Academe *Journal of Education & Psychology*
Volume-15, Issue-1, Year-2025 (January-June)
PP: 17 - 25 *ISSN No: 2249-040X*

EFFECT OF E-CONTENT INTEGRATION ON ACHIEVEMENT IN MATHEMATICS AMONG SECONDARY SCHOOL STUDENTS

Bhagwant Kaur

Assistant Professor, Moga College of Education, Ghall Kalan, Moga

ABSTRACT

Now a days technology has impacted almost every aspect of life, and education is no exception. Online education is one of the new innovative study methods that have been introduced in the pedagogy field. Technology has also changed the role of teachers and learners. In the traditional classrooms, students acted as the passive learners. However, in modern classrooms, teacher's role is shifting to the 'guide on the side'; as students take more responsibility for their learning. Learners can access course materials and engage with instructors at their convenience, breaking free from rigid schedules. E-Content is the latest method of instruction that has been widely employed in the process of education. It is becoming popular because of its flexibility of time, place and pace of learning.

The Investigator developed e-content with the integration of multimedia components such as text, audio, video, animation and image for secondary school students in the subject of Mathematics on selected topics (Trignometery, Fractions and Functions) using ADDIE model. This abbreviation stands for the five phases involved in the model – Analysis, Design, Development, Implementation and Evaluation. The present study was experimental in nature. The pre-test and post-test control group design was adopted. This design includes both control and treatment/experimental groups. A sample of 80 secondary school students were used. 40 students were added to each group. Experimental and Control Groups were compared with respect to their respective performances in pre and post tests. Students were also compared on the basis of their gender, locality of home and type of school. Findings of the study revealed that E-Content Integration effects positively the achievement in Mathematics among Secondary School Students irrespective of gender, type of school (Government or Private) and locality of home (Rural or Urban).

E content is a component of digital education designed to support both teachers and learners in transferring and acquiring knowledge remotely as well as face to face. One of the most important role s of e content from teachers' perspective is to support them in activating students and strengthening the individualization of the learning process. The learner show more significant involvement in the lessons and can learn the material more efficiently. Education is only one of the many facets of modern life that have been touched by technology. The roles of educators and students have also been altered by technology.

Using the ADDIE approach, the investigator created e-content for secondary school Mathematics students on a few chosen topics (Trignometery, Fraction, Functions) that included multimedia elements like text, audio, video, animation, and image. The five stages of the model—analysis, design, development, implementation, and evaluation—are represented by this acronym. The nature of the current investigation was exploratory. The pre-test and post-test control group design was utilized. Both control and treatment/experimental groups are included in this design. One hundred secondary school pupils served as the sample. Each group was expanded to include 40 pupils. The pre- and post-test results of the Experimental and Control Groups were compared to each other.

Additionally, comparisons between students were made based on their gender, type of school (Government or Private) and locality of home (Rural or Urban).

Keywords*-Content, E-Content Integration, Achievement in Mathematics, Secondary School Students*

