ACADEMIC PERFORMANCE OF IUKL INTERNATIONAL STUDENTS IN MATHEMATICS-BASED AND SCIENCE-BASED SUBJECTS

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ABSTRACT
This study is to determine the level of academic performance of the international students in Mathematics-based and Science-based subjects in Infrastructure University Kuala Lumpur (IUKL) and the factors that influence the international students in studying both subjects. 291 respondents were randomly selected to answer the research questionnaires. They were chosen from five faculties in IUKL. Three types of analyses used in this research were the calculations of arithmetic means, Kruskal-Wallis test and Spearman's Rank Correlation. The findings showed that 60.1% of the international students have poor academic performance with CGPA below 3.000. It is also revealed that there are significant differences between the students' overall performance and their grades in both Mathematics-based and Science-based subjects. While the correlations between the students' overall performance and their grades was 0.544 for Mathematics-based subjects and 0.536 for the Science-based subjects. Further analysis showed that student-lecturer interaction, support services and student characteristics have significant differences with the students' grades in Mathematics-based subjects while for the Science-based subjects, only student-lecturer interaction had a significant difference with the students' grades.

Keywords:
Academic performance, International students, Mathematics-based subjects, Science-based subjects, Cumulative Grade Point Average (CGPA)

INTRODUCTION

Over the past decade, Malaysia has become the fastest growing destination for international students, showing an annual increase of over 16%. Its average ratio is almost 1:10 which is one of the highest proportions of international versus domestic students in the academic world. The Second Education Minister, Datuk Seri Idris Jusoh stated during the Educational Malaysia International Development and Marketing Convention 2015, Malaysia had 135,502 international students from 160 nations studying in public and private higher institutions in Malaysia as well as the international schools as at 31 December 2014. Out of the total, there were 74,996 international students studying in private tertiary institutions. This shows an increase of 29.9% from the year 2013 (The Sun Daily, 29 January 2015).

Infrastructure University Kuala Lumpur (IUKL), one of the private tertiary institutions in Malaysia with its vision to be a world-renowned infrastructure university also has a population of roughly 33% of international students at present. In Faculty of Applied Science & Foundation Studies (FASF), there is approximately 50% of the Foundation in Science students are international students.

With the increasing number of international students studying in overseas including Malaysia, there has been a growing interest in exploring the factors that influence their academic performance during their studies. Findings from Ali (2013), Ali et. al. (2013) and Freeman et. al. (2014) have shown that there are significant factors which influence the academic performance

of the high and poor achievers such as teaching style, the medium of instructions, assessment methods, students' attitude towards lecturers and much more.

In IUKL itself, it has been noticed that the international students face some difficulties to perform in the Mathematics-based subjects (MBS) and Science-based subjects (SBS) compared to the local students. Data of international students' results from FASF for three MBS and five SBS subjects were taken from September Semester 2014 final examinations. The data showed an average of 83.3% and 89% achieved the grades of B- and below respectively. Thus, this research investigated the factors why the international students faced difficulties to perform excellently especially in these subjects and discussed the methods to overcome the problems. The respondents of this research were randomly selected from students of the five faculties in IUKL; namely Faculty of Engineering and Technology Infrastructure, Faculty of Architecture and Built Environment, Faculty of Business and Accounting, Faculty of Creative Media and Innovative Technology and Faculty of Applied Science and Foundation Studies.

LITERATURE REVIEW

Mathematical knowledge is significant to students who undertake college science subjects, this includes even the biology subjects (Sadler and Tai, 2007). In another research by Nakakoji et. al. (2014), the level of mathematics knowledge is found to be an influencing factor to overall pass rates in science, technology, engineering and mathematics based diploma or bachelor programmes. In a research to investigate student performance on chemistry subject, the reason for poor performance is found to be poor basic knowledge in mathematics such as division, multiplication, fractions and ratios (Scott, 2012; Hoban et. al., 2013). In accordance with this, Becker and Towns (2012) found that students couldn't perform in physical chemistry subjects due to inability to transfer between mathematical and chemistry context.

