Use of ICT in Teaching Conic Section

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Abstract

This study entitled "Use of ICT in conic section: An experimental study" is an experimental research. ICT can be applied in conic sections which include parabola, ellipse, hyperbola, circle etc. For graphics and visualisation, geometric modelling, optics and imaging, satellite orbits, signal processing, engineering design, architectural design; ICT is used. The objectives of the study was "to compare the achievement of students taught by using ICT software and conventional teaching method while teaching conic section of grade XII." The research was based on Vigotski's constructivist view of learning. A pre-test and post-test of quasi-experimental research design was used to find the students' achievement after experiment. Conventional sampling were used and two sections of Aadikavi bhanubhakta Secondary School were selected. Two sections were observed as Section 'A' of class XII was used for conventional group and section 'B' was used for experimental group. The school is located in Vyas Municipality ward no.1. There 28 students in section 'A' and 28 students in section 'B'. For data collection, researcher used MAT. The result of Mathematics Achievement Test indicated that there was a significant difference between the average achievement of students taught by using ICT software and without using ICT software on post-test. The finding illustrated that the students in the experimental group performed better when using ICT software like Geogebra and Mathematica than the control group with the conventional method.

Keywords*:* conventional ,ICT, GeoGebra, mathematica, post-test, pre-test, quasi-experimental design

Introduction

Mathematics is compulsory subject from grade 1 to 10 in Nepal. Mathematics is essential for solving all behavioural problems of human life.

Conic section is a chapter, needed to study by intermediate student in class 12. In former days, there were not availability of ICT software like GeoGebra, Mathematica, Matlab etc. to make teaching and learning easier. Students were restricted to study with handmade materials. But, this is the era of technology, so as to how a lot of technological materials (software) are created to make geometrical figures understandable and to help in engineering. The creation of ICT also helps in the good concepts of conic section. Those figures and concepts like parabola, ellipse, hyperbola which is comparatively difficult to understand, is easier to study with the help of ICT.

The futuristic intention of the study is to explore the application of ICT tools in Mathematics teaching. Technology has become the integral part of our daily life, including the teaching and learning procedure. Mathematics is considered as the queen of all sciences. For a long time, Mathematics had been limiting in purely academic domain but in this period, Mathematics has entered in the field of industry, engineering, technology etc. as a result, lovers and supporters of Mathematics are increasing and new concepts and procedures are coming to support teaching and learning process of Mathematics. Among them, ICT is one. ICT not only helps to visualize the concept of different figures and calculations but also makes the learning sustainable. For example, in "parabola" teaching, teacher can show the formation process of parabola on the basis of focus and directrix by the help of GeoGebra software, consequently, students can understand well and their learning will be sustainable.

This article is especially crucial for those teachers who are old and haven't got sufficient knowledge about ICT and for those teachers as well who are unable to make their students understand about the concepts of some extremely vast geometrical problems. Sometimes the teachers of Mathematics doesn't have sufficient knowledge, but it is necessary to read into the concepts that contradicts what the theory of Mathematics says or implies. However, Mathematics is a unique subject, which encourages the acquisition of specialized science, skills and knowledge, which explains the natural phenomena of life in society. It is something that grows in civilization as the quantity of demand of people increase. It is originated from practical problems and men needed to solve it. It has

contributed in the development of civilizations, other disciplines and in the development of culture (Taylor, 2003).

There were not any effective materials for teaching. Actually, there were handmade materials like geoboard, Abacus, 3D objects of cone, cylinder, sphere etc. However, these materials are not sufficient for teaching chapters like Conic section, curve tracing. We need to have technical material (software) like GeoGebra and Wolfram Alpha Mathematica for the visualization of different figures' formation process like of parabola, hyperbola, ellipse etc. In GeoGebra and Wolfram Alpha Mathematics, there is options like Manipulations, Animation so that we can animate the formation process of any figure like parabola and hyperbola, and we can manipulate any figure with different variable values with figure. If such ICT based software are used in teaching conic section all over the world, then only our students will receive core concept regarding conic section. Especially, they can catch the concept of formation of different conics like hyperbola, pair of straight line etc. Moreover, in developing countries like Nepal also, ICT can be used all over the country and can make geometry easier.

