

Examination Achievement of Engineering Students from UKM and UDE : A Comparison

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ABSTRACT

Under the double-degree programme offered by Universiti Kebangsaan Malaysia (UKM), a number of Universitat Duisburg-Essen (UDE) students are required to study in UKM for one semester each year. They are free to choose any courses offered in the programme for that particular semester. In Semester 1 of the 2014/2015 session, the Department of Mechanical and Materials Engineering ran four courses that were enrolled in by students from both universities. Given the different background, ways of thinking and academic competencies, it was expected that the students would perform differently and it was predicted that the German students would demonstrate better achievement compared to UKM's mostly Malaysian students. The objective of this study was to discover if there was a difference in terms of performance between the international students and the host students who took the same courses. This paper consists of three main sections. First, after a general introduction of the study, the methodology is explained. Second, a comparison of examination-based achievement in four selected courses between the two groups of students is presented in summary. Finally, some possible reasons as well as explanations for the

difference or similarity in the performance of the two groups is considered. The findings suggest that in general, students from UDE showed better performance than the host students. In the long term, this study is intended to be useful in improving the quality of teaching and learning in UKM, specifically when dealing with students from UDE as well as home students.

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INTRODUCTION

Since 2000, Universiti Kebangsaan Malaysia (UKM) and Universitat Duisburg-Essen (UDE) have been collaborating on a double-degree programme, which enables students from various engineering fields to complete their degree at both universities. UKM students who are interested must have excellent academic results of at least 3.0 CGPA in their third year. Those selected will have to take up German language classes for at least 300 hours before leaving for Duisburg, Germany (Nasir, 2013). Additionally, each year, students from UDE will study in UKM for one semester, taking any offered courses in the programme. Upon completion, students will graduate with two degree certificates from both partner universities.

Since the launch of the double-degree programme, both partners have committed themselves to intensive and growing

cooperation in the field of research and education. In every academic session, students from UDE are free to choose the courses they wish to enrol in. If they pass these courses, they are exempted from similar courses in UDE as the credit is transferable. Since UKM hosts UDE students for only one semester, the courses taken in UKM are based on the fundamental knowledge they gained from their previous semesters in UDE.

Courses Involved

Four courses were selected randomly for this study: Thermodynamics 1 (KM2114), Control System (KP3254), Planning and Production Control (KP4334) and Manufacturing Strategy Management (KP4373). In Semester 2 of the academic session of 2014/2015, these courses were offered and taken by both groups of students. The number of students for each course is tabulated in Table 1.

Table 1
Number of Students in Each Course

| Courses | UKM | UDE |
|--|-----|-----|
| Thermodynamics (KM2114) | 48 | 16 |
| Control System (KP3254) | 15 | 23 |
| Planning and Production Control (KP4334) | 21 | 3 |
| Manufacturing Strategy Management (KP4373) | 13 | 6 |

For each course, the students were assessed through projects, laboratory work and examinations. The number of UDE students varied as they were free to choose their courses. Four courses were chosen;

general information on each course is presented below:

- 1) Thermodynamics 1 (KM2114) – This course provides exposure, knowledge, understanding and synthesis of

the main characteristics of the first law of thermodynamics and its basic properties, properties of pure substances, control volume analysis, the second law of thermodynamics and entropy analysis. Students will be exposed to experimental and calibration work on the measurement of temperature and pressure. In the first semester of the 2014/2015 academic session, 48 UKM students and 16 UDE students registered for Thermodynamics 1.

- 2) Control System (KP3254) – This course aims to introduce the methods of analysis and design for feedback control systems. It includes modelling of mechanical, electrical and electromechanical systems, analysis of feedback control systems using time domain techniques (Routh-Hurwitz stability criterion and root locus) as well as frequency domain techniques and design of control systems using PID and lead-lag compensation methods. Fifteen UKM students and 23 UDE students enrolled for this course.
- 3) Production Planning and Control (KP4334) – The objective of this course is to convey knowledge, understanding and synthesis in the area of production planning and control. It covers production management problems in manufacturing systems including theories and practical knowledge of qualitative and quantitative planning. Therefore, it is strongly relevant to academic and industry application.

Only three students from UDE signed up for this course, while from UKM, there were 21 students.

- 4) Manufacturing Strategy Management (KP4373) – This course provides exposure to organisations and systems as well as knowledge, understanding and synthesis. It also applies the system concept in the organisation, mission, objective, goal, work and strategy. This includes the process of modelling organisation strategy, unity of function units, corporate strategy and internal and external analysis and value chain analysis to identify the internal and external strength of an organisation as a corporate strategy shaper. Students are also exposed to the unity of corporate strategy and the implication of strategies in manufacturing, particularly in manufacturing process selection, human resources strategy, which is human resource management, the effect of changes to organisational structure and the effect of technology on an organisation. Thirteen UKM students and six UDE students took this course.