Students are required to perform excellently in the pure mathematics and science courses as eventually they are required to take up applied mathematics and science-based courses throughout their programmes. Thus, a good foundation in these subjects is essential for their upcoming semesters till they graduate.

However, in the current circumstances, students are seen to perform poorly in these courses and producing low CGPAs. From past studies, Scott & Graal (2007) reported that lower CGPA points are due to the poor performance of students during their prerequisite undergraduate courses which consist of mathematics and science courses such as algebra, calculus, chemistry, biochemistry and many more. Student's academic performances are influenced by several factors either personal to the students or external. Mainly there are 3 major factors which influence low academic performance; students, parents and teachers/lecturers (Diaz, 2003). Nevertheless, it is to be noted that the influencing factors do vary from time to time due to the academic environment, individualistic factors and background, and cultural values embedded to the students.

STUDENTS

Student factor plays an important role in determining their academic performance. Obtaining a good grade in their studies depends on the amount of effort a student undertakes in his/her studies, revision and training for the respective courses undertaken (Ali et. al., 2013). In addition to this, previous educational background and knowledge on certain courses also do help the students in their preparation for the course (Anderson & Benjamin, 1994). Generally, students are given typical courses like calculus, algebra, physics and chemistry in their first and second years to strengthen their skills and knowledge. Students with good mathematics grades in their high school, have a strong foundation to pursue these courses. Rylands & Coady (2009) found that secondary

school mathematics results are the benchmark on the students' preparedness for undertaking university mathematics and mathematics-related courses. A recent research by Nicholas et. al. (2015) supports this finding. Analysis on students taking science based degree programmes shows that students with experience of undertaking higher level mathematics during their High School Certificate (HSC) are more successful in their first-year science and mathematics courses.

Attending classes at least up to 80% is made compulsory for all students in IUKL to ensure their commitment towards the subject. It is noted that students who are frequently missing their classes do perform poorly in their subject. Romer (1993) found that students' attendance is related to their academic performance. Though students can do personal studying to cover the syllabus missed, but most of the times either the students procrastinate and do not study or in certain cases, they do study but do not understand the syllabus and they have no one to refer to in the event of his classmates also are unsure or not very clear on the topics. At this point, they still are required to refer to their lecturers where most of the times students neglect to do so as to avoid reprimanding from their lecturer for being absent from the class. In the long term, these students tend to fall back in their studies. Thus, poor class attendance indirectly will influence the academic performance. In a study by Newman-Ford et. al. (2009), it was found that students skip classes due to the pressure from the assessment, the commitment required for team works, the mismatch between lecture presentation methods and also class timing.

PARENTS

Parents' education background influences the students' academic outcomes. An educated parent is able to assist or give guidance to their children on how to complete their homework, assignment or even teach and guide in certain topics that students are facing difficulties. It indirectly gives confidence to the students that they have a comfortable place to turn to if they don't understand their lecture. Especially for mathematics and science-based subjects, parents with a strong background in mathematics and science courses can assist in courses related to mathematics and science.

Next factor will be family economic status. A family with good financial standing are able to support the students financially through their education. At this point, the students have free mind to concentrate on their studies and not to worry about his/her tuition fees or working part-time to support himself/herself during the 3 or 4 years that they are enrolled in the programme (Ali et. al., 2013).

TEACHERS / LECTURERS

Students learning preference is a crucial matter in assisting a student's academic performance (Harb & El-Shaarawi, 2006). Teaching styles or methods practiced by the lecturer must be in line with the students learning styles. In general, any class will comprise with students practising various learning styles. A lecturer must be competent to mould and nurture all types of learning preference of his/her students. The lecturer must be able to create new ways or methods that cater his/her students learning styles. In terms of learning preferences, Reid (1995) noted that it's an individual's nature of habits and preferred methods in acquiring knowledge. When a lecturer chose a particular method of delivering his/her lecture, only the respective group who are in the same mind of learning with the lecturer will benefit. This will affect the students' academic performance in the long run. Thus, good connectivity and interaction between the lecturer and students during the lectures have a significant influence on the students' performance on the respective subjects (Ali, 2013).

