Using the Contextual Teaching and Learning Method in Mathematics to Enhance Learning Efficiency on Basic Statistics for High School Students

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ABSTRACT

The purposes of this classroom action research were to determine the student learning efficiency and to evaluate the student attitudes towards using the Contextual Teaching and Learning Method (CTLM) in teaching mathematics. The selected topic is “Basic Statistics”. Participants in this research were 32 students studying in grade 11, second semester, academic year 2014 at Horwang School, Bangkok, Thailand. The instruments used in this study were 11 learning management plans based on the CTLM for basic statistics, CTLM activity sheets, tests, and a questionnaire. The findings of this study demonstrated that the efficiency of the proposed CTLM based learning management plans was at 90.09 / 81.38 attaining above the 80 / 80 criterion. Most students in this study had high level of cognitive, affective, and behavioral attitudes.

Keyword: Contextual Teaching and Learning Method (CTLM), Learning Efficiency, Attitude

1. Introduction

The current situation at schools is that many students regarded contents as having a few or no relevant applications in real-world situations. Facing this problem in high-school level at Horwang School, the teacher needs to find alternatives to arouse the interest and to motivate students. It can be done by bringing the knowledge to be acquired close to the student’s reality and using the contextual teaching and learning (related to the “real world”) that can challenge their curiosity. However, many teachers still use conventional techniques in which they had the dominant role over students. There was a research showed that the ideas of “steadily working through the textbook, page by page, and assigning sheets of drill exercises from the workbooks or worksheets for practice” are fundamentally wrong (Daniels, 1998). According to Greeno’s study (as cited in Shamsid-Deen, 2006), using of Contextual Teaching and Learning strategies increases the likelihood of student in the learning process to transfer information learned in a typical classroom setting to real life situations. Furthermore, students are expected to apply the previous information what they have learned to solve the problem in a realistic setting. It is believed that when students are taught in a context that is closed to a realistic setting, they will have a greater chance for transfer of learning from one teaching setting to another and/or to real life situations (Lindsay, 2000; Schell & Black, 1997). The contextual teaching and learning method helps teachers motivate students to make connection between subject matter contents to real life situations. The context for subject matter contents may include real world context categories: personal, societal, occupational, and scientific. (OECD, 2013)

This study investigated the student learning efficiency and attitude regarding the Basic Statistics unit in high school mathematics curriculum using the contextual teaching and learning method. The assumptions and practices of contextual teaching and learning method were adapted from Smith (2010) as follows:

1. Students are actively engaged.
2. Students view learning as relevant.
3. Students learn from each other and together.
4. Learning is related to “real world” and/or simulated issues and meaningful problems.
5. Appreciating students’ diverse life contexts and prior experiences are fundamental to learning.
2. Research Objectives

This research has two objectives described as follows:

(1) To study learning efficiency by using the contextual teaching and learning method in basic statistics unit in high school mathematics curriculum for Grade 11 students according to criteria 80 / 80.

(2) To study attitude of Grade 11 students on the contextual teaching and learning method used in learning basic statistics unit.

3. Research Methodology

3.1 Participants

Participants in this study were 32 grade-11 students studying in the second semester, academic year 2014 at Horwang School, Bangkok, Thailand.

3.2 Research Instruments

Research instruments used in this study were as follows:

(1) Eleven learning management plans used to prepare learning activities.

(2) CTLM activity sheets used to evaluate student learning efficiency.

(3) Evaluation tools including formative tests and posttest which require basic statistics knowledge.

(4) A questionnaire based on five-point scale used to evaluate student attitudes.

3.3 Conceptual Framework

The conceptual framework, as illustrated in Figure 1, is primarily based on the system approach in the action research (Plan – Do – Check – Act), which is composed of input, process, output, and feedback.

As an input to this study, 11 learning management plans using CTLM for basic statistics had been developed to evaluate student learning efficiency and attitudes. In the process, CTLM activities were utilized to the teaching and learning namely: engaging, building and applying, and extending or enhancing. In the output, the test was provided to evaluate student learning efficiency. A questionnaire was utilized to evaluate student attitudes towards learning using the CTLM, to check and to collect feedback for future revision or improvement of teaching and learning management.
3.4 Data Collection

The procedure of data collection is as follows: First, students were introduced about the CTLM; then the researcher conducted the research according to 11 learning management plans based on the CTLM. 50 minutes time was assigned for each topic.

1. Examples of cases or problems that require statistics and meaning of statistics
2. Type of statistics
3. Data and data collection
4. The frequency distribution of the data
5. The frequency distribution using graphs
6. The sum of data
7. Arithmetic mean for ungrouped data
8. Weight arithmetic mean for ungrouped data and combined arithmetic mean
9. Median and mode for ungrouped data
10. Arithmetic mean for grouped data
11. Remarks and rules in using the central tendency

Next, the researcher collected all data from every learning management plans and evaluated students’ behavior in the classroom then adjusted and improved learning management plans. In addition, students were taking formative test, posttest, and questionnaire which were prepared by the researcher. Finally, the researcher analyzed and evaluated the data from tests and questionnaires as completion of this classroom action research.