Assessment

During the 14 weeks of the course, lectures were conducted for an average of 3 hours per week. In general, after seven weeks of lecture, students will sit a mid-semester examination that covered all the topics taught in the first half of the semester. By the end of the semester, students would sit a final examination aimed at evaluating

their understanding of the course. These examinations represent 20-30% and 50-60% of the overall assessment for the course, respectively. Examination questions are designed based on the lectures; the questions are put through a moderation process at the departmental level in order to ensure all examination questions are up to the expected high standard and quality compliance required by UKM.

Additionally, during the 14 weeks of the integrated project, laboratory work must be done according to schedule. For open-ended laboratory assignment, students are free to design the experiment based on the topic and problem statements provided. The assessment for this part consists of a proposal presentation, final presentation and a written technical report. However, the project assessment is done in groups, which means that every group member gets the same score as each member is assumed to have contributed fairly in conducting the experiment. Other than academic assessment, students are also assessed for generic skills to fulfil all the outcomes set in Outcome-Based Education (Tahir et al., 2013).

Research Problem

Sharing the same culture and educational background has led to a degree of lack of enthusiasm in being competitive among local students. It was expected that the presence of new classmates from a different country could increase the desire and will to compete among local students in order to better their grades. Therefore,

as a quantitative measurement, individual achievement in terms of examination was believed to be an effective tool to use for comparison.

The major aim of this study was to identify the difference between international and local students by comparing their individual achievement based on examinations in various courses. It was expected that the comparison would yield input for re-evaluation of teaching and learning for future improvement.

Nevertheless, this study limited the comparison to only individual performance so that only two main examinations were taken into account. The comparison was made by evaluating only the average achievement of a set of students rather than to focus on every student individually.

METHODOLOGY

The methodology used in this study was straight to the point. Data were gathered from the marks of multiple courses taken by the UDE students. By the end of the semester, after completing all the assessments, the marks were recorded in the provided template. For each course, students were divided into two groups, UKM and UDE, and then, by focussing only on the examination results, their achievement was compared.

Analysis of data was done using Microsoft Excel as the analysis was limited to only a simple statistical analysis. Based on the raw data collected, bar charts representing the average achievement values were plotted for the mid- and final

examinations for the four selected courses. Other than the average score, standard deviation was calculated and presented in a separate table as the average value alone may not have been sufficient to represent the score.

Comparison Analysis

From the data analysis depicted in Figure 1 and Table 2, it can be clearly seen that the group from UDE scored higher than the UKM students on all the selected courses. For KP3254, 46% of differences between the two groups of students was obvious; however, the standard deviation showed a high value, revealing the fact that in the same group of students itself, the scores were scattered. KP4334 also showed

obvious differences, but notably, there were only three students from UDE who took this course. Thus, the low value of the standard deviation might have been caused by the small number of students. Nevertheless, the comparison of standard deviation for each course in general proved that students from UDE presented comparable performance among themselves.

Data analysis for the final examination results showed that UDE students scored slightly higher than UKM students only in two courses, KM2114 and KP3254, while the other two courses showed different results. In Table 3, the highest standard deviation for KP4334 proved that a small number of UKM students in the group are in the excellent category while the rest are in the average category.

Table 2
Mid-Semester Examination Analysis

| Course | UKM | | UDE | |
|--------|---------|--------------------|---------|--------------------|
| | Average | Standard Deviation | Average | Standard Deviation |
| KM2114 | 68.90 | 12.72 | 84.20 | 8.63 |
| KP3254 | 27.73 | 20.67 | 73.83 | 7.48 |
| KP4334 | 68.67 | 9.56 | 96.67 | 3.06 |
| KP4373 | 60.15 | 15.48 | 66.67 | 11.57 |

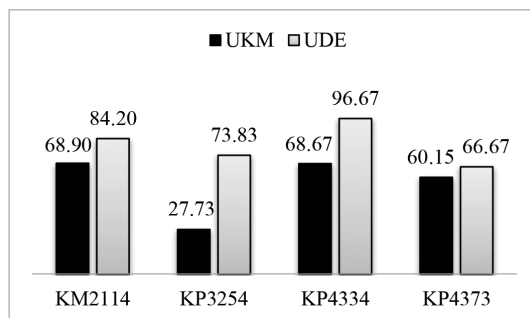


Figure 1. Average score for mid-semester examination.

