Assessment of the Impact of Blended Learning in Teaching Algebra at Malayan Colleges Laguna

Ria Grace Abdon
College of Arts and Science,
Malayan Colleges Laguna,
Pulo Diezmo Road, Cabuyao, Laguna, Philippines 4025
rgpabdon@mcl.edu.ph

Abstract - Malayan Colleges Laguna adopted a blended learning approach in its various mathematics and science courses by employing web-based learning management system bundled with textbooks. The science courses, chemistry and physics, adopted E-connect, while algebra and trigonometry used the Enhanced Web Assign technology. This paper aims to assess the impact of using the Enhanced Web Assign system in the performance of the students in algebra. Four sections handled by the same professor are evaluated, two of which employed the blended learning approach while the other two underwent straight conventional face-to-face instruction. Data are gathered, as regards to the scores of the students in the major exams, the overall final average and the passing rate of the students. Mean average is the statistical tool used in the assessment of the data of the major exams and z-test is used to determine if there is a significant difference between the two average means in terms of the students overall final average. Results showed that students who underwent blended learning obtained higher average in all of the four major exams taken, 67, 70, 75, 67 compared to those with no on-line technology intervention, 60, 58, 60, 58, respectively. Mean average of the overall final grade of the blended learning group is 68 while the conventional group is 58. Applying the z-test hypothesis with a 95% confidence level, shows a computed z score of -3.81, which falls under the region of rejection, which signifies that there is a significant difference between the two means? 69% of the students in the blended learning group passed the course while the passing rate for the non-blended learning group is only 52%. The results of the study infer that blended learning in teaching algebra through the Enhanced Web Assign system enriches learning and improves the performance of the students.

Keywords - Algebra, Blended Learning, Enhanced Web Assign, Learning Management System, Mean Average, Z-Test

I. INTRODUCTION

Technology is essential in teaching in the 21st century where students are considered digital natives. Educators must optimize the potential of technology to increase students’ access to information, ideas, and interactions to strengthen learning experience and enhance ownership of knowledge [1]. Findings from a number of studies have shown that the strategic use of technology tools in mathematics and science education, in particular, can support the learning of mathematical and scientific procedures and skills as well as the development of advanced proficiencies such as problem solving and reasoning [2-4]. Computer applications and technological tools, either alone or in concert with traditional instruction, may improve student achievement in mathematics and science by tailoring lessons and skill practice to individual students’ needs or by offering
students additional opportunities to interact with information through computer simulations or other methods. In addition, computerized assessment may provide more precise and efficient feedback on student learning, allowing teachers to adapt instruction to student needs more effectively [5]. Instruction through technology may also motivate students’ interest in mathematics and science [6].

Blended learning or hybrid learning is generally applied to the practice of using both online and in-person learning. In a blended-learning course, for example, students might attend a class taught by a teacher in a traditional classroom setting, while also independently completing online components of the course outside of the classroom. In this case, in-class time may be either replaced or supplemented by online learning experiences, and students would learn about the same topics online as they do in class - i.e., the online and in-person learning experiences would parallel and complement one another [7]. And because students use digital and online technologies in blended-learning situations, they naturally acquire more technological literacy and greater confidence using new technologies which is one of the skills of the 21st century workforce.

Malayan Colleges Laguna integrates various blended learning approach in its curricula such as employing Moodle System, tapping social media sites like EdModo and Facebook, applying computer aided instruction in the classrooms by linking lessons to educational sites i.e., quia, intermath, phet simulations and u-tube, and adopting web-based learning management system bundled with textbooks for specific mathematics and science courses. Chemistry and Physics courses use the E-connect technology, while mathematics courses such as Algebra, Trigonometry, and Calculus adopt the Enhanced Web Assign.

Enhanced Web Assign is an online homework and assessment system where students answer on-line drills. Learning experience is strengthened through the various features that come with the on-line drills:

- It promotes independent learners by displaying learning tools and feedback to complete or review the concepts, through video tutorials and read it option.
- It reinforces student learning through practice and instant feedback.
- It promotes academic honesty because of its randomized and customized questions.
- It automatically tracks student scores and has a prompt feedback mechanism to identify where students are struggling.
- It facilitates faculty collaboration and student communication.
- It encourages knowledge sharing among other professors.

