EMBEDDING ETHICS AND MORAL VALUES IN ENGINEERING PROGRAMME IN A MALAYSIAN TECHNICAL UNIVERSITY

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ABSTRACT*: The development of a harmonious and prosperous country depends on the good ethics and moral values amongst its nation. Further, considering the importance of humanistic values among engineers worldwide, engineers are expected to be competent not only in developing technologies but also become educated, informed and ethical engineers. In this case, ethics and moral values has become essential for engineers. In Malaysia specifically, the higher education transformation has outlined ethics and moral values as one of the essential softskills that needs to be developed by the learners of higher education including engineering students. This research investigated how ethics and moral values are embedded in engineering programmes offered by a Malaysian technical university. Specifically, the elements of ethics and moral values as well as the mechanism used by the university to inculcate these values among its engineering students were investigated. Data were collected through survey questionnaire, interview and observation involving 371 students and 16 lecturers. Three main elements related to the ethics and moral values among the university students were identified, namely, the innovation, integrity and effort. Additionally, the study found that three teaching practices to inculcate these values were lectures, tutorials and group projects. It can be concluded that these elements are prevalent in the engineering programmes and universities need have effective strategies to ensure that student engineers are equipped with these values so that they can become professional engineers with first class human values.*

Key words: ethics and moral values, Malaysian higher education, teaching approaches, engineering courses

1.0 INTRODUCTION

Ethics and moral values are closely linked to the development of a country. It is a common consensus today that incidents of moral decadency amongst professionals in this country, namely bribery and violation of power have become rampant. This will no doubt hinder the development of first class human capital; therefore, it is imperative that serious countermeasures are taken to address this problem.

In an effort to develop first class human capital for its nation, Malaysia has outlined ten higher education transformations that need to be implemented by the universities[1]. As ingrained in the national transformation education blueprint, the government realises the importance of ethical and moral values in the education system to develop a holistic and balanced graduands [1]. It is an educational philosophy which stresses on a balance of the intellectual, emotional and physical aspects of humans in terms of manners and caliber. On that note, universities acting as agents of change in the society have to play their part not only in providing knowledge, but also in inculcating high moral values among university students.

Congruent with the changing needs in the practice of engineering, emerging engineers are expected to be able to recognize their role, not merely as developers of new technology, but also as educated, informed and ethical servants of society with higher purpose[2]. To realize this inspiration, it is pertinent for engineering students to develop ethics and moral values.

The inculcation of ethics and moral values among engineering students in the universities is highly related to the implementation of generic skills or soft skills at the institutions of higher learning. Seven elements of soft skills have been identified based on the opinions of experts, research and experiences of Malaysian universities . They are communication, critical thinking and problem solving, team working, lifelong learning and information management, entrepreneurship, ethics and integrity and leadership skills[3]. Recently, based on the blue print of the Malaysian higher education, integrity and patriotism have been identified another important skills for the development of a holistic and balance graduates[1].

This research is conducted due to the interest generated in this area to develop programmes which will enhance the development of ethics and moral values of engineering students for the benefit of national human capital. The objective of this research is twofold. First, it aims to identify the elements that are closely related the development of ethics and moral values embedded in the engineering programmes offered at a Malaysian technical university, namely the *University Teknikal Malaysia Melaka* (UTeM). The second objective is to identify the teaching and learning approach to inculcate the values of moral and ethics in the engineering programmes offered by the university.

This paper is organised in four sections. After the introduction section, the second section presents the literature review. This is followed by the third and fourth sections which describe the research methods and findings of the research. Finally, this paper ends with a conclusion section.

2.0 LITERATURE REVIEW

Studies related to the inculcation of ethics and professional values among students' engineering have been conducted by many researchers both international [4,5] and local [6,7]. Dickinson [4] in his research *Giving Undergraduates Managerial Experience* identified that most new applications that are needed in performing tasks at work can be learned by hard work and training from those who are more experienced in the field. In his research, he suggested that generic skills, the most basic model of learning as more important than specific knowledge on a certain work, such as a computer application. Besides, his research also explained the types of skills that employers want to see in a graduate's profile.

Generally, the skills outlined are communication, problem solving, personal and interpersonal, responsibility and organizational ability. Dickinson's research compared between technical skills and generic skills. He focused more on the workplace than on the courses attended by workers when they were still students.

Harvey [5] in his research *Defining and Measuring Employability* discovered that graduate employability can be defined by a number of aspects, which are mostly related to the possession of certain skills by a graduate and his capability in using them for job hunting. Harvey claimed that a highly employable person is one who is highly motivated, confident, committed, adaptive and flexible. One must be able to work in groups, efficient in solving problems and making decisions, a fluent communicator, innovative and can handle change. Besides, he must also be capable of expressing business appreciation, uses a customer-focused approach, committed towards high quality work, passionate to self develop and analytical towards approach used. In short, his research sought to determine the graduate employability factors needed before stepping into the working sector. Generic skills were only generally discussed and focus was not given on the development of the skills in undergraduate courses.