INTRODUCTION

Educational technology has given rise to E-learning, also appertained to as online literacy or electronic literacy. Online literacy isn't the coming big thing, it's the now big thing. Generally, E-learning is conducted on the internet, where scholars can pierce their literacy accoutrements online at any place and time. E-learning is naturally suited to distance literacy and flexible literacy, but can also be used in confluence with face- to- face tutoring, in which case the term Blended literacy is generally used. E-learning has introduced us to e-content. E-content which is also known as digital content refers to the content or information delivered over network grounded electronic bias widgets or that's made available using computer network similar as internet. E-content is the digital textbook and images designed to display on web runners. E-content is principally a package that satisfies the conditions like minimization of distance, cost effectiveness, Stoner benevolence and rigidity to original conditions (Saxena, 2011). Learning by E-Content varies from the traditional system, because this system is concerned with new technological features similar as seductive images, robustness, links, audios and videos. E- learners can pierce educational content anytime & anywhere. E-content provides better compass for literacy. E-content don't tend to replace traditional tutoring and literacy process, but is anticipated to round the traditional settings. Mathematics is still a agony for numerous scholars. To understand the real conception of Mathematics, classical face to face styles may have to be supported by innovative styles. E-Content can be used to make tutoring of Mathematics creative, easy and effective for scholars, so as to make them creative and productive learners. E- learning modules have proved to be effective at academy position (Benjamin, 2013) and he also recommended to borrow electronic media to fulfill the points of education. E- Content integration was also set up effective in literacy of scholars at tertiary position (Amutha, 2016). E-content provides multi-sensory experience to the learners. Also the learners are suitable to fantasize the entire content and attain mastery over the motifs. E-content comprises of all feathers of formats of information that can be placed on a digital platform like textbook, audio, videotape, plates, vitality etc. These formats give a wide range of sensitive stimulants. In addition to Mathematics, E -content modules were also developed for other subjects like Science, English, History, Psychology etc. (Sathya, 2016) conducted a study in which she developed an E-content module on a lyric. The study aimed to show that E-content module as one of the finest ways through which the learners could learn at any time, at anywhere and at any pace.

E-content learning is a user-friendly and flexible approach for learners, allowing them to study outside the classroom at their own pace, anytime and anywhere. It promotes self-directed, independent learning while facilitating teachers' roles. Although e-content can supplement the teacher's presence, it does not replace the role of an educator. Joan (2013) conducted a study titled "Effect of e-content learning package in Mathematics education for prospective teachers," which aimed to measure its effectiveness. The findings indicated that the experimental group outperformed the control group, confirming the positive impact of e-content learning packages in Mathematics education. Similarly, Karthick, M. (2007) developed and validated an e-content package on the 'Pearl Harbor' incident for graduate-level History students. The results showed that e-content was effective in teaching History at the tertiary level. Raval&Gohel (2014) also highlighted that e-content, in the form of Short

Learning Objects (SLOs), enhances student performance compared to traditional teaching methods. E-content offers the advantage of unrestricted access to learning materials, which improves learners' knowledge and enhances the quality of education (Duraisamy & Surendiran, 2011).

The ultimate goal of e-content development is to create an information-rich society where individuals, are empowered to share and utilize knowledge for their socio-economic and cultural development (Eremias, 2013).Reflecting on the famous saying, "I hear and I forget, I see and I remember, I do and I understand," the integration of e-content into education is essential. It provides virtual realities that make learning more direct, meaningful, and engaging, helping students retain knowledge for longer. E-content packages enhance students' imaginative abilities, rational thinking, research skills, and conceptual understanding more effectively than conventional methods. They allow for the repetition of complex concepts until a comprehensive understanding is achieved.

SAMPLE

The sample for this study consisted of secondary school students. A total of 80 students were randomly selected from various schools in Ludhiana District. These students were divided into two groups: 40 students were assigned to the control group and 40 students to the experimental group. Random selection ensured that the sample was representative of the population, and students from different schools were included to enhance the generalizability of the findings.

RESEARCH METHODOLOGY

The present study employed an experimental design, specifically adopting the pre-test and post-test control group design, which is often referred to as the classic controlled experimental design. The design involved two groups: a control group and an experimental (or treatment) group. Participants were randomly assigned to either group to minimize selection bias and ensure the validity of the results.

Initially, a pre-test (T1) was administered to both the control and experimental groups to assess their baseline achievement levels. Following the pre-test, the control group was taught using the traditional instructional method, while the experimental group received instruction through an e-content learning package. After the intervention, a post-test (T2) was conducted for both groups to measure the impact of the respective teaching methods.

The difference between the pre-test and post-test mean scores for each group was calculated, and statistical analysis was performed to determine whether the e-content learning package produced a significantly greater effect on students' academic achievement compared to the traditional method used in the control group.

