The Quarterly Journal of
New Approaches in Humanities (NAHQ)

Vol. 1, No. 1, May 2023, 42-53
E-ISSN: 2981-1031, **P-ISSN:** 2981-1023

Available online at: https://www.nahq.ir/

Research Article

The Impact of Multimedia Software on the Learning of Mathematics among High School Students in District 2, Sari

Samaneh Shirzad [1], Zeinab Qadiri [2], Zeinab Entezari [3]

1. *PhD in Higher Education Management, Sr.C., Islamic Azad University, Sari, Iran.* ***Email:*** *Samaneh.shirzad65@gmail.com*
2. *Master of Art, Educationa department of Mazandaran, Distirict 2, Sari, Iran.* ***Email:*** *Z.Qadiri@gmail.com*
3. *Master of Art, Educationa department of Mazandaran, Distirict 2, Sari, Iran.* ***Email:*** *Z.Entezari@gmail.com*

Corresponding Author*: Samaneh.shirzad65@gmail.com*

ARTICLE INFO **ABSTRACT**

Keywords:

Multimedia Software,
Mathematics,
High School.
Sari.

Received:
11 February 2023
Received in revised form:
14 March 2023
Accepted:
14 April 2023
Published:
May 2023
Pp.42-53

Background and Objectives: Multimedia software with its various features, including videos, interactive images, simulations and other graphic tools, are widely used in the field of learning and education. Math lesson is also one of the fields where the use of these softwares can help to improve the learning process and understanding of its concepts. Since mathematics lesson is often known as one of the complex and difficult topics, using multimedia tools can make the learning process more attractive and efficient. The study aimed at examnining the impact of multimedia software on the learning of mathematics among high school students in district 2, Sari.

Methodology: This research was done with a descriptive-survey method. Its statistical population consisted 152 people (62 women and 90 men) who are mathematics teachers in Sari schools in 2019. The sample size was 102 people (44 women and 58 men) using the Karjesi and Morgan table, and this number of samples was determined by stratified random sampling. The data collection tool included a researcher-made questionnaire consisting of 30 closed questions for the variables of increasing the speed of learning, meaningful learning, accuracy of learning, interest in solving problems and interest in explaining students' mathematics lesson problems. The validity of the tool has been confirmed by supervisors, consultants, specialists and experts in the field of educational planning and psychology, and the reliability of the tool has been estimated at 0.92 using Cronbach's alpha method. In order to statistically analyze criteria such as frequency by number, percentage, graph, Kolmogorov-Sminov test was used to determine the normality of the variables and the t-test was used to reject or confirm the hypotheses.

Results: The results of the t-test showed a positive and significant relationship between the independent variable of multimedia software and the dependent variable of students' mathematics learning.

Conclusion: Multimedia software usually provide facilities for active interaction of students. These features include interactive exercises and tests, educational games, and other interactive tools that help students understand math concepts in a more active and practical way.

Citation: Shirzad, S., Qadiri, Z., & Entezari, Z. (2023). The Impact of Multimedia Software on the Learning of Mathematics among High School Students in District 2, Sari. *The New Approaches in Humanities*, 1(1), 42-53.

http:// 10.22034/NAHQ.2023.194734

Introduction

Nowadays, education is expected to facilitate active and collaborative learning among students. To realize this approach, a shift from traditional methods is inevitable. Old teaching techniques are certainly inadequate in addressing the changing educational needs of the modern era. Therefore, one of the key efforts of educational organizations should focus on information and communication technology (ICT) and its integration into the curriculum (Niaz Azari, 2004). ICT has a significant impact on learning, including changing the roles of learners and teachers, increasing peer collaboration among students, expanding the use of resources beyond textbooks, and enhancing design and presentation skills (Afzal Nia, 2008). Overall, the role of students in an ICT-based learning environment transforms, making them active participants in knowledge production (Armitage, 2003; Azizi, 2006). ICT plays a crucial role in motivating students, deepening and broadening learning, making knowledge retention more durable, reducing student fatigue and boredom, and developing cognitive skills to respond to questions.

