Butwal Campus Journal, Vol. 8, No. 1: 187-192, August 2025
Research Management Cell, Butwal Multiple Campus, Tribhuvan University, Nepal
DOI: https://doi.org/10.3126/bcj.v8i1.85566

Effectiveness of Geogebra in Learning Matrices

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Abstract

Learning mathematics becomes easier through the use of geogebra. In the learning process student need technology This study was conducted using a quasi- experimental design. Through the quasi experimental. Geogebra was found to be helpful for learning matrix. The B.Ed science students from Butwal Multiple Campus were selected based on convenience sampling. Students were divided in to two groups, an experimental group and a control group. The significance between the two groups was determined on the basic of their mean scores. The experimental group showed a better understanding of the concepts of matrix. A survey instrument, a quantitative approach was used in this study. Students achievement in matrix was measured through pre test and post test. In this study a t test was used and the p value was found to be 0.002. The analysis showed a positive perception towered matrix learning.

Keyword Collaborative, Effectiveness,Technology, Learning, Geogebra

Background of the study

Students learn many things through a teaching and learning process. Technology is a great opportunity for students. Technology not only helps keep students engaged but also improves their ability to explore new things (Roberts, 2012). In Mathematics educations geometry can create images and construct shapes. Using technological tools such as calculators, whiteboards, geogebra, ipad and sketch pads, students can be taught effectively. Teachers must first become familiar with the software (Aliyu & Kumar, 2021). They should encourage students through the subject matter they are teaching. Geogebra can be used for learning through a collaborative approach. Collaborative learning theory helps in building knowledge. Collaborative learning contributes to students practical skill and learning outcomes (Radovic & Veljkovic, 2020). Society can be advanced in every field through the use of science and technology. Once society becomes educated , it becomes easier to use technology in the teaching and learning process. Even though using technology is challenging for students, they make efforts to learn through the teachers support (Bebbll & Dwyer, 2010).Technology is necessary to enhance Students achievement (Eyyam & Yaratan, 2014). The ability of visualization is the process and product of forming images, diagrams and pictures (Zimmermann, & Cunningham,, 1991). To measure the effectiveness in the teaching and learning process, dynamic software such as Geometer's, sketchpad was used (Leong, 2013). Geogebra create an idea in the learning process. Student prefer to use geogebra to easily transfer their thoughts. The geogebra software serves as an aid for learning calculus and

Geometry (Hohenwarter & Lavicza, 2008). Technology helps in every field of mathematics. In the context of Nepal the concept of geogebra has not been included in high school curriculum. However teachers provide students with skills as part of extracurricular activities. Understanding the concepts of matrix learning is not very easy, but once students improve their problem solving skills they begin understand the concepts of row and columns. The concepts of matrix are an important fundamental assumption . Gradually students go on to understand matrix addition, subtraction, multiplication, division. In matrix learning students to constru ct diagram to understand the concepts of row and columns. Matrix learning enhances the skills of students internal resources. (Bhagat & Chang, 2015). Matrix learning has been included in the high school curriculum. Teachers make efforts to help students develop matrix skills through the use of geogebra in mathematics.

Statements of the problems

In teaching and learning geometry students often find it difficult to understand community processes. Teachers address the knowledge gaps that exists among students. In our context while studying geometry students lack cognitive process. For the concepts of matrix the teacher delivers the knowledge and the use of geogebra helps to fill the gaps in students cognitive knowledge. Students take knowledge as a challenges and work hard to improve their skills (White & Mitchelmore, 2002). They try to express their perceptions about the properties and type of matrices. Geogebra serves as a tool for understanding. It play a significant role in teaching students and achieving effective learning outcomes.

Objective of the study

To examine the students understanding of matrices.

Research Questions

(a) What is the effectiveness on students understanding of matrix as compared to the traditional approach.

(b) What are students perceptions towards the use of geogebra in learning matrix.

Limitation of the Study

Since students often find it difficult to solve mathematical problems. Geogebra tools were used with the objective of helping them solve problems more easily. At Butwal Multiple Campus B.Ed Science forth year Students have ICT as a subject which made it easier to select these students for the use of geogebra compared to others. The content area chosen in mathematics was matrix. For Sampling convenience sampling was used. All the students present in the classroom were divided in to experimental and control groups.

Methods

In the study of methodology research design and sampling have been discussed. In this study a design has been implemented both groups were given a pretest and a post test. Experimental group was taught for two weeks using Geogebra, while the control group was taught using the traditional learning methods.

The total population selected for the study is the B.Ed Science Faculty of Education Butwal Multiple Campus. There are a total of 235 students in B.Ed Science. In the 2081 batch (first year), There are 48 students consisting of 17 male and 31 females. In the 2080 batch (second year) there are 52 students including 25 male 27 females. In the 2079 batch (third year), there are 28 students, on which 10 are males 18 are females. In the 2078 batch(previous third year), out of 65 students, 33 are male, 32 are females. In the 2077 batch (fourth year), there are 42 students including 18 male and 21 females.

Since the geogebra curriculum has been included in the subject "ICT in Science Education 444" in the B.Ed science forth year, this class was chosen based on convenience sampling to determine the impact of geogebra on students achievement. The researcher selected the fourth year student because he himself teachers that class, and the students are required to study the content related to geogebra. In mathematics learning open ended questionnaires related to matrix addition, subtraction, multiplication, and division were developed. The data were analyzed based on the likert scale (strongly disagree = 1,disagree = 2, neutral = 3, agree = 4, strongly agree = 5). For the second research questions close ended questionnaires were prepared to measure students perceptions.

