Abstract— Recent emphasis on monitoring student outcomes to continuous quality improvement (CQI) of an academic curriculum has been influential in higher education. However, the term of continuous quality should be further anticipated with the experience and previous knowledge of student’s pre-university qualifications. Very little work has been studied on this correlation of pre-university background to the students education in the university. The quality assurance process of an institution has included student admission but the quantitative assessments directly to the learning outcome are still very limited. Hence, this paper explored the influence of student pre-university education background on the learning outcome pattern throughout the four years of undergraduate study. The study involves 97 civil engineering graduates and categorized into their pre-university admission namely matriculation/science foundation, diploma and Malaysian Higher School certificate (Sijil Tinggi Persekolahan Malaysia, STPM). The learning outcome achievements during their four years of study were analyzed and show an important trend of relationship with their pre-university experiences. The study has demonstrated that, in their first year of study, STPM group were able to achieve better learning outcomes than matriculation group but both groups has performed equal learning achievement throughout their four years of study and similarly improved at the final year.

Keywords—Outcome Based Education; Learning Outcome; Pre-University Admission; Matriculation; STPM; Diploma

I. INTRODUCTION

In line with Malaysia’s long term development plans and the aspiration of the Ministry of Higher Education for transformation of higher education in the country, Malaysian Qualifications Agency (MQA) has developed a series of guidelines, standards and codes of practice to enhance academic performance and institutional effectiveness.

Effective from January 2009, all academic programmes offered by public and private universities in Malaysia need to adhere to the MQA standards and procedures, which replaced those issued previously by Lembaga Akreditasi Negara (LAN). This means that new proposed academic programmes must be in accordance to the guidelines provided by MQA. Engineering field has long involved with the accreditation since graduate engineer recognition is requirement by the Board of Engineers Malaysia (BEM). Delegated by BEM, Engineering accreditation Council (EAC) is responsible for accreditation of engineering degrees in Institution of higher learning. They have been responsible to ensure the quality of engineering education / programme of its registered engineers attains the minimum standard comparable to global practice.

The accreditation of engineering degrees by EAC has mandate and put emphasize on the academic approach of outcome-based education (OBE). The Outcome-Based Education is an approach that focuses on outcomes, i.e. the achievements of students that are measurable, proven, and can be improved. OBE is an organization of educational process that target to obtain the desired results by the students achievement evaluation [1] and/or work as principle that decisions about curriculum and instruction should be driven by the outcomes students that show at the end of their educational experience [2]. It requires a taught subject clearly outline the course statements of the knowledge, skills, and abilities the individual student possesses and can demonstrate upon completion of a learning experience or sequence of learning experiences which also termed as learning outcome. According to Harvey [3], learning outcome is the specification of what a student should learn as the result of a period of specified and supported study. Perhaps, a smart or intelligent student with their previous educational background may significantly have input in the learning pathways in achieving the outcomes. Other factors such as study strategy, personal learning conceptions, the educators and learning environments would effects the student’s learning accomplishment.

Practically most institutional will required high academic quality input of students to be admitted in their institution. Unfortunately this is not always the situation and certainly the minimum academic quality must as well get equal opportunity. The process of admission is varied form one institution to other institution. The percentage of total student enrolment in Malaysia’s public universities for first degree in various fields from 2002 to 2010 has risen at the rate of minimum 3% and maximum up to 30% per year [4]. However, from this total database, the percentage of enrolment in engineering field has a constant rate of 15 ± 2 % increment. To be admitted in engineering bachelor program, most of the public universities will require qualification either matriculation, science foundation, diploma and/or Malaysian Higher School certificate (Sijil Tinggi Persekolahan Malaysia, STPM) with special academic requirements on selected subjects.

The objective of this paper is to explore the relationships between student admission academic background towards the learning outcome achievement for the civil engineering
subjects thought at the School of Engineering and Information Technology of Universiti Malaysia Sabah (UMS). This study emphasis on the pre-university background influence to their learning outcome focusing on selected subjects learned that related or applied in the undergraduate level. In spite of other main engineering accreditation requirements, one of the factors incorporated to assure program outcomes achievement is the student admission. However, the learning outcome of the graduates would be affected by several of factors either by the learners him/herself or also by the educators approaches and techniques. Hence, this paper focuses on specific sample study case evaluating the influence of pre-university admission to the learning achievement on comprehension and computation subjects learned throughout their four years of study.

