Abstract: Quality education is important to produce graduates who are competent and able to use knowledge and skills in real life situations to assist in the development of the country. Therefore, this study was conducted to examine whether the use of SolveMe website implemented with Problem Based Learning (PBL) method could improve the level of achievement of polytechnic students in Malaysia. This study employed an experimental research involving only one group. The study sample consisted of forty-eight Diploma in Information Technology students who took DFC20113 Programming Fundamentals course at a Polytechnic in Malaysia. Students underwent a three-week learning process using the SolveMe website. Data were collected through a set of pre-post test questions. A paired sample T-test analysis showed that there was a significant difference between the pre- and post-test on the students’ achievement level ($p = 0.000 < 0.05$). Therefore, it could be concluded that the PBL method could improve the level of student achievement.

Key words: Problem Based Learning, Web, Achievement

1. INTRODUCTION

The development of the national education system can be seen to be growing according to the passage of time and the growth of technology without borders. Teaching and Learning (T&L) methods using traditional approaches are declining. The revolution of computer education applications as well as the use of computers in education is growing day by day until finally, the concept of online learning based on technical is introduced to provide educational knowledge to students through effective means [1]. According to [2], online technology-based learning should also be the main pedagogy for all institutions of higher learning in Malaysia. In the Malaysian Education Development Plan 2015-2025 (Higher Education), one of the leaps in achieving system aspirations and student aspirations is global level online learning as Malaysia is the seventh highest country in Asia in terms of internet usage [2]. Therefore, educators can take advantage of this internet usage rate through online learning methods in higher education institutions.

Computer programming is one of the core courses in the field of study of STEM clusters which consists of Science, Technology, Engineering and Mathematics. The need for programming in this field has made programming a compulsory course in most courses offered at the tertiary level especially for students in the field of Computer Science and Information Technology [3]. Students need to master the basic concepts of programming because otherwise, students will have difficulty mastering learning at the next level [4]. Developed countries such as the United States and Japan began to introduce comprehensive programming starting from the primary school level [5]. Programming is a skill acquired through continuous training. Students need to constantly practice to master these programming skills.
2. PROBLEM STATEMENT

[6] states that programming is considered to be quite complex and challenging. Thus, student achievement in programming is still low and not encouraging [7]. In this regard, the Ministry of Education Malaysia has provided various efforts to meet the needs of manpower resources in the field of computing through various levels of the education system. This can be seen through the planning and implementation of Computer Science and Information Technology programs in Institutions of Higher Learning as well as community colleges [2]. The government through the Ministry of Education (MoE) also undertakes efforts to include computational thinking skills modules at the primary school level and Basic Computer Science at the secondary school level starting from 2017 to introduce programming and problem-solving skills to school students [8].

In addition, one of the factors is because most of the programming courses offered in higher education institutions still use traditional methods that are teacher-centered in delivering T&L [9]. This traditional approach begins with the lecturer teaching programming techniques using theory [10]. According to [11], programming that is taught formally and seriously and only emphasizes programming skills alone is not suitable for students. Therefore, the selection of content and pedagogy in T&L is done carefully to ensure that students do not get bored quickly. The method of presentation presented by the lecturer thwarts students from being able to master the concept of programming let alone applying it into the real-world problems [12]. Consequently, among the challenges identified in the context of higher education in Malaysia is the result of programming learning among students that do not meet the requirements of expertise in the industry.

3. LITERATURE REVIEW

3.1 Problem Based Learning (PBL)

PBL is a teaching method that allows students to learn while being active with real problems. Students are given the opportunity to solve problems in a collaborative environment, create mental models for learning, and form self-learning habits through practice and reflection [13]. Students are expected to solve problems or issues presented based on the learning resources that have been provided [14]. In this situation, the teacher acts as a facilitator for the problem-solving process thrown in T&L. This means students are actively involved in the T&L process in the classroom [15]. A problem-based learning approach can also increase students' commitment to learning. This is because learning activities revolve around research activities, reading, teamwork, and communication among the group members [15]. Students will focus on the real problem determined by the teacher and work with a friend to find relevant material. Indirectly, such activities can improve the students' ability to determine what they need to master and at the same time learn about aspects of time management [15].

3.2 Online Learning or e-Learning

The e-Learning medium in Malaysia is more focused on online learning in line with the government's efforts to encourage people to use broadband [16]. In general, the use of e-Learning in T&L is an alternative to the existing T&L methods based on whiteboards and marker pens or traditional methods that use blackboards and chalk [17]. [18] stated that the main purpose of most universities implementing online learning is to provide a student-centered learning environment to enable students to generate their own thoughts and knowledge without relying on lecturers. It is a common knowledge that e-Learning medium is one of the latest technology educations which provides a transformation of more interactive learning methods. This
e-learning medium has a huge impact on student learning which in turn gives a reform in the education system [19]. [20] also says that through e-Learning, students can find and take learning information based on the syllabus or criteria set by the teaching staff. Students can also communicate online with instructors via email.

4. RESEARCH METHODOLOGY

The purpose of this study was to examine whether the use of SolveMe website implemented with PBL method could improve the level of achievement of polytechnic students in Malaysia. An experimental research design was chosen for this study in the form of pre-test and post-test involving experiments towards a group of students.

