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Distinguishing Between Civil and Structural Engineering (CSE) and Civil and Environment Engineering (CEE) Programme from Student Perspective

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ABSTRACT

This study uses descriptive data to assess students' perceptions about the differences between the two programmes offered by the Department of Civil and Structural Engineering (JKAS). The programmes offered are Civil and Structural Engineering (CSE) and Civil and Environmental Engineering (CEE). Confusion about the name may be the key issue affecting programme selection by prospective students in their application for placement in the department, thus curtailing their keenness to join the department out of fear of choosing the wrong programme. A total of 95 respondents consisting of new intake students of Semester 1 Year 1 of the 2014-2015 session engaged in the questionnaire survey process conducted in this research. Data obtained were analysed using the percentage of the score on a Microsoft Excel 2010 spreadsheet. The results showed that the students may have understood and may have had some basic knowledge about the field of study and the syllabus offered designed exclusively for each programme. Therefore, from the perspective of the students, efforts aimed at rebranding the programme names were not necessary. However, there were some existing courses that were identified and proposed for rebranding as their names were misleading for the students.

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INTRODUCTION

Since 2008, Malaysia has been a member of the Washington Accord (Cui et al., 2012) that requires all Institute of Higher Learning (IHLs) members to adopt and implement the holistic Outcome-Based Education (OBE) system approach. For quality assurance, WA requires that all programmes be accreditated by a signatory body and in Malaysia, the body responsible for this is the Engineering Accreditation Council (EAC). The objective of the accreditation is to ensure that graduates of the accredited engineering programmes satisfy the minimum academic requirements in order to be registered as a graduate engineer with the Board of Engineers Malaysia (B. Malaysia, 2012) and for admission to graduate membership of the Institution of Engineers Malaysia (IEM) (M. Malaysia, 2011).

The results of the recent EAC accreditation visit to the Department of Civil and Structural Engineering (JKAS), Universiti Kebangsaan Malaysia (UKM) in 2013 raised the issue of the existence of the two programmes in JKAS, namely Civil and Structural Engineering (CSE) and Civil and Environmental Engineering (CEE). The accreditation-appointed panelists found that the implementation of the programmes did not reflect the name of the programme in the specialisation field of structural or environmental engineering. In addition, their report concluded that both the CSE and CEE programmes be run as a single Civil Engineering Programme. This was due to the fact that the depth and breadth of coverage and scope of the courses did not clearly distinguish between the two programmes. Hence, the accreditation reports from the EAC panels in 2013 suggested that the two specialised programmes be given fair reconsideration and and that essential revision of the curriculum structure should be implemented to ensure that the courses offered were appropriate and relevant to each programme name.

Confusion over the name of the engineering programmes has affected the management and implementation process of the programmes and has been studied through scientific research to overcome the problem. The profession 'engineer' is difficult to define and tends to be recognised by specific specialisation (Depieri & Lopes, 2014). A quantitative study by Marshall (2007) showed that the respondents' views about the word 'engineer' varied widely. His research found that only respondents who had advance knowledge of engineering were capable of distinguishing one engineering field from another and they could distinguish that the work of professional engineers is more creative and complex compared to that of other professions.

Apart from this confusion, statistics obtained from the Ministry of Education (MOE) found that some programmes scored lower in choice (FKAB, 2015). Thus, from the point of view of university management, a merger between the two programmes was seen to be the solution for a more economical, effective and efficient university management system.

The objective of this study was to identify the perceptions of new-intake

students towards the two JKAS civil engineering programmes and their ability to distinguish between the two as well as to study how they related to the programme. Two parameters were tested that included programme selection factors and the students' prior knowledge about the selected programme. This study used the questionnaire survey method, which gives non-experimental descriptive statistics data.