Table 3
Final Examination Analysis

| Course | UKM | | UDE | |
|--------|---------|--------------------|---------|--------------------|
| | Average | Standard Deviation | Average | Standard Deviation |
| KM2114 | 56.48 | 14.63 | 65.06 | 13.52 |
| KP3254 | 45.60 | 13.11 | 58.35 | 10.26 |
| KP4334 | 64.90 | 18.01 | 56.67 | 8.14 |
| KP4373 | 82.46 | 13.36 | 80.83 | 6.21 |

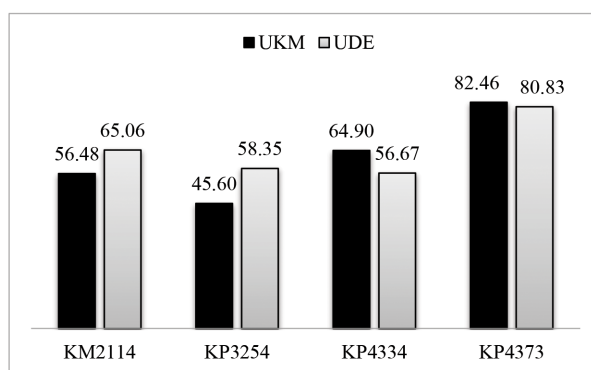


Figure 2. Average score for final examination.

Assumptions and Inferences

The comparison analysis of average achievement showed that there were noticeable differences between the two groups of students in the mid-semester examination although the gap became narrower in the final examination. In any examination, all the students are tested on knowledge gained from the same lectures and through the same learning process. This fact supported the idea that students from UDE have put more effort into self-learning than did the home students. Self-learning outside the classroom might have contributed as the main factor for this result as the students from different backgrounds would choose different study approaches

(Husain et al., 2013). The difference might be caused by different learning methods adopted by the students. According to a study conducted by Tawil et al. (2012), there are various learning approaches, for instance traditional learning, e-learning, individual and group study.

The assimilation process can prepare students to adapt to and even do well in a new environment (Zepke & Leach, 2005) and it seems that students can successfully integrate and adapt to new, challenging institutional settings. Being away from their homeland and out of their comfort zone might have helped the German students to perform better in UKM. A study conducted among Malaysian students

studying abroad and students enrolled in the same programme in UDE showed that their personality changed with respect to the changes in environment and culture (Mughtar et al., 2010). It is believed that a similar occurrence happened with the UDE students in this study.

Despite these general assumptions, research findings on the effects of studying abroad cannot be generalised across programmes (Ecke, 2014). Nevertheless, the relevance of this point must be clearly supported by future studies on a specific cohort of students. Mastor et al. (2011) in their study focussed on the UKM-UDE double-degree programme and found that in order to adapt to the challenge of cultural distance, exchange students showed noticeable changes in their attitude, personal characteristics and lifestyle.

For the international students, joining the double-degree programme should motivate them to score high grades on all courses taken in Malaysia as failing to do so would require them to repeat the same course in Germany, which was what they had wanted to avoid by coming to Malaysia in the first place. Only excellent students, selected from informal interviews, are offered the opportunity to join the double-degree programme. Apart from the academic requirement of showing excellent grades, they also found that making the decision to study abroad was also challenging, despite the increasing number of students joining the programme each year since it was launched in 2003. The option to further study abroad is not a one-

time choice but the outcome of different long-term processes (Carlson, 2013). Therefore, other than the opportunity for extensive social interaction, the foreign students were aware why they were in UKM. This was probably the main reason why this group of students struggled very hard to achieve good results.

Although there was no direct evidence nor explicit study conducted on fundamental knowledge of the two groups of students, it was presumed that the fundamental knowledge gained possessed by the UDE students from their study in the University of Duisburg-Essen was strong and sufficient for them to understand the course, answer the examination questions and finally attain better results. Obviously, all four courses taken in UKM had not been offered to these students in UDE. There are some courses that must be taken prior to these four courses. Regardless of where and how they learnt the basic knowledge, possession of strong fundamentals would have enabled them to understand the courses better.

The fact that both countries use a different educational system should not be overlooked. The Malaysian educational system is more examination-orientated compared to Germany's. Despite readiness to adapt, students from UDE faced a form of cultural shock as assessments were weighed too high. In addition, the systematic way of conducting examinations in UKM led them to perceive that to succeed in their studies in UKM, they had to perform best in the examinations.

CONCLUSION

The achievement of the two groups of students in four selected courses were compared. Overall, for the mid-semester examination, students from UDE showed better performance in all four courses compared to the UKM students. However, the difference in performance was less obvious in the final examination and, surprisingly, there were some courses in which UKM students scored slightly better. It was found that the significant difference in performance between the international and the host students might have been due to personality changes in order to adapt to a new culture, new environment, and most importantly, new educational system among the UDE students. Another significant finding that emerged from this study was that the fundamental knowledge that the students possessed from their previous study in Germany might have been a vital contribution for them to excel in UKM. This research has triggered many questions and performance in the double-degree programme certainly needs further investigation. Future studies should be expanded in terms of the quantitative or qualitative approach to identify concrete reasons for the gap between the two groups of students. However, in the near future, it is recommended that if this study is embarked on, the survey should be conducted early because the international students tend to leave UKM as soon as their final examination is over.

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