OTHER FACTORS

Various studies were done on gender differences on academic performance. Park et. al. (2012) analysed Korean students' gender differences; the research found that students from single-sex school gain higher scores regardless its female or male schools. Research by Eisenkopf et. al. (2014) gave a positive outcome for performance in Mathematics subjects among female students from single-sex education. Also the female students from single-sex education background in UK showed better academic results (Booth et. al., 2013). In contrast, some other researches showed there is no relation between female and male students in their academic performance (Borde, 1998 & Hyde et. al., 2008).

In random, there are further factors as well that influence students such as students confidence level, emotional problems, poor infrastructure and lack of resources and textbooks (Zakaria & Bamidele, 2015, Ali, 2013).

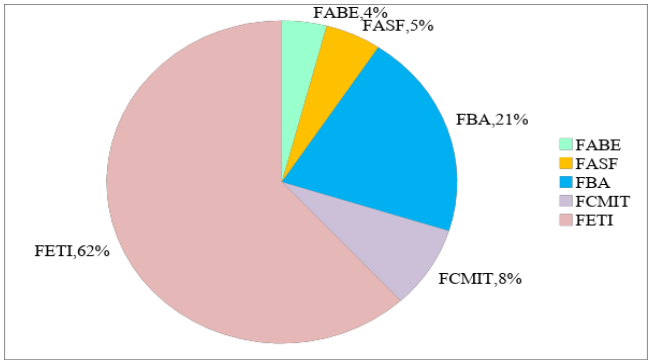
METHODOLOGY

This study was a survey based research. A 6-point likert scale questionnaire comprising of three sections to collect information on personal information, factors influencing student's performance in MBS and SBS, and suggestions to improve academic performances, were distributed to the respondents. 24 items from the questionnaire were used for the analysis. The respondents in this research were randomly selected from Bachelor, Diploma and Foundation programmes from the five faculties in IUKL; which were Faculty of Engineering and Technology Infrastructure (FETI), Faculty of Architecture and Built Environment (FABE), Faculty of Applied Science and Foundation Studies (FASF), Faculty of Creative Media and Innovative Technology (FCMIT) and Faculty of Business and Accounting (FBA). A valid 291 questionnaires were collected from the respondents and used for analysis. SPSS 20.0 software was used to analyse the data collected. The three analyses used in this research were Arithmetic Means, Kruskal Wallis and Spearman's Rank Correlation.

FINDINGS

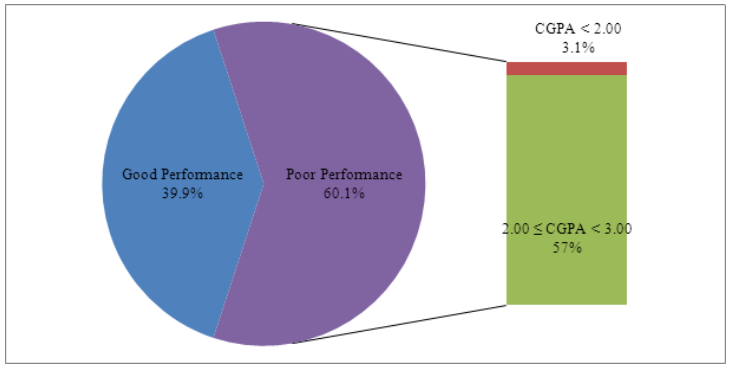
From the 291 respondents, 86.6% were male students while 13.4% were female students. It is to be noted here that IUKL population has higher male students than the female students. The respondents were segregated according to the faculties - FETI, FABE, FASF, FCMIT and FBA. The Figure 1 below shows the distribution of respondents as per faculties.

Chart 1: Distribution of respondents according to faculties



The highest percentage of respondents was from bachelor programmes (96.3%) and the rest were inclusive of students pursuing diploma and foundation programmes. For the purpose of this research, the students were categorized into two; good performing students and poor performing students. Good results were set at CGPA of 3.000 and above, while poor results were set at CGPA of below 3.000. The Figure 2 below shows the distribution of the CGPA bearers.