II. METHOD OF STUDY

A. Sample case study

Consecutive cohort of 2 different sample batches of civil engineering graduates were compared and named as sample Case 1 and Case 2. For both sample cases, the analysis for student’s learning outcome (LO) is measured based on selected subject taken in every year of studies. Each cohort sample comprise of 43 students and 54 students respectively.

B. Subjects learning outcome achievement

Two subjects per year were randomly selected to reduce bias. However, subjects are categorized into two groups. The typical reading course (considered 60% comprehension) will be grouped as ‘A’ whereas subjects considered as computational (considered 60% calculation) will be categorized as ‘B’. The parameters of analysis were simplified in Table I.

The detail calculations of learning outcomes (LO) for each student on every subject were not discussed here. Basically the measurement criteria for the LO were based on student’s evaluations of examination, quizzes and assignments. The LO may depend on courses and lecturers and hence it is out of scope of the paper to outline the whole LO measurement technique.

However, to simplify here, each LO would be indicated into five categories (as listed in Table I); implying the educational course outcome achievement. Since the purpose of the paper is to explore the relationship of UMS civil engineering LO accomplishment to the student’s academic pre-university admission background, the paper focus on the established LO output of the subjects only.

III. RESULTS AND DISCUSSIONS

A. Student distribution characteristic

For both sample Case 1 and 2, the entry admission is divided into three major categories as shown in Fig. 1. Both cases have a comparable trend of percentage distribution of matriculation (also named afterward as matric), diploma and STPM distribution. The education background or entry from STPM has been the largest portion of group in both cases (58% and 48%) respectively, whereas student from matriculation were remain constant quantity of percentage.


<table>
<thead>
<tr>
<th>Factor of analysis</th>
<th>Parameter used in this work</th>
</tr>
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<tbody>
<tr>
<td>Student sample</td>
<td>Case 1 (n=43) and Case 2 (n=54)</td>
</tr>
<tr>
<td>Learning outcome (LO)</td>
<td>LO1-Very poor, LO is completely not achieved</td>
</tr>
<tr>
<td>Level Indication</td>
<td>LO2-Poor, LO is not achieved</td>
</tr>
<tr>
<td></td>
<td>LO3-Satisfactory of LO achieved</td>
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<tr>
<td></td>
<td>LO4-Good, LO of the course achieved</td>
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<tr>
<td></td>
<td>LO5-Very good, LO has excellently achieved</td>
</tr>
<tr>
<td>Subjects analyzed</td>
<td>Based on year of study; and mainly comprehension and computation content (Labeled as A and B respectively):</td>
</tr>
<tr>
<td></td>
<td>• Year 1 A. Engineering Geology</td>
</tr>
<tr>
<td></td>
<td>B. Engineering Mathematics</td>
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<tr>
<td></td>
<td>• Year 2 A. Construction Technology</td>
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<tr>
<td></td>
<td>B. Mechanics of Solids</td>
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<td></td>
<td>• Year 3 A. Hydrology engineering</td>
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<tr>
<td></td>
<td>B. Geotechnical engineering</td>
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<tr>
<td></td>
<td>• Year 4 A. Environmental engineering</td>
</tr>
<tr>
<td></td>
<td>B. Finite Element</td>
</tr>
</tbody>
</table>

The characters of the group sample in terms of gender and students origin for each category of pre-university background are further investigated in Fig. 2 and Fig. 3.

In terms of gender distribution, the overall was dominated by male student consist of 88% and 63% in the sample Case 1 and 2 respectively. From the matric group, 80% are male in Case 1 whereas only 21% in Case 2. The 79% of female student has been largely contributed from the matriculation group as shown in Case 2. However, male students are still the largest crowd for both STPM and diploma group.