Liew & Wye [6] conducted a research entitled *Students' Perception on the Importance of Generic Skills Development: A Case Study at Centre for Economic Studies, UKM* on 80 final year students from the Centre for Economic Studies, Universiti Kebangsaan Malaysia. From the research, they discovered that the development index for all generic skills was recorded as lower than the important index. It was identified that English oral communication skills has the lowest level of teaching effectiveness, followed by mastery of ICT and computer, risk and stress handling ability, and creative and critical thinking skills. All in all, students' perception on the development and the importance of most generic skills do not significantly differ much according to their specialization and academic achievement. This implies that the students were aware of the importance of possessing generic skills, but admitted that their mastery of the said skills was still low. This research suggested the use of Problem Based Learning (PBL) in classrooms to develop creative and innovative thinking so that students would not become just good 'exam machines'. This research was done only on the final year Centre for Economic Studies students and does not represent the whole population of a learning institution. Therefore, it also does not provide the actual picture for all the courses offered at National University Malaysia.

Hazilah, Juhana, Salwani, Hairulliza and Nor Azan [7] studied the level of importance of generic skills and computer skills according to the types of jobs in Malaysia. The research surveyed employers' expectation towards employees' generic skills and computer skills that they need to master according to types of jobs.

217 company managers from various units and departments answered the questionnaires distributed for data collection. Results discovered that the generic skills deemed important by employers are team working, willingness to work hard, quick learning, communication, time management, problem solving ability, self motivation, analytical ability and ability to operate computer applications such as HTML, SQL, Visual Basic, JAVA, Microsoft Access, C/C++, General and Oracle. Obviously, this research only focused on generic and computer skills expected by employers as the research subjects. It was also done only on managers of certain companies. Further, it did not involve detailed scrutiny on courses offered at university.

Based on previous research, it is known that quite a number of studies on generic skills have already been done locally and abroad. Most researches focused mainly on the possession of generic skills among graduates before they are accepted for work. Meanwhile, studies on employers looked at their expectation of generic skills needed in a graduate.

Nevertheless, no research has focused specifically on the implementation of generic skills in courses offered at institutions of higher learning, especially at technical universities. Some topics of interest here are to discover whether a clear-cut teaching and learning approach has been used and to know whether its implementation has enabled the inculcation of ethics and moral values among students. Previous researches were not wide or focused enough on the questions asked in this research.

3.0 RESEARCH METHODOLOGY

The main objective of the study was to investigate the perceptions of the lecturers and students regarding the elements of ethics and moral values embedded in the engineering programs offered at the technical university. In this respect, the research conducted a document analysis and a survey research.

The survey research utilised two sets of questionnaire: Set A for the lecturers and set B for the students. Both set A and set B questionnaire contain 4 parts, which are i) the background of the respondents, ii) the elements of ethics and moral values embedded in the courses offered, iii) the mechanism used in developing the ethics and moral values of students from their courses and the iv) the problems faced in integrating the ethical and moral values. Likert Scale was used on both sets of questionnaires based on of scale 1 to 4: 1=totally agree, 2=agree, 3=disagree, and 4=totally disagree.

To ensure that the questionnaires are valid and reliable, a pilot survey was carried out. It is also aimed at testing the reliability of the questionnaire crafted by the researcher. This is done by using a combination of test-retest and equivalent-form reliability to determine the internal consistency correlation co-efficient of items[8]. The researcher used the Cronbach's Coefficient Alpha in measuring the reliability of the questionnaire items [8].

For that purpose, 10 lecturers and 20 students were involved in the pilot test. For set A (lecturers), questions in part B showed the *cronbach alpha* value of 0.98, part C 0.90 and part D 0.72. This means that the questions used in set A has high reliability. For set B, the *cronbach alpha* values shown for the questions in part B was 0.93, part C 0.85, part D 0.83 and part E 0.78. These values also showed high reliability.

To investigate the integration of ethics and moral values in the engineering programs, 16 subjects offered at a technical university, located in Melaka were purposely selected. Specifically, eight subjects were categorised as core subjects,

while the other eight subjects were categorised as the mainstream subjects. The core subjects are compulsory subjects for the respective engineering programmes, whereas the mainstream subjects are subjects compulsory for all students regardless of the programme they are pursuing.

Set A questionnaires were distributed to the lecturers teaching each of the 16 subjects. At the same time, each of them was given 25 copies of set B questionnaires to be distributed to the students in their respective classes, totalling 400 questionnaires to students. 100% response was received from the lecturers, while 92.75% (371) responses were received from the students' counterpart. Data were analysed based on simple statistical methods, mainly the average and frequency. The results of the data analysis are presented in the following section.

In addition, documents, namely the university's vision, mission, general educational objectives as well as the syllabus of the 16 subjects selected for this study were analysed in order to identify the ethical and moral values integrated in the respective subjects.