Using ICT as a tool, students spend productive time developing strategies for solving complex problems and develop the deep understandings of the various Mathematics topics. Students can use ICT as a tool to perform calculations, draw graphs, and help solve problems. ICT gives rapid and accurate feedbacks to students and this contributes towards positive motivations. ICT not only helps students in understanding any Mathematical concepts but also promotes enjoyment and it provides the opportunities for students to take part in cooperative activities.

Literature Review

Keong, Horani and Denial (2005) prepared an article on "A study on the use of ICT in Mathematics Teaching". The specific research objectives are "Assigning the current level of ICT integration in Mathematics classroom" and "identifying the challenges and barriers faced by teachers in implementing ICT". The finding of the study shed light on the potential of ICT to enhance Mathematics instruction and student engagement. The study discussed the positive impact of ICT tools and resources in promoting active learning, problem solving skills and conceptual un-

derstanding among students. The survey was conducted to the study the hindrances preventing the integration and adoption of ICT in teaching Mathematics. Six major barriers were identified: lack of time schedule, insufficient teacher training opportunities for ICT projects, inadequate technical support and lack of knowledge and difficulties in integrating and using different ICT tools. By their identifications of barriers of implementing ICT in teaching and their deed on ICT, researcher intended to write the article in ICT related topic

Vrasidas and Glass (2007) wrote an article on "Teachers' professional development and ICT: strategies and models". The article "Teachers' professional development and ICT: strategies and models" explores the role of Information and Communication Technology (ICT) in supporting and enhancing the professional development of teachers. It focuses on how digital tools and resources can empower educators with the knowledge and skills needed to improve their teaching practices and, in turn, enhance student learning outcomes.

Mwalongo (2011) prepared an article, entitled "Teachers' perceptions about ICTs for teaching, professional development, administration and personal use". The article investigates teachers' perception and attitude towards ICTs in various aspects of their professional and personal lives. It explores how teachers view ICT as a tool for enhancing teaching practices, supporting professional development, streamlining administrative tasks, and facilitating personal activities. By investigating teachers' perspective of ICT in different contexts, the article aims to contribute a better understanding of how technology is embraced and utilised in the educational settings, and how it can be effectively integrated ti improve teaching and learning experiences.

Finally in conclusion, ICT has revolutionized Mathematics education, providing unprecedented opportunities for engaging, personalised and inclusive learning experiences. When appropriately integrated into the curriculum and supported by well-trained educators, ICT empowers students to become confident and proficient problem solvers, equipped for success is an ever evolving digital world.

Research objectives

In general, research objectives explain what we expect to achieve by the project. The objectives of the study is:

- To compare the achievement of students taught by using ICT software and conventional teaching method while teaching conic section of grade XII.

Methodology

The study is based on quantitative design. According to the topic, it is experiment in class as well as in class presentation. So, Quasi-experimental design is used in this study to answer the formulated research question. Quasi experimental is an empirical interventional study, used to estimate the casual impact of an intervention. In this research, a pre-test is given at first to two random groups with same paper. Their outcomes are almost equal. And after pretest, one group is taught by using experimental method (i.e. by using ICT based software like GeoGebra and Wolfram Alpha Mathematica) and another group is taught by using conventional method. Teaching process is held up to 15 days. And after 15 days, post-test is given to both groups for testing the effectiveness of ICT used teaching procedure. To evaluate the date, Mathematical calculations t-test was calculated and for these tests, mean, standard deviation are needed.

Result and Discussion

In Aadikavi Bhanubhakta Secondary School, there were 2 sections in class XII in Science faculty. These two sections had been chosen as a sample. Before conducting experiment, pre-test was given for testing whether their present situation is even or not. The result of pre-test is shown below.

Table 1: *Achievement of students in pre-test*

S.N.	Experimental Group	Control Group
1	16	22

2	16	20
3	17	19
4	19	19
5	15	19
6	10	7
7	12	12
8	13	13
9	18	11
10	21	15
11	20	21
12	7	17
13	12	7
14	13	8
15	16	5
16	16	11
17	15	12
18	18	13
19	17	17
20	13	18
21	13	18
22	17	19
23	18	20
24	12	14
25	13	14
26	18	15
27	8	16
28	5	13
Sum	408	415
Mean	14.57	14.82
S.D.	3.82	4.5
t-value		-0.054

There were 28 students in section A and 28 students in section B. A same paper at same time was given to the students as an exam. The result is obtained in quantity form. And to check the mean difference, t-test at a 0.05 level of significance was used,

1.The null and alternative hypotheses are:

$H0: \mu_1 = \mu_2$

$H1: \mu_1 \neq \mu_2$

2.Level of significance: $\alpha = 0.05$

3.Critical region: It is two tailed test. The critical region at 0.05 level is $t_{0.025, 27} \geq 2.052$ and $t_{0.025} \leq -2.052$.