Table 1: Paradigm For The Design

RANDOMLY ASSIGNED	**INDEPENDENT VARIABLE**	**DEPENDENT VARIABLE**
Experimental Group	Teaching By E-Content Learning Package	Academic Achievement
Control Group	Teaching By Standard Methods	Academic Achievement

OBJECTIVES

The aim of the research work was to assess the effect of e-content integration on achievement in mathematics among secondary school students. The following objectives were to be accomplished:

- To develop an e-content on concepts of mathematics.
- To develop an achievement test.
- To compare the levels of performance in pre-test and post-test.
- To compare the levels of performance of secondary school students with respect to gender.
- To compare the levels of performance of secondary school students with respect to locality of home (rural/urban).
- To compare the levels of performance of secondary school students with respect to type of school (government/private).

HYPOTHESES

On the basis of the objectives of the present study the investigator framed the following hypotheses:

- There is no significant difference in achievement mean scores between the experimental and control groups at the pre-test.
- There is no significant difference in achievement mean scores between the control group and experimental group at the post-test.
- There is no significant difference in achievement mean scores between pre-test and post-test of control group.
- There is no significant difference in achievement mean scores between pre-test and post-test of experimental group.
- There is no significant difference in achievement mean scores with respect to gender.
- There is no significant difference in achievement mean scores with respect to locality of home (rural/urban).
- There is no significant difference in achievement mean scores with respect to type of school (government/private).

ANALYSIS AND INTERPRETATION

The statistical techniques used for analyzing the data were: Descriptive Analysis (Mean, Percentage and Standard Deviation) and Inferential Analysis (t-test). The Inferential statistical technique was employed for the analysis of data to arrive at conclusions. The data were analyzed with a level of significance established at 0.05 level.

Table 2 : Hypotheses Testing Using t-Test

Groups Compared	N	Mean	Standard Deviation	Standard Error Mean	t	Significance
1.Pre - Test						
Control Group	40	16.52	2.30	0.33	0.5726	Not Significant for

Experimental Group	40	16.78	2.24	0.32		the df of 78 at 0.05 level (1.985)
2.Post - Test						
Control Group	40	21.8	2.5	0.35	9.0368	Significant for the df of 78 at 0.05 level (1.985)
Experimental Group	40	25.7	1.75	0.25		
3.Pre and Post Test Of Control Group						
Pre - Test	40	16.52	2.30	0.33	10.9905	Significant for the df of 78 at 0.05 level (1.985)
Post - Test	40	21.8	2.5	0.35		
4.Pre and Post Test Of Experimental Group						
Pre - Test	40	16.78	2.24	0.32	22.1892	Significant for the df of 78 at 0.05 level (1.985)
Post - Test	40	25.7	1.75	0.25		
5.Achievement Mean Scores With Respect To Gender						
Experimental Group	**N**	**Mean**	**Standard Deviation**	**t**	**df**	**Significance**
Boys	20	25.64	1.976	0.6036	38	
Girls	20	25.96	1.767			Not Significant for the df of 38 at 0.05 level (2.009)
6.Achievement Mean Scores With Respect To Locality Of Home						
Rural	15	25.73	1.91	0.3135	38	Not Significant for the df of 38 at 0.05 level (2.009)
Urban	25	25.9	1.83			
7.Achievement Mean Scores With Respect To Type Of School						
Government	17	25.89	1.81	0.2525	38	Not Significant for the df of 38 at 0.05 level (2.009)
Private	23	25.75	1.92			

DISCUSSION

Hypothesis wise discussion have been undertaken below (data in accordance with table 2).

Hypothesis 1: No significant difference in achievement mean scores between the experimental and control groups at the pre-test.

In examining the pre-test achievement scores between the control and experimental groups, the mean and standard deviation for the control group were 16.52 and 2.30, respectively, while the experimental group had a mean of 16.78 and a standard deviation of 2.24. The calculated t-value of 0.5726 is less than the critical t-value of 1.98 at a 0.05 significance level for 78 degrees of freedom. Therefore, the null hypothesis is accepted, indicating that there is no significant difference in the pre-test scores between the two groups. This suggests that the control and experimental groups were homogeneous and had similar academic performance before the intervention, which supports the validity of the study's design.