Background on Civil and Structural Engineering (CSE) and Civil and Environmental Engineering (CEE) Programmes

JKAS was established in 1984 with permission and instructions from the Ministry of Education Malaysia to distinguish between the civil engineering programme and other civil engineering programmes that existed in other IHLs in Malaysia. At that time, JKAS only offered the CSE programme with the main thrust of study centred on civil engineering. Then, in 1996, JKAS began offering both the CSE and CEE programmes to meet current demand during that period and increasing awareness of the need for global environmental protection and preservation. The CSE and CEE programmes offered six core courses subjects and three elective subjects. Both programmes met the guidelines and fulfilled the requirements stated in Appendix B (FKAB, 2015; B. Malaysia, 2012) for the civil engineering division. Therefore, all JKAS graduates could register as civil engineers under BEM and IEM.

According to the rules of the MQA Programme Standards for Engineering and Engineering Technology (2011), a condition for using the word 'and' or the symbol '&' in the name if an engineering programme requires a 1:1 ratio of elements in the two fields or subjects being combined i.e. a programme combining the two fields of engineering would have to offer 50% subject content in Civil Engineering and 50% subject content in Structural Engineering/Environmental. The naming of the Civil and Structural Engineering programme (CSE) and the Civil and Environmental Engineering programme (CEE) has, a number of times, misled the EAC accreditation expert panelists. Thus, the JKAS administration consulted with the industry advisory panel (IAP) and decided to conduct a questionnaire survey for future direction of JKAS programme naming for all stakeholders.

Students' Perceptions of the Programme

A review by Spoor (2014) focussed on two contexts that affected student perception of courses based on name of course prior to registration; the two contexts were course name and gender of instructor. The study found that the course name influenced the students' choice more than the gender of the instructor. More traditional course names were chosen by the students due to poor perception regardless of the actual content of the courses. Students were likely to choose an attractive programme name for engineering education because new-intake students do not have a clear overview of

the engineering profession as a whole. The first year at university is considered a critical learning period that affects the performance of students because of factors such as student expectations and challenges they are bound to face as new students adapting to university life. This can impact upon learning outcomes throughout their years of study (Liu & Chang, 2014).

Prior research has demonstrated that students' initial attitudes towards their diversity-related courses may influence their subsequent engagement in class and the quality of their learning experience (Spoor, 2014). However, there is relatively little research on examining the factors that shaped those initial attitudes. Spoor (2014) also mentioned that students who begin these courses with resistant attitudes and negative expectations tend to be less engaged, resulting in more negative experiences reported during the class. These findings were similar to those of Gati (2012), who found that the efficiency of an educational programme was highly dependable on the learning mode. Thus, students' perceptions of a programme play an important role in the education process.

It is interesting to note that Cui et al. (2012) reported that a successful curriculum relied on combining many different types of course and as such, an optimised curriculum structure is needed to achieve the goals of education. Therefore, in the JKAS context prior to curriculum reform such as the merging of two available programmes, it is necessary to determine which types of course are mostly in need of reformation. All available factors need to be considered, such as students' and other stakeholders' perceptions, course structure, course demand, course names and graduates' employability rate.

METHODOLOGY

This study used the questionnaire survey to determine student perception of the name of the programme. This instrument is more practical and efficient because it can improve accuracy and reliability of responses given by the respondent. Respondents are fully independent in stating their opinions or answering each item given in the questionnaire. In addition, the questionnaire survey method was used because it is one of the easiest ways to obtain information for research into perception, facts, beliefs, feelings and desires, among others.

The profile of the respondents was new-intake civil engineering students. The study was conducted during the first week of their enrolment at the university. Questionnaires were distributed during orientation week in the lecture hall. New-intake students were selected as they were considered fresh in their outlook and experience i.e they had yet to undergo the learning process, thus it was expected that they would answer the questionnaire using their existing knowledge as well as based on their reasons for selecting the programme through the *Unit Pengurusan Universiti* (UPU) system. A total of 95 JKAS students of Semester 1 of Session 2014/2015 were selected as respondents. Of these, a total of

46 students were from CSE specialisation, while the remaining 49 students were from CEE specialisation.