One of today's major challenges in education is students' lack of interest in learning, particularly in subjects like mathematics. Despite the importance of all academic stages, high school serves as the foundation for shaping students' academic identity and their attitudes—positive or negative—toward subjects, especially math (Davaei, 2010; Dohen, 2009). Therefore, innovative methods must be adopted to foster interest in learning, particularly in this subject. One such modern approach is the use of ICT in education. Applying ICT in math classes increases student engagement because lessons are taught with visually appealing graphics, and students take an active role in learning, deepening their understanding and interest (Floridi, 2009; Goos et al., 2001).

In recent decades, traditional learning approaches have undergone fundamental changes with the emergence of multimedia technologies, hypermedia, and telecommunication. The success of educational goals now heavily depends on the effective use of technology due to its specialized nature. Teaching methods also

need revision to maximize student outcomes through modern research findings (Gharibi, 2009). The introduction of multimedia and e-learning in education has revolutionized teaching, academic performance, and student participation. Modern technology offers several advantages: integrating ICT promotes self-directed learning, multimedia tools allow learners to take initiative rather than passively reacting, and students can select appropriate materials for meaningful and goal-oriented learning (Hadi nejad, 2010; Hamuy, E., & Galaz, 2010).

It is no secret that many first-year high school students struggle with math, often expressing: "We can't learn this subject; it's too hard. The teacher tries hard, but our minds just can't grasp it." Studies show that students lack sufficient focus on lessons. Instead of identifying their weaknesses, they disengage by making such statements (Mehrmohammadi, 2010). Teachers using traditional methods exert maximum effort to convey basic concepts, but unfortunately, their attempts often hit a mental barrier in students. We know that failure to learn math reduces logical analysis skills, deep comprehension of other subjects, and the ability to abstract concepts from real-life situations. Math learning is essential for military, economic, and technical sciences. Thus, we seek ways to first spark interest—the driving force behind learning—since engagement depends not only on intrinsic motivation but also on how content is delivered.

The rapid expansion of knowledge, the quick obsolescence of educational content, and unpredictable societal changes necessitate continuous learning over fragmented education. Lifelong learning requires new methods that enable individuals to independently pursue knowledge throughout their lives (Haji Ketabi, 2002). Today, the advancement of science and technology demands innovative teaching methods that move students away from rote memorization toward active learning. Active teaching methods stimulate students' mental engagement in general areas (Tuttle, 2008).

New technologies provide opportunities tailored to students' talents and interests, significantly improving school education systems. Additionally, ICT in schools increases students' motivation and engagement, leading to faster, deeper,

and more meaningful learning (Hannafin, 2000). Hojafroosh and Orangi (2004) studied "The Impact of ICT in Tehran High Schools" and found that ICT deepens learning in math, physics, chemistry, biology, and English. Sheykhzadeh & Mehrmohammadi (2004) concluded that math software based on constructivism significantly improves students' higher-order cognitive skills (analysis, synthesis, evaluation) and enhances problem-solving motivation. Haji Ketabi (2002) found that ICT boosts learning motivation and makes the process easier and more creative, balancing teacher-centered and student-centered approaches. Ghasemi (2009) reported that students taught with ICT perform better and exhibit higher self-esteem than those taught traditionally. Harrison et al. (2002) concluded that ICT makes learning deeper, more effective, and creative. Samari (2009) highlighted ICT's role in flexible learning programs, urging governments to invest in teacher training and ICT integration, especially in developing countries.

Given the importance of fostering student interest in learning and recent efforts by Iran's Ministry of Education—under the Fundamental Reform Document of Education—to promote e-content development and educational software in classrooms, this research examines: "The Impact of Multimedia Software on Math Learning and Student Engagement in First-Year High School Students in Sari." The findings can aid school administrators, teachers, and policymakers, while also serving as a resource for future researchers.