Though blended learning through web-based learning management system offers many advantages to foster learning, critics of blended-learning experiences may question whether the practice can provide students with enough personal attention, guidance, and assistance from teachers, especially for students who may not be self-directed, self-disciplined, or organized enough to learn effectively without regular supervision from teachers and adults. Another cause of concern is the additional cost that goes with the adoption of the technology.

As such, several studies focus on the evaluation of the effectiveness of blended learning in teaching various courses at Malayan Colleges Laguna. Loza & Portez (2012) evaluated the effect of integrating e-learning in Drawing courses [8]. Dampil (2014) determined the influence of E-connect in teaching Chemistry [9], Suello (2013) verified the impact of digital learning in his Calculus classes [10] and Fabila (2012) assessed the effect of on line technology in teaching Physics [11]. Proponents conclude in their studies that blended learning improves performance of the students in the courses studied.
This study aims to assess the impact of blended learning, through Enhanced Web Assign Technology, in teaching Algebra at Malayan Colleges Laguna.

II. METHODOLOGY

Four sections are evaluated and divided into two groups, each composed of 78 students. The two sections which adopted the Enhanced Web Assign Each Technology comprised the data for the blended learning group, while the two classes who went through the conventional face-to-face instruction, belong to the traditional group. Students’ output in the four major exams are collected and processed, where mean average is the statistical tool used. Mean average (A) for the long exams is computed as follows:

\[ A = \frac{\sum \text{test scores}}{\text{no of observations}} \]

Statistics on the Overall Final Average (OFA) of the students are also applied and z-test is used to determine if there is a significant difference between the results of the two groups. Data analysis feature of MS Excel is used for the z-test while overall final average is computed as follows:

\[ OFA = \frac{\sum \text{final average}}{\text{no of observations}} \]

Finally, percentage passing rate of the two groups are computed and compared.

III. RESULTS

Fig 1. Illustrates the mean average of the scores of the two groups in the four major exams, Long Exam 1 to 3 (LE1, LE2 and LE3) and in the final exam (FE). Malayan Colleges Laguna uses absolute system in grading.

![Mean Average of the Scores from Two Groups in Four Major Exams](image1)

Hypothesis with 95% level confidence is also applied and the summary of the data is presented in Table I.

![Comparison of the Overall Final Average of the Students](image2)

<table>
<thead>
<tr>
<th>TABLE I</th>
<th>Z-TEST DATA FINAL AVERAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conventional</td>
<td>Blended Learning</td>
</tr>
<tr>
<td>Mean</td>
<td>58</td>
</tr>
<tr>
<td>Known Variance</td>
<td>326</td>
</tr>
<tr>
<td>z</td>
<td>-3.82</td>
</tr>
<tr>
<td>z Critical two-tail</td>
<td>1.96</td>
</tr>
<tr>
<td>Analysis</td>
<td>Reject the null hypothesis; there is a significant difference between the two means</td>
</tr>
</tbody>
</table>

Computed z score obtained is -3.82 which falls beyond the ± 1.96 value of the acceptance region. Thus, the null hypothesis that there is no significant difference between the two averages is rejected implying that indeed, the positive difference between the final averages of the blended learning group against the conventional group is significant. Students with online technology performed better.
compared to the students with no online intervention. Finally, the percentage of passing rate of the two groups is computed and the data are shown in Fig 3.

![Fig 3. Percentage Passing Rate of Students](image)

Higher percentage passing rate is obtained by students who adopted the Enhanced Web Assign, 69%, while the passing rate for the conventional group is only 52%. This further verified that the learning experience of the students is enhanced by the adoption of blended learning.

**IV. CONCLUSIONS**

Blended learning, through Enhanced Web Assign, improves performance of students in algebra at Malayan Colleges Laguna. Learning experience of the students are enriched and is signified by their performance in the major exams, overall final grade and the high percentage passing rate.

Enhanced Web Assign does not only improve students’ academic performance, the technology also develops in them the necessary skills as 21st century professional. Technology is essential and must be integrated in the curricula of mathematics courses.

**REFERENCES**

(Arranged in the order of citation in the same fashion as the case of Footnotes.)


[9] Dampil, F. “The Influence of Educational Technology in Improving the Performance of Students in Chemistry”.