4.0 RESULTS & DISCUSSION

The following section presents the results of the research based on the objectives of the research.

4.1 The Integration of Ethics And Moral Values In the Subjects

As shown in Table 1, there were 16 elements of ethics and moral values embedded in the subjects offered. These elements are competency, innovation, creativity, cooperation, honesty, independence, respect, poise, punctuality, dilligenc, self effort, patience, self discipline, patriotism, self esteem and responsibility.

Table 1: The Integration of Ethics and Moral Values in the Subjects in terms of Percentage and Ranking

	Elements	**Lecturers [n=16]**		**Students [n=371]**	
		%	**Rank**	**%**	**Rank**
1	Competency	100	I	87.4	IX
2	Innovation	93.8	II	90.3	III
3	Creativity	87.5	III	87.6	IX
4	Cooperation	100	I	86.3	X
5	Honesty	93.8	II	83.6	XII
6	Independence	100	I	89.3	V
7	Respect	87.5	III	88.4	VIII
8	Poise	87.5	III	90.1	IV
9	Punctuality	100	I	81.1	XIII
10	Dilligent	100	I	89.2	VI
11	Self effort	100	I	92.1	I
12	Patience	100	I	88.7	VII
13	Self Discipline	100	I	87.4	IX
14	Patriotic	56.3	IV	68.4	XIV
15	Self esteem	50	V	85.8	XI
16	Responsibility	100	I	91.4	II

Based on Table 1, the lecturers gave equal importance and ranked nine elements of ethics and morals as the most important. These elements were competency, cooperation, independence, punctuality, dilligent, self effort, patience, self discipline and responsibility. Further, the second ranking are innovation and honesty. This is followed by creativity, respect and poise as the third ranking. The fourth ranking is patriotism and the lowest ranking is self-esteem. The lecturers seem to have common opinion regarding the elements embedded in the subjects. This result is inconclusive due to the limited number of lecturer respondents.

Table 1 also presents the students' perception of the ethics and moral values embedded in the subjects. As shown in Table 1, self effort was ranked first, followed by responsibility as the second, innovation as the third, poise as the fourth, independence as the fifth and patience as the seventh ranking. Meanwhile, the lowest ranking was patriotism, followed by punctuality as the second lowest, honesty as the third lowest, self esteem as the fourth lowest and cooperation as the fifth lowest ranking. Competency and creativity received equal emphasis which was ranked as the ninth place. It can be implied that students seem to have diversified ranking for the elements of ethics and morals embedded in the subjects.

4.2 Mechanism to embed ethics and morals in the subjects offered

Respondents were also requested to indicate the teaching and learning mechanism used to embed the ethics and morals in the subjects offered. Table 2 lists twelve teaching and learning mechanisms, which are lecture, tutorial, consultation, quiz, paperwork, presentation, laboratory practical, group project, examination, class participation and case study.

Table 2

No	Mechanism in T&L	Lecturers N=16		Students N=371	
		%	Rank	%	Rank
1	Lecture	100	I	90.8	I
2	Tutorial	81.3	IV	88.4	II
3	Consultation	93.8	II	82.0	X
4	Test	93.8	II	85.8	VI
5	Quiz	87.5	III	84.6	VII
6	Paperwork	56.3	V	86.0	V
7	Presentation	87.5	III	78.9	XI
8	Laboratory practical	37.6	VII	83.8	IX
9	Group Project	93.8	II	87.4	IV
10	Examination	87.5	III	84.1	VIII
11	Class Participation	100	I	87.9	III
12	Case study	43.8	VI	77.4	XII

Based on Table 2, lecturers ranked lecture and class participation as the most important, followed by consultation, tests and group project as the second ranking. The third ranking were quiz, presentation and examination and the fourth ranking is tutorial. Paper work, case study and laboratory each received the lowest ranking respectively.

Students rated lecture as the first ranking and tutorial as the second ranking. The third ranking was class participation followed by group project as the fourth ranking. Paperwork, test, quiz and examination were ranked as fifth, sixth, seventh and eight ranking respectively. Finally, laboratory practical, consultation, presentation and case study were considered as among the lowest with ninth, tenth, 11th and 12th ranking.

Both lecturers and students chose lectures, tutorials, assignment and group work as the main teaching and

learning mechanisms to inculcate ethics and morals values. They also agreed that case studies are not suitable for this purpose.

5.0 CONCLUSION

The inculcation of ethics and morals among students through the subjects should be collectively seen as a continuous effort in building the desired students' personalities. This effort must be shouldered by all parties as previously suggested in this paper.

The strengths identified within the elements of ethics and morals as well as the mechanism used in teaching and learning are hoped to serve as a guide for future research. In this respect, the obstacles faced by lecturers and students should be addressed properly so as to ensure that the inculcation of ethics and morals can be continued and further enhanced for generations to come.

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