Methodology

The present study is descriptive in method and also survey-based. The statistical population under investigation in this research includes all male and female high school teachers in Sari County during the 2020-2021 academic year. According to the report from the Statistics and Budget Department of Sari County's Education Administration, their number totals 152 individuals, categorized by gender as shown in the following table.

Based on the table derived from Krejcie and Morgan, the sufficient sample size for a population of 152 people with a 95% confidence level and 5% sampling error is 102 participants (sample). Considering Table 1, from the total population of 102 male and female teachers, 44 female teachers and 58 male teachers were selected as the sample. Since the sample of this study was drawn from among male and female high school teachers in Sari County, the sampling method used was stratified random sampling proportional to size. In this research, for data collection, a researcher-made questionnaire consisting of 30 closed-ended questions was used, employing a Likert scale (very high, high, somewhat, low, and very low).

Table 1

Questionnaire Structure

No.	Variable Measured	Number of Items	Questionnaire Items	Scale Type
1	Learning Speed	6	1-6	Ordinal (Ranked)
2	Meaningful Learning	6	7-12	Ordinal (Ranked)
3	Learning Accuracy	6	13-18	Ordinal (Ranked)
4	Interest in Problem-Solving	6	19-24	Ordinal (Ranked)
5	Interest in Explaining Problems	6	25-30	Ordinal (Ranked)

The reliability of the instrument was determined using Cronbach's alpha. Initially, 20 questionnaires were randomly distributed and collected among the test subjects. Then, using SPSS 18, the Cronbach's alpha for the questionnaire was calculated as $\alpha = 0.92$, indicating that the questionnaire has acceptable validity based on the obtained alpha value.

To assess the scientific validity of the questionnaire in the present study, face validity was employed. The questionnaire was validated by the respected advisors, consultants, and experts in the fields of sociology and psychology, who confirmed its validity. Given that the measurement scale in

this study was of an interval and ranked type (converted to quasi-interval), descriptive statistics—such as mean, median, mode, standard deviation, as well as bar charts and tables—were first used for sample classification and summarization. Subsequently, the research hypotheses were analyzed. Since the conditions for parametric testing (normal distribution, verified through random sampling and the Kolmogorov-Smirnov test) were met, a t-test was used for two-variable hypotheses.

Results

Out of a total of 102 male and female high school teachers in Sari County, 44 (43.1%) were female and 58 (56.9%) were male. Regarding marital status, 22 (21.6%) were single and 80 (78.4%) were married. In terms of educational qualifications, 65 participants (63.7%) held a bachelor's degree, 29 (28.4%) had a master's degree, and 8 (7.9%) possessed a doctoral degree. Before conducting any statistical tests, it was necessary to determine whether the data followed a normal distribution. The Kolmogorov-Smirnov test was used to assess the normality of variables. In this test:

- **Null hypothesis (H_0):** The data are normally distributed.
- **Alternative hypothesis (H_1):** The data are not normally distributed.

The null hypothesis is rejected if the *sig* value is less than 0.05.

Table 2

Normality Test of Variables

Variable	Learning Speed	Meaningful Learning	Learning Accuracy	Interest in Problem-Solving	Interest in Explaining Problems	Math Learning
Sample Size (n)	102	102	102	102	102	102
Normal Parameters						
Mean	3.6526	3.3785	3.5358	3.3240	3.3411	3.4464
Std. Deviation	0.58864	0.56569	0.57143	0.47519	0.54484	0.33667
Extreme Deviations						
Absolute	0.097	0.102	0.123	0.112	0.122	0.113
Positive	0.068	0.073	0.077	0.098	0.088	0.063
Negative	-0.097	-0.102	-0.123	-0.112	-0.122	-0.113
Kolmogorov-Smirnov	1.005	1.052	1.275	1.156	1.263	1.166
Sig (p-value)	0.264	0.218	0.077	0.138	0.082	0.132

As shown in Table 2, the *sig* values for all variables exceed the significance threshold of 0.05. Therefore, H_1 is rejected, and H_0 (normality of data) is accepted. This confirms that the data are normally distributed, allowing for the use of parametric statistical tests.