4.1 Research Population and Sample

The target population for the study was comprised of Diploma in Information Technology (Digital Technology) students at the Polytechnic who took DFC20113 Programming Fundamentals course. A total of 48 students from one class were involved as respondents of the study. However, this study used the intact group sampling method where the study sample only involved the existing group in the class involving a total of 48 students covering one class.

4.2 Instrument

This study used pre-test and post-test to determine the improvement of student achievement level after using the SolveMe website. The questions contained in these two test sets were based on the syllabus content of DFC20113 Programming Fundamentals course. The form of test used in this study was objective test. The difficulty level of the questions developed by the researchers was based on the bloom taxonomic level.

5. RESEARCH AND DISCUSSION

The findings of the analysis in Table 1.0 shows that the mean score of post-test (M = 11.73, SD = 2.915) was relatively higher than the mean score of pre-test (M = 9.25, SD = 11.73).

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
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<tbody>
<tr>
<td>N</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>Mean</td>
<td>9.25</td>
<td>11.73</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>2.547</td>
<td>2.915</td>
</tr>
<tr>
<td>Minimum</td>
<td>2</td>
<td>3</td>
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<tr>
<td>Maximum</td>
<td>15</td>
<td>17</td>
</tr>
</tbody>
</table>

The results of this study showed that there was a difference after the students used the SolveMe website. This study showed that the level of student achievement increased after using the SolveMe website.

<table>
<thead>
<tr>
<th></th>
<th>Pre-test</th>
<th>Post-test</th>
<th>STD</th>
<th>Sig.(2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-test Post-test</td>
<td>-2.271</td>
<td>2.632</td>
<td>.000</td>
<td></td>
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</table>

Based on Table 2.0, the results of the SPSS analysis showed that the significant value obtained was .000 not exceeding .05. Then, there was a significant difference in the mean scores. At the confidence level of .05, there was a statistically significant difference between the mean of pre- and post-test scores after conducting the learning process using the SolveMe website. The findings of this study were supported by the results of the study [21] which found that if a teacher only wanted his students to remember and memorize the facts for
the subjects taught and reproduce them during the examination, then, the conventional teaching was enough to achieve the desire. On the other hand, if the teacher wanted to cultivate cognitive skills at a higher level such as synthesis and evaluation, then, the teacher could optimize the benefits of using PBL. According to [22], the PBL approach stimulates the activity and personality of students. The collaborative learning found in PBL had encouraged students to think critically like the collaborative skills required for problem solving. The PBL approach was realized by taking into account the problem-solving measures implemented to produce students who were able to think critically in a problem.

The results of the study [23] found that the PBL approach made students earnestly prepare for self-learning and be motivated in solving problems in more depth and detail. [24] overall view PBL an effective method to improve students' problem-solving skills. Students would make strong connections between concepts when they knew the facts by working actively to obtain information rather than just passively receiving information. PBL encouraged students to work on solving a problem and also increased the students confidence in problem solving. These skills could place PBL students at an advantage in their careers. [25] stated that one of the methods of finding solutions and making decisions is to use the PBL approach. According to studies [26], the PBL method invites many ideas to solve problems and then, choose the best results as this method is one of the techniques where many people from one group share ideas on something without criticizing. This method was suitable for group problems. Students had to make problem-solving decisions accurately and made sure the decisions made were the best decisions. In addition, students needed to have strong reasons to support the decisions taken. The selection of these results was generated using various methods to ensure the results obtained were of good quality. In a study regarding the use of PBL Module by [24] found that the clinical decision-making skills of nursing students had improved. This made it easier and smoother for their nursing tasks due to the ability to make decisions quickly and accurately.

The findings of this study were also supported by [27] who stated that the first goal of PBL was the development of reasoning to use knowledge and expertise in a broad knowledge base. Other studies [28] also supported this study by showing the ability of students in predicting further effects of something as much as 95% and categorized as excellent criteria. The reasoning evaluation of the experimental group found in this study automatically increased from good to very good. Based on the criteria of finding the cause of the problem, the students needed to analyze the possible cause of the problems that occurred and the source of the problems. Students sought sources of problems from all fields such as economics, environmental conditions and the level of knowledge of society. Most students were able to find the cause of the problems that occurred.

6. CONCLUSION

The method of using PBL in T&L could stimulate students' active learning through the given problem scenarios. Authentic problems gave students the experience to solve problems that occurred in real-world contexts. This could increase the students' understanding of learning concepts as well as provide students with practical experience. This study showed that PBL method could improve the achievement of students who took the DFC20113 Fundamental Programming course. This was seen when students played an active role in managing and taking responsibility for learning with minimal guidance from teachers. Therefore, this study suggests that this PBL method could be implemented in the T&L process of DFC20113 Programming Fundamentals course to improve the level of understanding and subsequent student achievement.

ACKNOWLEDGEMENT

The authors would like to thank the Ministry of Higher Education, Malaysia, for supporting this research under the Research fund, E15501, Research Management Centre, UTHM and Geran Penyelidikan Pasca Siswa (GPPS) VOT No H437. In addition, the authors also wish to thank the students of Polytechnic, Malaysia who had given their full cooperation to ensure the success of this study.
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