The questionnaire consisted of two main parts: Part A asked for background of the students, including gender, race, highest relevant academic achievement and other demographic items, while Part B consisted of questions that sought to measure the two parameters, namely the reason for having chosen the programme and the student's basic existing knowledge of the selected programme. Questionnaires that were completed by the respondents were analysed using Microsoft Excel 2010 to find the percentage score.

RESULTS

In this section, a summary of the data collected and data analysis will be described in four subsections according to the classification of items contained in the questionnaire survey. Demographics of respondents for both programmes are shown in Figure 1. In Figure 1a, we can see that both the CSE and CEE programmes had a higher percentage of females compared to males. Figure 1b shows that the majority (more than 78%) of the students for both programmes were matriculation graduates, followed by postgraduate diploma holders (about 20% of the students). Up to 98% of the students had a cumulative grade point average (CGPA) of 3.00 and above. This indicates that a higher CGPA score is compulsory for those who want to further their studies in civil engineering. Based on Figure 1d, for the CSE programme, 70% of the students stated that they chose CSE as their first choice compared to only 43% who said the CEE programme was their first choice.

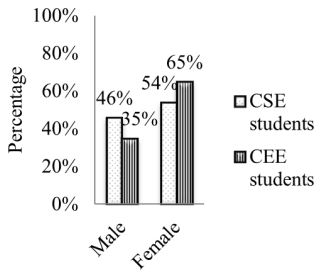


Figure 1a. Student gender.

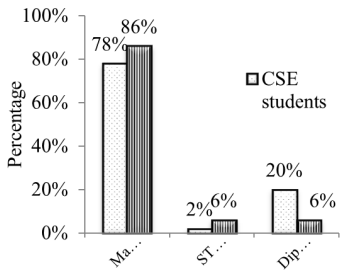


Figure 1b. Higher education.

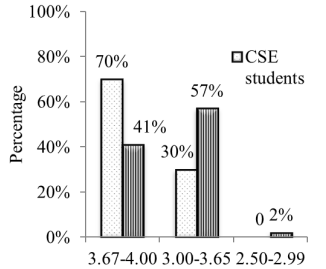


Figure 1c. Highest CGPA achievement.

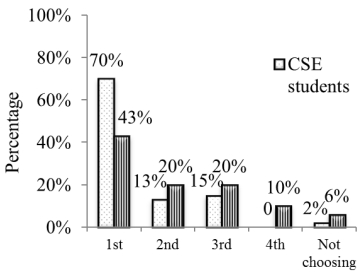


Figure 1d. Choice ranking.

Figure 1. Student demographics.

The first parameter of student demand can be measured directly by looking at the number who chose the CSE and CEE programmes as their first choice. The data show that hardly 50% of the CEE students chose CEE as their first choice.

There are several external and internal factors to explain these findings. Figure 2a and Figure 2b show that more than 63% of the CEE and CSE students chose their respective programmes based on personal interest related to the engineering field. The remaining 37% students listed other internal factors such as influence of parents, teachers and friends. As for the external factors, Figure 2b and 2d show that more than 80% of the students stated that they chose their programme based on the university's ranking and location. Other main external factors had to do with the main language used for course delivery and the attractive name of the programme. Several other factors were mentioned that did not play a significant role in the selection programme, accounting for only 20%.

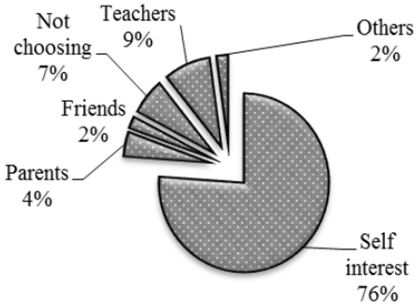


Figure 2a. CSE students – internal factors.