Chart 2: Good and poor performing CGPA of respondents

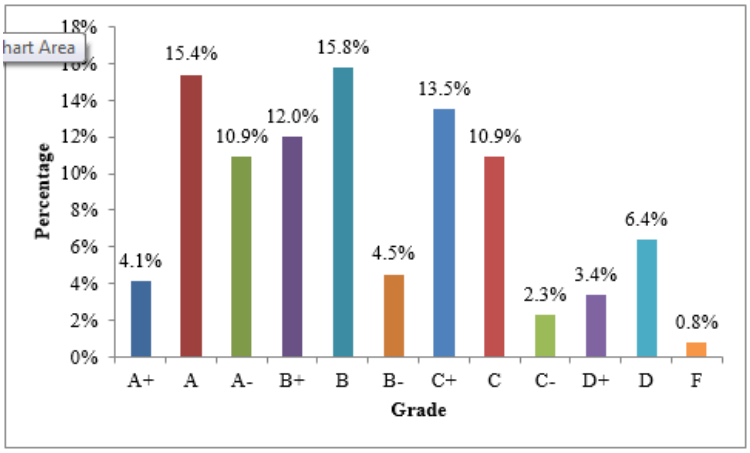


The grading system used in IUKL to evaluate the students is shown below.

Grade	Grade Points	Marks %
A+	4.00	95-100
A	4.00	85-94
A-	3.67	75-84
B+	3.33	70-74
B	3.00	65-69
B-	2.67	60-64
C+	2.33	55-59
C	2.00	50-54
C-	1.67	47-49
D+	1.33	44-46
D	1.00	40-43
F	0.00	0-39

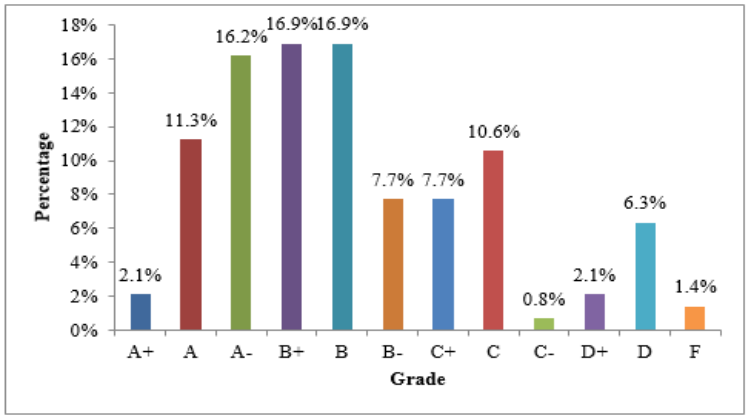
This research specifically focused on students' performance in MBS and SBS. In this research, the outstanding result was set as A+, the good result was set from grade A to B and the rest was the poor result. The following figure shows the distribution of student's results for MBS.

Chart 3: Distribution of students' results for MBS.



The next chart shows the distribution of student's results for SBS.

Chart 4: Distribution of students' results for SBS.



The students' results in SBS were also categorized as outstanding (A+), good results (A to B) and poor results (B− to F). It is found that only 2.1% of the respondents achieved outstanding results, followed by 61.3% achieved good results and the remainder 36.6% had poor results.

The level of academic performance of the international students in MBS and SBS was tested using Kruskal-Wallis. The first test involved two variables which are students' CGPAs and their grades in MBS. The null hypothesis is rejected (p-value = 0.000) and it was concluded that there is a significant difference between the two variables. The second test was repeated for SBS. There is a significant difference between the students' overall performance and their grades in SBS (p-value = 0.000).

Further analysis using Spearman's Rank Correlation test for the grades for MBS and SBS showed a significant correlation (both p-values = 0.000) toward CGPAs. The rho value between students' CGPA and grades of MBS is 0.544 while the rho value between students' CGPA and grades of Science-based subjects is 0.536. These values reflected moderate correlation.