Hypothesis 2: No significant difference in achievement mean scores between the control group and experimental group at the post-test.

The post-test achievement scores of the control and experimental groups were analyzed, and a significant difference was found. The control group's mean score was 21.8 with a standard deviation of 2.5, while the experimental group had a mean score of 25.7 and a standard deviation of 1.75. The calculated t-value of 9.0368 exceeds the critical value of 1.98, leading to the rejection of the null hypothesis. This implies that students in the experimental group, who were taught using e-content, performed significantly better than those in the control group who received traditional instruction. This result highlights the effectiveness of the e-content teaching method in improving students' achievement.

Hypothesis 3: No significant difference in achievement mean scores between pre-test and post-test of the control group.

For the control group, the comparison of achievement scores between the pre-test and post-test reveals a mean increase from 16.52 to 21.8, with corresponding standard deviations of 2.30 and 2.5, respectively. The calculated t-value of 10.9905 exceeds the critical t-value of 1.98 at the 0.05 significance level, leading to the rejection of the null hypothesis. This suggests that the control group demonstrated significant improvement in their post-test scores, despite being taught using the conventional method. However, the increase in performance was not as substantial as that seen in the experimental group.

Hypothesis 4: No significant difference in achievement mean scores between pre-test and post-test of the experimental group.

In the experimental group, the comparison of pre-test and post-test achievement scores shows a significant improvement. The mean increased from 16.78 to 25.7, with standard deviations of 2.24 and 1.75, respectively. The calculated t-value of 22.1892 far exceeds the critical value of 1.98, leading to the rejection of the null hypothesis. This result demonstrates that the students in the experimental group experienced a significant improvement in their achievement scores after being taught through e-content. The superior performance of the experimental group compared to the control group suggests that e-content is more effective in enhancing students' learning outcomes.

Hypothesis 5: No significant difference in achievement mean scores with respect to gender.

When comparing achievement scores based on gender, the analysis shows that the mean and standard deviation for boys were 25.64 and 1.976, respectively, while girls had a mean of 25.96 and a standard deviation of 1.767. The calculated t-value of 0.6036 is less than the critical t-value of 2.009, resulting in the acceptance of the null hypothesis. This indicates that

there is no significant difference in achievement scores between boys and girls, suggesting that gender does not play a role in students' academic performance when e-content is used as the teaching method. The results imply that both male and female students benefited equally from the e-content.

Hypothesis 6: No significant difference in achievement mean scores with respect to locality of home (rural/urban).

The comparison of achievement scores based on the locality of home (rural vs. urban) shows that the mean for rural students was 25.73 with a standard deviation of 1.91, while the mean for urban students was 25.9 with a standard deviation of 1.83. The calculated t-value of 0.3135 is less than the critical t-value of 2.009, leading to the acceptance of the null hypothesis. This suggests that there is no significant difference in achievement scores between rural and urban students, indicating that e-content is equally effective for students regardless of their geographical location. The data suggests that e-content teaching methods can bridge the gap between students from different localities.

Hypothesis 7: No significant difference in achievement mean scores with respect to type of school (government/private).

The comparison of achievement scores between students from government and private schools revealed no significant difference. The mean for private school students was 25.75 with a standard deviation of 1.92, while government school students had a mean of 25.89 and a standard deviation of 1.81. The calculated t-value of 0.2525 is less than the critical value of 2.009, leading to the acceptance of the null hypothesis. This indicates that the type of school (government or private) does not significantly affect students' achievement when using e-content. Both groups of students, regardless of the school type, benefited similarly from the e-content approach.

EDUCATIONAL IMPLICATIONS

The findings of this study reveal several significant educational implications. First, the e-content learning package demonstrated superior effectiveness compared to traditional teaching methods in promoting both lower and higher-order learning objectives, including knowledge, understanding, and application. This suggests that e-content learning can be implemented in secondary schools to enhance students' academic achievement in mathematics, as it provides a comprehensive approach to mastering various learning goals.