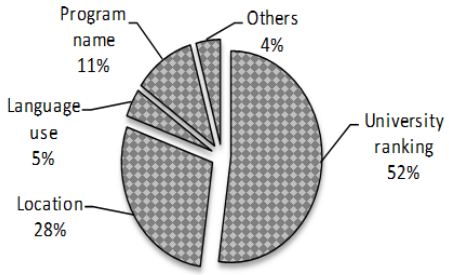


Figure 2b. CSE students – external factors.

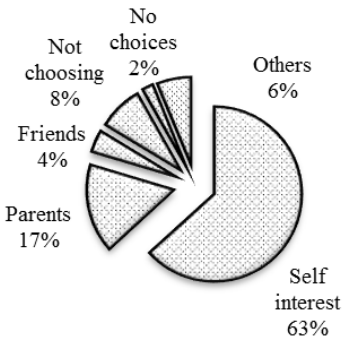


Figure 2c. CEE students – internal factors.

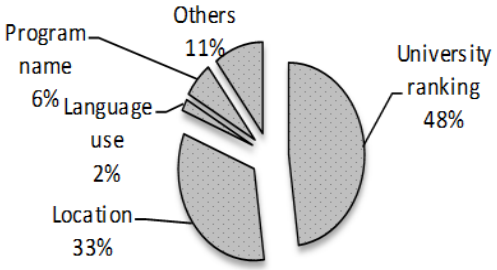


Figure 2d. CEE students – external factors.

Figure 2. Factors influencing the choice of programme by CSE and CEE students.

This offers the conclusion that the students chose CSE and CEE due to personal interest rather than coercion or persuasion of parents, friends, teachers and others. In addition to the factor of personal interest, the students also stated that they chose JKAS because of UKM's ranking as one of the top five research universities in Malaysia as well as its strategic location in Bandar Baru Bangi and its harmonious learning environment. Nevertheless, it should be noted that a percentage, although a small one, did select JKAS because they were attracted to the uniqueness of the names, CSE and CEE.

In terms of demand, CSE received a higher score compared to CEE, with the name of the programme being the only external factor. The percentage for this was smaller than for attraction due to the university's ranking status. As one of the top five research universities in Malaysia, UKM has indeed gained attention among new students as its research facilities are deemed an integral part of a reputable department, and therefore it is perceived as being able to cater for better education.

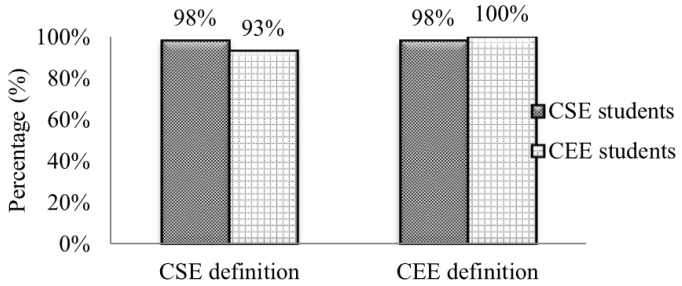
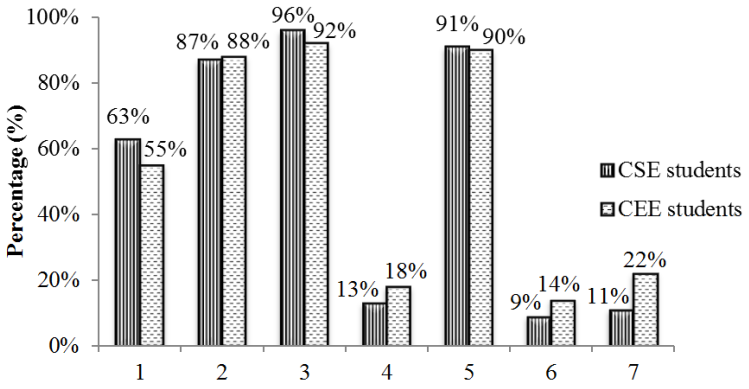


Figure 3. Number of students who stated the appropriate definition for each programme.