FACTORS THAT INFLUENCE STUDENTS' ACADEMIC PERFORMANCE

Factors that influence the students' academic performance analysed in this research were categorized into four groups which were student-lecturer interaction, support services, student interaction and student characteristics. The findings showed that student-lecturer interaction, support services and student characteristics had a significant difference with the students' grades in MBS ($p = 0.036$, $p = 0.046$ and $p = 0.024$) while they showed no significant difference between student interaction and the students' grades in MBS ($p = 0.091$).

Next, analysis on SBS showed that student-lecturer interaction had a significant difference with the students' grades in SBS ($p = 0.040$) while they showed no significant difference between support services, student interaction and student characteristics and the students' grades in SBS ($p = 0.196$, $p = 0.723$ and $p = 0.290$).

CONCLUSION

The findings showed that higher percentage of the international students (60.1%) had poor academic performance (CGPA below 3.000). It also showed that one-third of them scored below grade B for both MBS and SBS which were 37.7% and 36.6% respectively. The results obtained from Kruskal-Wallis test proved a significant difference between the students' overall performance and their grades in both MBS and SBS. While the correlations between the students' overall performance and their grades in MBS and SBS were moderate which are shown from the results of Spearman's Rank Correlation test. Additional Kruskal-Wallis test was done to determine the factors that affect and help students in studying MBS and SBS in IUKL. The results showed that student-lecturer interaction, support services and student characteristics had significant differences with the students' grades in MBS while there was no significant difference between student interaction and the students' grades in MBS. On the other hand, SBS results showed a different pattern where the student-lecturer interaction had a significant difference with the students' grades in SBS while they showed no significant difference between support services, student interaction and student characteristics and the students' grades in SBS.

RECOMMENDATION

Challenges in studying MBS and SBS are not limited to the poor performing students alone. Even the good performing students also face some challenges at one point of their education journey. These subjects are compulsory for the students to train the way they think and practice on how to solve problems. Thus, it is crucial to find ways and methods to help our students in tackling these issues.

Five top methods recommended for the students based on the research findings are as listed below.

i) Do not skip class (72.2%)
ii) Consult with lecturer on the lesson which are difficult to understand immediately (25.8%)
iii) Study smart (25.8%)
iv) Pay attention in class (25.4%)
v) Do all assignment by oneself, do not simply copy from others (21.3%)

There are also some recommendations given spontaneously by the respondents which are useful.

"Always ask questions" (Student 266, male, BSAR)
"Be more friendly with other students" (Student 269, male, BITNT)
"Cultivate discipline" (Student 236, male, BEC)
"Do everything on time" (Student 226, female, BBA)
"Focus on the study and the reason behind this effort" (Student 182, male, BCE)
"Lecturer should always pay more attention to those students" (Student 6, male, BCE)
"Read last year final paper" (Student 162, female, BTCM)
"The teacher should force the good students to help the weak students" (Student 192, male, BCE)
"We just need better environment" (Student 130, male, BCE)
"Weak students also try to improve their selves not only waiting for help from others" (Student 195, male, BCE)

Overall, it is recommended that both parties should help each other in bringing up the poor students' academic performance. The weak one has to work for it as well as the good ones can help the peers in understanding the subject. Besides, lecturers also have to keep an eye on the poor performing students as well as coach them in their studies.

LIMITATIONS

Researchers faced difficulties in obtaining respondents to answer the questionnaire because many of them were reluctant to disclose their results.

SIGNIFICANCE OF STUDY

This research is significant to the academic communities, parents and students. It provides the educators with the information on the problems and factors influencing the students' performance hence they can find rooms for improvement on their teaching methods and provide better learning environment for the students. As for the parents, this research enlightens their understanding on the strengths and struggles faced by their children. Parents will be able to understand their children's problems, if any and give necessary advice and support to them. On the other hand, the students are able to overcome the problems that they are facing. In addition, IUKL is able to produce graduates with good knowledge in the two disciplines.

FUTURE RESEARCH

In future, it is suggested that researchers extend the sampling to the local students and make comparison between the performance of international and local students in MBS and SBS.

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