Furthermore, the success of e-content in improving mathematics learning outcomes highlights the need to explore new and innovative techniques to aid students in conceptualizing complex concepts. Since e-content was found to be effective in the selected mathematics topics, educators should consider developing and distributing e-content materials across a broader range of subjects to improve students' learning experiences.

Given the significant role that the e-content learning package played in enhancing the academic achievement of secondary school students, it is imperative that teacher training institutions incorporate training on e-content development and implementation into their programs. By equipping teacher trainees with the skills to use and create e-learning strategies, future educators can better serve their students and improve overall academic outcomes.

Additionally, both students and teachers should be encouraged to develop their own e-learning modules. This initiative will foster creativity, ownership, and a deeper understanding of content creation, benefiting not only individual learners but also their peers and the broader learning community.

On an experimental basis, schools could adopt e-content learning packages across all subjects to elevate student achievement. To ensure successful implementation, schools should provide teachers with the necessary resources, in-service training, and motivation to develop and apply e-content effectively. This will lead to a more engaging and meaningful learning experience for students.

E-content learning packages have also proven to be highly adaptable and inclusive, making them suitable for use in diverse classroom settings. They offer equal benefits to all students, regardless of their gender, learning style, or ability level. This inclusively extends to students with special needs, those from marginalized backgrounds, and those in rural or urban areas. The study's findings demonstrate that e-content learning can provide meaningful support for all students, making it a valuable tool for equitable education.

CONCLUSION

Based on the data analysis and interpretation, the study concludes that e-content learning is significantly more effective in enhancing the academic achievement of secondary school students in mathematics compared to traditional teaching methods. Moreover, the study shows that e-content benefits all students, regardless of gender, home locality (rural/urban), or type of school (government/private), making it a versatile and powerful tool for improving education across diverse student populations.

REFERENCES

1. Ali, W. (2018). Transforming higher education landscape with hybrid/blended approach as an evolving paradigm. Journal of Advances in Social Science and Humanities. 4(7), 143–169.
2. Alrowwad, A. &Katoua, T. (2016). A review of literature on E-learning systems in higher education. International Journal of Business Management and Economic Research (IJBMER). 7(5), 754-762.
3. Anbazhagan, A. &Govindarajan, S. (2019). E-content development: future and provocation. Journal of Applied science and computations. 6(1), 2379-2386.
4. Castro, M.D. &Tumibay, G.M. (2019) A literature review: efficacy of online learning courses for higher education institution using meta analysis. EducInf Technol. 26(1), 1367-1385. https://doi.org/10.1007/s10639-019-10027-z
5. Clements, I. &Xu, Z. (2005). ELCAT: an e-learning content adaptation toolkit. Campus-Wide Information Systems. 22(2), 108-122. https://doi.org/10.1108/10650740510587119
6. Clover, I. (2017, February 17). Advantages and disadvantages of E-learning. Elearningindustry. https://elearningindustry.com/advantages-and-disadvantages-of-elearning/
7. Dhawan, S. (2020). Online learning: A panacea in the time of COVID-19 crises. Journal of Educational Technology. 49(1), 5–22. https://doi.org/10.1177/0047239520934018
8. Kannan, B. &Muthumanickam, A. (2010). Development and Validation of E-Content Package on p-Block Elements for XI Standard Students. Unpublished PhD Thesis. [Madurai Kamaraj University].
9. Mangal, S.K. (2015). Educational Technology and ICT. Tandon Publications.

10. Shaikh, I. (2013). Introduction to Educational Technology and ICT. McGraw Hill Education (India) Private Limited.
11. Tamm, S. (2019, December 21). What is E-learning? Estudent.org. https://e-student.org/whatise-learning/
12. Tripathi, H. (2019). Educational Technology and ICT in Education. Red'Shine Publications.
13. What Is Technology? – Definition & Types. (n.d). Study. https://study.com/academy/lesson/whatis-technology-definition-types.html
14. What is the meaning of Technology? Concept, Definition of Technology. (n.d). wikididactic.
15. https://edukalife.blogspot.com/2013/01/concepts-and-definition-of-technology.html?m=1