Main Hypothesis:

Multimedia software has a significant effect on mathematics learning among first-year high school students.

Null Hypothesis (H_0):

Multimedia software does not have a significant effect on mathematics learning among first-year high school students *(H_0: $\mu \leq 3$)*.

Alternative Hypothesis (H_1):

Multimedia software has a significant effect on mathematics learning among first-year high school students *(H_1: $\mu > 3$)*.

Table 3
Descriptive Statistics for Mathematics Learning

Variable	N	Mean	Std. Deviation	Std. Error Mean
Mathematics Learning	102	3.4464	0.33667	0.03255

Table 3 presents the mean, standard deviation, and standard error of the mean for students' mathematics learning.

Table 4
T-Test Results for Mathematics Learning

Variable	t-value	df	Sig (p-value)	Mean Difference	95% Confidence Interval	
					Lower	Upper
Mathematics Learning	13.716	101	0.000	0.44642	0.3819	0.5109

Since the *Sig (p-value)* (0.000) is less than the significance level of 0.05, we reject the null hypothesis (H_0) and accept the alternative hypothesis (H_1) with 95% confidence. Additionally, the high t-value (13.716) further supports the conclusion that multimedia software has a statistically significant positive effect on students' mathematics learning.

Discussion and Conclusion

This study aimed to investigate the impact of multimedia software on mathematics learning among first-year high school students in Sari County. In today's rapidly advancing technological era, there is an increasing need for innovative teaching methods that can shift students from rote memorization to meaningful learning. Active teaching methods have proven particularly beneficial for both students and teachers. Recognizing the importance of fostering student engagement in learning, the Ministry of Education has made efforts to promote

electronic content development by teachers and students, as well as the use of educational software in classrooms.

The findings demonstrate that multimedia software significantly enhances the speed of mathematics learning. This conclusion is supported by a t-statistic of 11.469 and a significance level of 0.000, leading to the confirmation of the study's first hypothesis. We can therefore state with 95% confidence that multimedia software effectively improves the speed of mathematics learning. These results align with previous research by Zare Zadeh (2007), Gharibi (2009), Guss (2001), and Clements (2000).

Based on the main hypothesis regarding the positive impact of multimedia software on mathematics learning speed, we recommend that teachers:

- Guide students in selecting optimal methods for reviewing previous material,
- Create information maps using linear, spider-web, or hierarchical formats,
- Facilitate the transfer of information to long-term memory through various techniques,
- Utilize software as an intermediary program, and
- Provide prompt feedback on lesson content.

As e-learning continues to expand as a key achievement of the information age, despite numerous challenges, we suggest that educational institutions, particularly schools, make more concerted efforts to implement this technology. Specific recommendations include:

- Conducting in-service training workshops, educational gatherings, and specialized conferences for teachers
- Implementing public IT education programs through national broadcasting networks
- Exercising careful selection of electronic educational content in schools
- Employing personnel with management and supervision skills in e-learning
- Gradually replacing textbooks and dictionaries with educational CDs in the curriculum

http:// 10.22034/NAHQ.2023.194734

The study faced certain limitations, including:

- Inability to randomly select teachers (recommended for future research)
- Difficulty controlling for confounding variables such as:
- IQ levels
- Degree of interest
- Motivation factors
- Fatigue
- External environmental influences

These limitations should be addressed in future research to further validate the findings.

Acknowledgements

The authors extend their sincere thanks to all those who contributed to the development of this article and the accompanying research.

Conflict of Interest

The authors declare no financial, scientific, or personal conflicts of interest related to this work.