3.5 Statistical Analysis

The data analysis was designed into two categories:

Category 1: Determine the student learning efficiency according to the 80 / 80 criteria (Promwong, et al., 1977). $E_1$ represents the procedure efficiency and $E_2$ represents outcome efficiency. Two values can be calculated from (1) and (2) as follows:

$$E_1 = \frac{\sum X}{N} \times \frac{A}{A} \times 100,$$

where

$E_1$ is the efficiency of the CTLM procedure,
$\sum X$ is the total marks from the activity sheets and formative tests,
$N$ is the total number of students,
$A$ is the total marks of every activity sheets and formative tests,

$$E_2 = \frac{\sum F}{N} \times \frac{B}{B} \times 100,$$

where

$E_2$ is the outcome efficiency of the CTLM,
$\sum F$ is the total marks from the posttest,
$N$ is the total number of students,
$B$ is the total marks of the posttest,

Category 2: Evaluate student attitudes from questionnaire results and calculate mean of each statement.

4 Research Results

Category 1: The evaluation of learning efficiency 80 / 80
Table 1
The evaluation of learning efficiency of the CTLM

<table>
<thead>
<tr>
<th>Learning efficiency</th>
<th>Score</th>
<th>N</th>
<th>$\bar{X}$</th>
<th>S.D.</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure efficiency ($E_1$)</td>
<td>195</td>
<td>32</td>
<td>175.69</td>
<td>11.27</td>
<td>90.09</td>
</tr>
<tr>
<td>Outcome efficiency ($E_2$)</td>
<td>25</td>
<td>32</td>
<td>20.34</td>
<td>2.51</td>
<td>81.38</td>
</tr>
</tbody>
</table>

From Table 1, calculation of the learning efficiency of the CTLM showed that the procedure efficiency ($E_1$) was 90.09 and the outcome efficiency ($E_2$) was 81.38. The learning efficiency of the CTLM was 90.09 / 81.38 attaining above the 80 / 80 criterion.

Category 2: The evaluation of student attitudes

Table 2
The Evaluation Of Student Attitudes

<table>
<thead>
<tr>
<th>Items</th>
<th>Statements</th>
<th>Levels of attitude (Number of students)</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cognitive attitude (thoughts, beliefs, and ideas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>The CTLM made meaningful learning.</td>
<td>12 19 1 - -</td>
<td>4.34</td>
</tr>
<tr>
<td>2</td>
<td>The CTLM enabled students to connect between the knowledge and real-life context.</td>
<td>11 14 6 1 -</td>
<td>4.09</td>
</tr>
<tr>
<td>3</td>
<td>The CTLM enabled students to use statistics for with decision making.</td>
<td>10 19 3 - -</td>
<td>4.22</td>
</tr>
<tr>
<td>4</td>
<td>The CTLM activity sheets were appropriate and understandable.</td>
<td>20 9 3 - -</td>
<td>4.53</td>
</tr>
<tr>
<td>5</td>
<td>The CTLM activity sheets could be used for revision and problem solving.</td>
<td>10 17 4 1 -</td>
<td>4.13</td>
</tr>
<tr>
<td></td>
<td>Affective attitude (feelings or emotions)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>The CTLM created interest and motivation for learning basic statistics.</td>
<td>14 13 5 - -</td>
<td>4.28</td>
</tr>
<tr>
<td>7</td>
<td>The CTLM reduced anxiety in learning basic statistics.</td>
<td>12 17 2 1 -</td>
<td>4.25</td>
</tr>
<tr>
<td>8</td>
<td>The CTLM made basic statistics learning easily.</td>
<td>13 15 4 - -</td>
<td>4.28</td>
</tr>
<tr>
<td>9</td>
<td>The CTLM enable motivated to learn basic statistics.</td>
<td>13 14 5 - -</td>
<td>4.25</td>
</tr>
<tr>
<td>10</td>
<td>The CTLM activity sheets were appropriate for each classroom period.</td>
<td>14 16 2 - -</td>
<td>4.38</td>
</tr>
<tr>
<td></td>
<td>Behavioral attitude (tendency or disposition to act)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>The CTLM supported students to learn from each other.</td>
<td>13 16 3 - -</td>
<td>4.31</td>
</tr>
</tbody>
</table>
Using the CTLM in teaching mathematics (basic statistics) for high-school students, the designed method had learning efficiency at 90.09 / 81.38 which is higher than the standard level (80 / 80). The attitude test yielded the average score at 4.28 which means the students had good attitude towards studying using the CTLM and agreed that the CTLM activity sheets were appropriate and understandable. It can be concluded from the results that the CTLM helped students learn more efficiently.

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References