Procedure

In this study is a quasi experimental design. Two group have been Taken, an experimental group and a contral group. Both group were asked the same pre test and post test questionnaire. Frist the achievement of both groups was measured through the pre test . Then after conducting two weeks of using Geogebra a post test based on the same questions was administered to the experimental group. For the control group matrix learning was taught using the traditional method without Geogebra. The experimental group consisted of student selected from one class who were female. The control group consisted of students selected form another class, who were male.

Table 1 Table of Sampling

Number of students	Group of Students	Breakdown of number	Percentage
42	Experimental	24	54.14
	Control	18	42.85
Total		42	

In this research an achievement test was measured. A t test was conducted. For the t test SPSS 23.0 software was used. The t test was applied to significance difference. The significance of the difference between the two groups the experimental and control groups was examined. Pre test and post test were conducted for the students in both the control and experimental groups. A pre test was conducted before the intervention and a post test was conducted after the study. The mean scores of the pre test and post test were compared. Descriptive studies were used for the survey questionnaire.

Results

Table 2. Pre Test of both groups, using Geogebra of Matrix

Group	Mean	Standard Deviation	t value	Significance(2 tailed)
Control (n=18)	3.8	1.3	- 0.62	0.08
Experimental (n=24)	3.2	1.1		

From table 2 showed that the mean score of the control group was 3.8 and the mean score of the experimental group was 3.2. The difference between the two groups mean score was 0.6. However the t value was -0.62. The p value (0.08 > 0.05) indicates that the difference in mean score between the two group is not significant. This clearly showed that the aptitude of students in the control group and the experimental group were equal. It shows that before using Geogebra in the learning process male and female students had equal knowledge of matter.

Table 3 Post Test of both groups, using Geogebra of Matrix

Group	Mean	Standard Deviation	t value	Significance(2 tailed)
Control (n=18)	5.98	2.12	1.8	.002
Experimental (n=24)	7.82	1.32		

From table 3 Indicated that the mean score of the control group was 5.98 and the mean score of the experimental group was 7.82. The difference between the two groups mean score was 1.84. However the t value was 1.8. The p value (0.002 < 0.05) indicates that the difference in mean score between the two group is significant. This clearly show that the aptitude of students in the control group and the experimental group were not equal. It shows that after using Geogebra in the learning process male and female students had different knowledge of matter. Therefore it is seen that the use of geogebra in learning matrices has increased the females attitude.

Table 4. Paired Sample t-test of both groups, using Geogebra of Matrix

Group	Mean	Standard Deviation	t value	Significance(2 tailed)
Control (n=18)	2.18	2.01	8.31	0.002
Experimental (n=24)	4.62	1.39	2.12	.001

In the pair sample t test the difference between the pre test and post pest mean score of the control group and experimental group were taken. The mean score of the control group was 2.18, while the mean score of the experimental group was 4.62. In the control group the t value was 8.31 and the p value was .002. In the experimental group the t value was 2.12 and the p value was .001. In both groups the p value was less then

0.05. Therefore in the paired sample t test both the experimental group and control group were found to be significant. Since the experimental group had a higher mean, it showed that the aptitude of the experimental group was better.

Table 5 Students Perception on Geogebra

	yes	no
The use of geogebra made me excited	80%	20%
I used to use geogebra software frequently	90%	10%
I was actively engaged in the learning process.	80%	20%
I benifited from both the teachers and students.	75%	25%
I used to respond to every activity.	78%	22%
I enjoyed using geogebra.	70%	30%

From table 5, it was found that the students received positive feedback. While learning matrices through the use of geogebra students perception were found to be positive. Eighty percent (19 students) reported feeling excited when using geogebra, While twenty percent (5 students) said they did not feel excited. Ninety percent (22 students) of the students use geogebra frequently While twenty percent (2 students) use it less often. The perception of the students in the experimental group in table 5 was interpreted in a similar way.

Discussion

Geogebra software can be used for the teaching and learning process. In mathematics geogebra software helps in learning matrix. This software is very useful for collaborative learning of matrix in the classroom. The study was conducted on the basis of pre test and post test achievement in relation to mathematical concepts. Technology helps in applying the expansion of knowledge in society (Vygotsky, 1978). When knowledge is expanded in society, it contributes to every fields. In this study the teacher played the role of facilitator and students progressed step by stepin learning the concept of matrix. Geogebra enables interaction between teachers and students. When use in the classroom Geogebra allows students to logically explain their understanding of the subject matters. Table 5 showed the students' perception used to measure the second research question. The students perception towards learning matrices was found to be interested.

Conclusion

Geogebra software is an effective tools for learning matrix. Compared to passive students , active students took mathematics learning more positively through the use of geogebra. It greatly helps in the visualization of geometry figures. The use of geogebra in the classroom was found to be very useful for constructivist learning. Geogebra played a major role in understanding broader mathematical concepts. The significance between the control and experimental groups was determined through these tools. The use of geogebra enhances students logical thinking in learning matrices. Among the students in the control and experimental groups, those in the experimental group showed greater interest in matrix learning. Similarity, the use of such tools in teaching mathematics has been found to increase the applications of practical knowledge among students.

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