The student samples in both cases were considered quite balanced in terms of student’s place of origin. Since university Malaysia Sabah is located in East Malaysia, location might influence the sample feature causing the overall percentage of students comes from Sabah or Sarawak (East Malaysia) were 60 ± 3%. The STPM intake has equalize the distribution of East and West origin as shown in Fig. 3.
Fig. 1 Percentage distribution of the sample case 1 and 2 according to background pre-university admission

Fig. 2. Percentage of male and female in both sample case study

Fig. 3. Distribution of student pre-university admission to the local origin (East and West Malaysian)

B. Overall influence on pre-university admission to the learning outcome achievement

In order to explore the influence of pre-university background of student through the four years of study, the frequency of student learning (LO) achievement with their respective group were compared.

Fig. 4 presents the overall student achievement and it was found that better LO was achieved by the STPM group. This could be attributed to their larger number in class. Hence, opportunity and study life endurance are higher compared to the other two groups.

Throughout the 4 years of study, the achievement of STPM students for LO4 is higher than matriculation and diploma students. On the contrary, the diploma students found to achieve LO3 better than the other groups. The ranks by majority on the learning achievement for the sample case are as follows: STPM-LO4>LO5>LO3>LO2, Matric-LO3>LO4>LO2>LO5>LO1 whereas Diploma-LO3>LO4>LO2>LO5>LO1.
C. Learning outcome achievement based on student yearly progress

However, when the group’s LO were further analyzed based on year to year course progress, an important trend were observed. As shown in Fig. 5, the analysis compares the total student percentage calculated based on group quantity to the measured learning outcome.

The figure illustrates the learning tendency between the three groups of STPM, matriculation and diploma in comprehension subject (Fig. 5-a). It was shown that for sample Case 1, at the beginning or first year, the optimum LO achieved by STPM (52%) and diploma (67%) was at level four (L04) but matric student (53%) of them attain L03. The difference in terms of student percentage however is very small. The rate of achievement could be influenced by the students learning attitude and university-life different perception that carried-away by the pre-university learning style. However, the group becomes equal when learns the subject course in the following years. This is shown by the similar LO tendency as the three groups keeps on adjusting to the education process and achieves the same trend until final year.

Whereas in sample Case 2 (Fig 5-b), most of matric group (58%) and diploma (44%) were a little behind compared to STPM group even though in the second year. Then, majority of 47% matric student’s learning achievement has decreasing to L02 in the third year. Matric group in Case 2 mostly attain L02 could be affected from second year learning continuance and then in third year, the course curriculum become more demanding as it requires extended engineering comprehension and concept application. The large difference range of achievement in sample 2 matric group in that year could also be influence by gender, associated to engineering course constraint and difficulties since this sample Case 2 involves female dominant (79%).

However, as shown in the Fig. 5 as well, the trend of majority LO achievement by each group for both sample cases resulting a significant findings toward the final years. In their final years, the trend has balanced and improved. Increase learning to L04 and L05 for all group of STPM, matric and diploma in the final year was observed. It reflects that most of the student were able to achieve better learning towards the comprehension course and became mature before exiting the university.
D. Influence of the subject content on the learning outcome achievement

The factor of subject type was also demonstrating a significant effect to the student’s learning outcome typically in the final year. The previous data shown in Fig. 5 provides the trend for comprehension subject. When similar investigation done for subjects that are more computation oriented, the measured learning outcome shows the influence trend as illustrated in Fig. 6. Typically the trend of LO achievement in the computation subject shows a large gap between the three groups especially in the 1st year. Both sample case 1 and 2 also has shows a low LO in the computation subject at the final year.

In Case 1 (Fig. 6-a), the majority of STPM group has achieved LO4 from the beginning first year up to third year, while for matric group, most of them achieved LO3 during their first and second year and improved their LO5 during their third year of study. On the other hand, for sample case 2, most STPM student achieved high LO (LO4 and LO5) for their computation subject even at the beginning year to their 3rd year.

The sample Case 2 (Fig. 6-b), matric group struggled a bit during their first year as 37% of them achieve LO2 and 32% gain LO3. However, they are then able to pick up and improve to better learning achievement in the following years.

In the final year, the measured learning achievement in computation subject was found difficult by most of them. Both sample cases show a decrease of LO and only several has achieve above the LO4 achievement. This might be related to the course taxonomy difficulty level and lecturer’s influence of learning assessment.

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