The Study of Mathematics Learning Activities on Conic Section for Grade 10 students using the Geometer’s Sketchpad as a Learning Tool

Sumit Phothong
Mathematics Education Program, International College
Suan Sunandha Rajabhat University,
U-Thong nok Rd., Dusit, Bangkok, Thailand
sumit.phothong@gmail.com

ABSTRACT
The purposes of this research were to examine mathematics learning achievement of students by using the Geometer’s Sketchpad and to investigate student’s attitude toward using the Geometer’s Sketchpad. The topic used in this study was Conic Section. The participants consisted of 52 Grade 10 students in the second semester, academic Year 2014 at Suankularb Wittayalai School, Bangkok, Thailand. The instruments employed in this study were the Geometer’s Sketchpad, achievement test and questionnaire. Achievement test was used to assess students learning achievement in learning mathematics with the Geometer’s Sketchpad. The researcher employed questionnaire to evaluate student’s attitude toward using the Geometer’s Sketchpad in learning mathematics. The findings of this study showed that using Geometer’s Sketchpad as a learning tool enhanced students understanding mathematics concepts and promoted the positive attitudes toward using the Geometer’s Sketchpad.

Keyword: The Geometer’s Sketchpad, student’s achievement, attitude

1. Introduction

In recent years, technology is an essential tool for teaching and learning mathematics. It also influences the way teachers teach mathematical contents and mathematical process and how it enhances student learning. Currently, there are various hardware and software available for the purpose of teaching and learning of mathematics, each of which differ in their functions (e.g. calculators, graphic calculators, Matlab, the Geometer’s Sketchpad). Some of these can allow the student to learn through exploratory before construct the concepts and a student would be able to interact with the environment (Jonassen, Peck &Wilson, 1999). The Geometer’s Sketchpad (GSP) is a tangible and visual software program that increases student’s engagement, understanding, and achievement in learning mathematics. It is utilized in learning the subject of mathematics that related to algebra, geometry, pre-calculus and calculus.

There are many studies have been conducted to explore the effectiveness of the use of the GSP in mathematics learning, especially in the learning of geometry. Lester (1996) found that GSP increased students’ achievement in geometry. Growman (1996) found that the use of GSP showed more positive reaction from both the students and the instructors in testing conjectures and constructions.

From the above studies, researcher was interested in using the GSP to development teaching and learning mathematics for Grade 10 students at Suankularb Wittayalai School on the topic of Conic Sections.

2. Research Objectives

2.1 Research Objectives
The research objectives were:
1) To examine mathematics learning achievement of students by using GSP; and
2) To investigate student’s attitude toward using GSP
2.2 Research Questions
   1) Does using GSP help students’ mathematics learning achievements?
   2) How did using the GSP affect student’s attitude?

3. Research Methodology

3.1 Participants
   The participants in this study were 52 Grade 10 students in the second semester of the 2014 academic year at Suankularb Wittayalai School, Bangkok, Thailand.

3.2 Instruments
   The following instruments were used in this research:
   1) Twelve lesson plans under the using GSP as a learning tool on the topic of conic sections;
   2) An achievement test consisting of 20 questions with 4-choice items; and
   3) A questionnaire consisting 10 questions to evaluate attitude of students toward using GSP as a learning tool.

3.3 Data Collection
   In this study, the researcher acted as a teacher and conducted the action research following to the research question:
   1) The teacher studied related works and course description;
   2) The teacher prepared GSP based on the course description in the selected topic (Conic Sections). The teacher prepared lesson plans using the GSP as a learning tool in the selected topic (Conic Sections). The teacher prepared course contents and other research instrument including measurement tools and a questionnaire;
   3) The teacher instructed students following to the prepared lesson plans. The estimate time is 12 periods in the second semester of 2014;
   4) The students sat for the achievement tests. Students were also asked to complete the questionnaire at the end of the instruction; and
   5) The teacher analyzed the data and conclusion.

3.4 Data Analysis
   The analysis of collected data was done statistically as follows:
   1) The learning effectiveness was analyzed from achievement test scores using one sample t-test with the significance level at 0.05; and
   2) Evaluation of the students’ attitude through the questionnaire with five-point Likert scale was calculated by using descriptive statistics, percentage.

4. Results

4.1 Achievement Results
   The achievement test scores were analyzed and displayed in Table 1. The total score test is 20 and the total number of students is 52.

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students achievements</td>
<td>52</td>
<td>17.40</td>
<td>2.12</td>
<td>11.60</td>
<td>51</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Students learning effectiveness was analyzed by achievement test scores with one sample t-test as shown in Table 1. One sample t-test revealed a significant difference in testing score as t(51) = 11.60, p < 0.05.
4.2 Attitude Results

A questionnaire with attitude test scores is shown in Table 2 displaying percentage score on each statement.

Table 2
Students’ Attitude Results toward using GSP as a Learning Tool

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Not sure</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The learning activities using GSP helps students understand more about conic sections.</td>
<td>84.62%</td>
<td>15.38%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2. The learning activities using GSP allows teaching a more attractive.</td>
<td>82.69%</td>
<td>11.54%</td>
<td>5.77%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>3. The learning activities using GSP helps make learning more fun.</td>
<td>73.08%</td>
<td>26.92%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>4. The learning activities using GSP is beneficial to learn about conic sections.</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>5. The learning activities using GSP allows to gain knowledge from the study fully.</td>
<td>86.54%</td>
<td>7.69%</td>
<td>5.77%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>6. The learning activities using GSP helps encourage students to see the benefits of the GSP program to learn about conic sections.</td>
<td>17.57%</td>
<td>78.58%</td>
<td>3.85%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>7. The learning activities using GSP allows students to link knowledge between different related topics of conic sections.</td>
<td>59.62%</td>
<td>17.31%</td>
<td>23.07%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>8. The learning activities using GSP gives students eager to learn.</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>9. The learning activities using GSP was compatible with the time given.</td>
<td>36.54%</td>
<td>55.77%</td>
<td>7.69%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>10. Overview of the learning activities using GSP allows students the joy of learning.</td>
<td>50%</td>
<td>30.77%</td>
<td>19.23%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

In this questionnaire, there are 10 questions that required the students’ evaluation on using GSP as a learning tool. In table 2 showed that the first three highest percent of statement that most students strongly agree were statement 4 and 8, 5, and 1, respectively: 1) The learning activities using GSP is beneficial to learn about conic sections (100%) and The learning activities using GSP gives students eager to learn (100%); 2) The learning activities using GSP allows to gain knowledge from the study fully (86.54%); and 3) The learning activities using GSP program helps students understand more about conic sections (84.62%).
5. Conclusion and Recommendation

5.1 Conclusion
In this study, GSP was used as a learning tool in teaching on the topic of conic sections. The results of the study show that using GSP as a learning tool helps students to improve their mathematics learning achievement. The findings of this study are consistent with the studies by Chulert (2010) and Lekwongmanopun (2011).

5.2 Recommendation
This study had a sample from students in the 10th grade. This study examines students’ achievement by using GSP on the topic of Conic Sections. The further research should be conducted by using GSP other topics.

Acknowledgements
This classroom action research was supported by the Institute for the Promotion of Teaching Science and Technology (IPST), Thailand.

References