4.Computation: We are given, $n_1=28$, $n_2=28$, $\bar{x}_1=14.57$, $\bar{x}_2=14.82$, $\sigma 1=3.82$, $\sigma 2=4.50$

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - d_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} = \frac{(14.57 - 14.82) - 0}{\sqrt{\frac{(3.82)^2}{28} + \frac{(4.50)^2}{28}}} = -0.054$$

5.Since -0.054 > -2.052, accept H0. Hence, it is concluded that, at a 0.05 level of significance, there is no significance difference in the performance of two groups.

After conduction procedure of pre-test, it was observed that present situation of both grouped are even and in consequence experimental process could conduct for 15 days. After 15 days, post-test was given to the same grouped students with same question paper in simultaneous time. The following result was obtained. The result is shown below.

Table 2: *Achievement of students in post-test*

S.N.	Experimental Groupt	Control Group
1	21	21
2	23	20
3	16	19
4	17	19
5	19	18

S.N.	Experimental Groupt	Control Group
6	25	17
7	24	16
8	24	16
9	23	15
10	15	13
11	16	12
12	13	14
13	18	17
14	22	18
15	23	13
16	24	19
17	25	20
18	21	22
19	19	23
20	20	24
21	13	21
22	17	14
23	20	16
24	21	20
25	21	20
26	23	22
27	22	21
28	23	17
Sum	568	507
Mean	20.29	18.11
S.D.	3.44	3.17
t-value	2.466	

Again, to check the mean difference, t-test at 0.05 level of significance was used.

1. The null and alternative hypotheses are:

$H0: \mu_1 = \mu_2$

$H1: \mu_1 > \mu_2$

2. Level of significance: $\alpha = 0.05$

3. Critical region: It is one tailed test. The critical region at 0.05 level is $t_{0.05, 27} \geq 1.703$.

4. Computation: We are given, $n_1 = 28$, $n_2 = 28$, $\bar{\bar{x}}_1 = 20.29$, $\bar{x}_2 = 18.11$, $\sigma_1 = 3.44$, $\sigma_2 = 3.17$

$$t = \frac{(\overline{X_1} - \overline{X_2}) - d_0}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}} = \frac{(20.29 - 18.11) - 0}{\sqrt{\frac{(3.44)^2}{28} + \frac{(3.17)^2}{28}}} = 2.466$$

5. Since 2.466 > 1.703, reject H0. Hence, we conclude that, at a 0.05 level of significance, $\mu 1 > \mu 2$. i.e.

Achievement of students taught by using ICT software is better than the achievement of students taught by using conventional method.

Conclusion

This is experimental research named "Use of ICT in teaching conic section: an experimental research" in class XII. The objectives of the research was "to compare the achievement of students taught by using ICT software and conventional teaching method while teaching conic section of grade XII." The research was based on quasi experimental design selecting two different classes of only one school of tanahun district. Name of the school is Aadikavi Bhubhakta secondary school. Mathematics achievement test were used as data collection tool. The reliability of these tools was determined by using statistical formulae and validity was insured by expert judgement and secondary school Mathematics curriculum. A pre-test, post-test equivalent group design of quasi experimental design was adopted for the purpose of the study. Students of class XII have been considered as the population. The sample school was "Aadika-

vi Bhanubhakta Secondary School" which is located in Vyas-1, Tanahun. There were 2 sections in class 12 faculty of science group. After teaching 15 days in "Aadikavi Bhanubhakta Secondary School" by using ICT with projector, data were collected from Mathematical Achievement Test. The score obtained by the students on pre-test was analyzed by using t-test at 0.05 level of significance, which shows that there was no significant difference of the average achievement score of two groups and the score obtained by post-test was also analyzed by t-test at 0.05 level of significance, which shows that the average achievement score of experimental group was better than control group. In this study, teaching using ICT software was found more effective than the traditional method on conic section of class XII. The result highlighted that the students in experimental group performed better than the control group.

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