in Treatment 1-5 Member Family and 6-10 Member Family childrennot differ in their achievement in science subject

Family type: The obtained t-value suggests that there is significant variation in the Achievement based on Family Type in Treatment Group. Considering that the computed t-value (3.955) is significant at the 5% level. As a result, the Null hypothesis is rejected and Alternate Hypothesis is acknowledged. Therefore, in Treatment group the achievements are different for the school children from different family type.

Table-4: T- Test Showing Relationship Between control Group and Treatment Group

Group	N	Mean	Std. Deviation	T Value	Result
Control Group	33	28.83	6.94	1.488	**NS**
Treatment Group	33	31.20	5.93		

The above table 4. exhibits the details of mean, S.D, and t-value relationship between control group and treatment group. According to the computed t-value, there isn't much of a difference in control group and treatment group school student's achievement. The calculated t-value of 1.488 indicates that it is not significant at the 5% level. Consequently, the null hypothesis is accepted and the alternative hypothesis is rejected. Therefore, it may be concluded that technology integration has no impact on achievement of the high school students in science subject.

Table-5: Stepwise Regression between Treatment Group Achievement and Other Personal Variables

Model		Unstandardized Coefficients		Standardized Coefficients			
		B	**Std. Error**	**Beta**	**Pearson R**	**Sr^2**	**Structure Coefficient**
3	(Constant)	-3.316	4.567				
	Mothers Qualification	7.216	1.651	.530	.728	0.397	0.479
	Parental Income	1.861	.727	.271	.400	0.184	0.222
	Fathers Qualification	4.216	1.651	.309	.619	0.183	0.221
Note: The dependent variable Achievement of Treatment group. R Square=0.685 and Adjusted R Square=0.653. sr^2 is squared semi-partial correlation. F(32,2) = 21.039							

Table 5 shows Course, Gender, Age, Mothers qualification, Fathers qualification, Parent occupation, Parent income, and Treatment group achievement were used in a stepwise multiple regression analysis to predict Treatment group achievement of the school students.

The prediction model contained three of the eight predictors and was reached in three steps with 5 variables removed. The model was statistically significant, $F(32,2) = 21.039$, $p < .001$, and accounted for approximately 68 % of the variance of Treatment group achievement (R Square=0.685 and Adjusted R Square=0.653).

Treatment group achievement is primarily predicted by the Mothers qualification, Parental income and Fathers qualification. The raw and standardized regression coefficient of predictors together with their correlation with Treatment group achievement, their squared semi-partial correlations, and their structured coefficients are shown in table-4.15. The Mothers qualification received the strongest weight in model followed by Parental Income and Fathers qualification. With the sizeable correlations between the predictors, the unique variance explained by each of the variables indexed by the squared semi-partial correlation was relatively high: The Mothers qualification, Parental income and Fathers qualification uniquely accounted for approximately 48%, 22% and 22% of the Treatment group achievement. Inspection of the structure coefficient suggests that, The Parental income and Fathers qualification were relatively less indicator of Treatment group achievement. But The Mothers qualification was relatively strong indicators of Treatment group achievement.

11. CONCLUSION

The current study clearly depicts that the both control and Treatment group show high achievement in Science Subject. 14 years Female students having college level educated parents, earning Rs. 5000/- through business, living in joint

family with 1-5 family members achieves more.Lecture method and Technology integrated method of teaching brings high achievement in Science, But Technology integration has no impact on Learning outcomes of the high school students in science subject. Mothers Educational Qualification, Fathers Educational Qualification, Parental Income and joint family having significant relationship with Learning outcomes of technology integration on learning of school students. Learning out comes are not only influenced by method of teaching and also influenced parental educational qualification and their income.

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