In this part, each respondent was required to give the definition of both programmes, CSE and CEE. Students from both programmes were able to provide a precise definition for both the CSE and CEE programmes, with over 90% of the students answering correctly as shown in Figure 3. The majority of the students stated that the CSE programme was a programme leading to structural design courses, while CEE was a programme that included the design of effluent and wastewater reactors as well as learning about factors involved in environmental impact assessment (EIA). Thus, the students showed a significant amount of awareness of what their programme of choice entailed. In addition, they could distinguish the fields of study for both programmes. Such findings indicated that there were really no issues regarding the name of the programme such as student confusion over the name.

The following section examines the students' ability to distinguish seven core courses for the CSE and CEE programmes. The students were expected to be able to state if the courses were either core courses for either the CSE or CEE

programme or core courses for both the programmes. Figure 4 shows that the majority of the students answered correctly for the Structural Analysis, Bioreactor System, Steel and Timber Structural Design and Principle of Chemical Process courses. The results imply that the names of the courses were appropriate and represented the specialisation in the respective field of the programme. However, the students from both programmes were found to be confused with the following three course names, namely Integrated Design Project, Reinforced Concrete Design and Highway Engineering, with only 22% getting the correct answer. Lack of student skills caused difficulty in finding common ground to integrate these core courses and led to their inability to discern and to understand the relevance of the three courses offered. In JKAS adaptation, great effort is made by the lecturers to distinguish clearly the difference in each of the project-orientated problem-based learning for the three courses named above to make sure that each student is able to solve the problems related to their specialisation i.e. either structural or environmental engineering.



Course names:
1. Structural Analysis
2. Bioreactor System
3. Steel and Timber Structural Design
4. Integrated Design Project
5. Principle of Chemical Process
6. Reinforced Concrete Design
7. Highway Engineering

Figure 4. Percentage of correct student answers to question related to distinguishing the core courses of the programme.

In brief, the students formed a preconceived perception that only environmental-based courses were offered in the CEE programme, while the CSE programme taught the more heavy-duty core civil engineering-related courses.

This could be a result of having taken the programme name literally, focussing on the programme's keywords, 'environmental' and 'structural'.

DISCUSSION

This study can be considered a descriptive perception survey and the sample is limited to new-intake civil engineering students. Data collection was done during their orientation week. Overall, the study found that there was high demand for the CSE programme compared to the CEE programme. The high demand came from the students' own will and personal interest rather than from coercion of any individuals such as parents, friends or teachers. The selection of the programme was heavily influenced by external factors, namely UKM's ranking as one of the top five research universities in Malaysia (Liu & Chang, 2014). Being a research university (RU) gave JKAS extra pulling power in attracting new students both local and international as this reputation was a promise of good research facilities and lecturers recognised globally for their research expertise. In addition, there was also the preconceived notion that they would get good exposure to latest technology and the industry. It is interesting to note that the uniqueness of the programme name contributed to only a small fraction of the external factors i.e. less than 12%. Thus, the name of the programme did not play an important role in programme selection. It could also be ascertained based on the statistical data that the students were mature enough and had a reasonable overview of their programme choices in terms of programme definition and the role and the scope of work. Confusion did arise on some of the course titles offered and to which programme they belonged. This did not come as a surprise, knowing the fact that the respondents had just entered university and they had just begun their orientation week. It is hoped that their confusion will be dispelled by the time they commence their studies, especially with help from committed lecturers, mentors and seniors.

CONCLUSION

Based on the data obtained and from student demand, the idea of the programme mergers was in concurrence with this study, without neglecting the interests and needs of environmental and sustainability awareness. Hence, this should overcome the issue of confusion in selecting a civil engineering programme in UKM. With a series of reviews and a detailed new programme structure complete with course titles that are specific to the field that is represented, a new comprehensive civil engineering programme is expected to be produced by UKM. It is hoped that the findings of this study can pave the way for the administrators and the department lecturers to chart JKAS' future direction. Further study needs to be done with a greater number of respondents and respondents should include other stakeholders who are necessary to obtain more accurate results.

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