Ethical Considerations

This study was conducted in full compliance with established ethical standards for scientific research. Informed consent was obtained from all participants. All data were treated with strict confidentiality, used exclusively for the stated scientific purposes of this research, and presented in a manner that fully protects participant anonymity.

Referemces:

Afzal Nia, M. (2008). Design and introduction to learning resource centers. Tehran: SAMT.

Armitage, S., & Leary, R. (2003). E-learning series: A guide for learning technologists. Heslington Generic Center.

Azizi, F. (2006). Understanding information literacy. *Electronic Nama Journal*, 3(4), 1-4.

Clements, D. H. (2000). From exercises and tasks to problems and projects: Unique contributions of computers to innovative mathematics education. *The Journal of Mathematical Behavior*, 19(1), 9-47. https://doi.org/10.1016/s0732-3123(00)00036-5

Davaei, S. (2012). Investigating and developing required ICT skills and competencies for teachers (Master's thesis). Shahid Rajaee Teacher Training University.

Dohen, N. (2009). Web 2.0: Inherent tensions and evident challenges for education. *Computer Supported Collaborative Learning*, 4, 343-363. https://doi.org/10.1007/s11412-009-9066-8

Floridi, L. (2009). The information society and its philosophy: Introduction to the special issue on the philosophy of information, its nature and future development. *The Information Society*, 25, 153-158. https://doi.org/10.1080/01972240902848583

Gharibi, F. (2009). The effect of educational multimedia on learning and retention of math concepts in 4th grade educable mentally retarded students in Arak (Master's thesis). Allameh Tabataba'i University.

Goos, M., Galbraith, P., Renshaw, P., & Geiger, V. (2000). Reshaping teacher and student roles in technology-enriched classrooms. *Mathematics Education Research Journal*, 12(3), 303–320. https://doi.org/10.1007/bf03217091

Hadi Nejad, S. (2010). Investigating the impact of educational technology on 3rd grade elementary students' learning (Unpublished master's thesis). Islamic Azad University, Sari Branch.

Haji Ketabi, A. (2002). Information technology. Proceedings of the National Conference on Educational Reform Engineering. Tehran: Educational Research Institute.

Hamuy, E., & Galaz, M. (2010). Information versus communication in course management system participation. *Computers & Education*, 54, 169-177. https://doi.org/10.1016/j.compedu.2009.08.001

Harrison, C., Cavendish, S., Comber, C., Fisher, T., Harrison, A., Haw, K., et al. (2002). ImpaCT2: The impact of information and communication technologies on pupil learning and attainment. ICT in Schools Research and Evaluation Series No. 7. Coventry: BECTA. https://doi.org/10.1111/j.1365-2729.2004.00099.x

Hojafroosh, A., & Orangi, A. (2004). Investigating the outcomes of ICT implementation in Tehran high schools. *Educational Innovations Journal*, 3(9), 11-31.

Karimi, F. (2008). A study of teachers' professional competencies in the knowledge age. *Educational Leadership and Management Quarterly*, 2(4).

Mehrmohammadi, M. (2010). Revisiting the teaching-learning process and teacher training (3rd ed.). Burhan School Publications.

Niaz Azari, K. (2004). Human behavior and relations in third millennium educational organizations. Tehran: Farashenakhti Andisheh.

Samari, E. (2009). Comparing the effects of ICT use vs. traditional methods on academic achievement, self-regulated learning, and academic motivation among Payame Noor University students. *Higher Education Letter*, 2(5), 23-30.

Sheykhzadeh,M. and Mehrmohammadi,M. (2004). Designing an educational software of mathematics for elementary school students from the point of view of constructivism and its effectiveness. *Journal of Educational Innovations*, *3*(3), 32-48.

Zare Zadeh, K. (2007). Comparing self-efficacy and creativity between internet-user and non-user students (Master's thesis). Tarbiat Moallem University.