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## The Main Engineering's Education Issues During and After Graduation

**Abstract-** *The opportunity of teaching engineers is not easy as everybody thinks for many reasons, some of these issues are related to the students' disappointment as a result of getting the engineering field and the other one related to lack of available knowledge about the role of engineers in improving and developing the life quality and the country overall. So, this paper will focus the light on the main issues and challenges that face the engineering education, with the possible solutions in order to reduce the unemployment and expelled from the job due to the lack of experience or lack the communications with other team members. Also, this paper explains how and when could apply each solution separately.*

**Keywords-** *BIM, Engineering Education, Issues, Sandwich year, Self-development.*

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### 1. Introduction

According to the Greek philosopher Diogenes Laertius, the basis of every state is the education of the young where this statement briefly describes the importance of education in modern society. And due to the complexity of global challenges, such as sustainable resource consumption and adaptation to climate change, engineering education is essential. The education and training of future engineers are essential to finding innovative solutions to address these challenges and to apply technologies that improve the quality of life for all. So, more engineers are needed to meet the growing global demands in all life areas. And in order to gain this, awareness of engineering should be promoted and encouraged. The Engineering Education Initiative develops projects with private sector partners that encourage the study of engineering in secondary and higher education.

Fifty years ago, the studying of engineering education was significantly increased and in its trial, version is one of the first main studies in the field of engineering education and then this study becomes a recommended for the graduate grade education. Later, Wickenden Report was amended and developed in order to be more suitable for the global requirement. Where the report mentions that the engineering education should be a study after graduation and should be followed by internship, industry training and the training in engineering societies in order to create a high-efficiency engineer [1].

Mustapha et al. [2] said that the engineering education courses are considered one of the major challenges because of the difficulties of the course. Where they study the problem and the issues that the students of electrical and electronic engineering could face it. As well as this research aims to identify the attitude of students for Problem-based-Learning (PBL). Where the researches prove that (PBL) is used to enrich the understanding of the students and making the learning process more significant and clear. In an action research design, a classroom was used to present the research site. Therefore, an engineering class consists of 30 students and 5 students of them were selected in a Technical School. Where the PBL method was applied in the class for a period of nine weeks. Experimental data was collected from peer assessment, observation, and pre- and post-tests. The data were described descriptively using frequency, mean and standard deviation. The results show that there is a significant increase in the students interactive and post-test results. In terms of the attitude towards PBL, the participants rated PBL highly. The participants also assert that the main advantages of PBL are enriching their cooperative and the skills of solving problems.

Venugopal Reddy [3] studied the future trends in Engineering Education along with many related challenges, threats, and opportunities. Where the main objective of this research was improving the engineering education by increment the awareness among the engineering teachers and other stakeholders to discuss and debate in

relevant to arrive at a consensus on these issues. The views expressed in this paper are based on the general perception of the engineering educators in India.

On the other hand, in many countries, female engineers face another type of challenges. Madara and Cherotich [4] found that the challenges that related to the gender types in learning are becoming a global phenomenon. These issues could limit the female engineering students from achieving their aims and future goals. Where, this study focusses on testing the self-known issues that undergraduates engineering students (female) could be faced at the School of Engineering (SOE), Moi University (MU). And the results of the study show that the students (women) faced many challenges that related to their gender and even harassment from both teachers and classmates who studying at SOE. The study made a recommendation to increase retention and improve the learning environment in the field of engineering education, female student Support and Mentoring activities should be designed and incorporated at engineering school.

In this research, the engineering education issues in the world and especially in Iraq will be discussed with the beneficiary issues with engineering graduates. As well as will discuss the beneficiary requirement to supply jobs for engineering graduates and possible solution to improve the graduation abilities.

## 2. The Issues of Engineering Learning

There are many issues and challenges could face both the educators and the students in different engineering fields and these issues as follows:

### I. Skill gap

Most of the universities teach the students the theoretical part and careless the practical part because the professors and the lecturers are concentrated on the sources of the knowledge, the history of information and who discover the specific point without caring about the future applications for the specific information [5].

### II. The present system of engineering education

In Iraq, all engineering educational system is mainly depending on the lecture system which is the way of the educational system depend on the lecturers' knowledge and character. However, this system has many disadvantages which mainly represented by producing a high number of disabling engineers who are mainly dependent on the lecturers to get the information or solving the problems, in other words, they are depending on

the ready solution and the store of information without analyzing it [6].

### III. Teaching-learning engineering materials

According to UNESCO most of the engineering curriculums in Iraq are so old and do not be changed since the department or college was opened. So, it does not represent the present knowledge in the world. And in most cases, the Engineering students do not have enough books and references to follow the university lectures, [7]. And after 2014 ISIS was burnt most of the books in AlMusil university library which led to reduce the books numbers to its lower number in Iraq.

### IV. Placement hurdles

Due to the economic conditions of the Iraq country, most of the engineering graduation do not have a job or their opportunity to get a job may be delayed for one, two or more years. So most engineers are forgetting their education and university information while they are waiting for the job [8]. In addition to all the previous issues, there are many vulnerabilities in engineering graduates today which perceived by the beneficiary as following [9].

- 1) Technical Arrogance
- 2) Lack of understanding of manufacturing processes.
- 3) Lack of ability in designing and creativity.
- 4) Everyone wants to be an analyst.
- 5) A narrow view of engineering and related disciplines.
- 6) Poor communication skills.
- 7) A little experience working as a team.
- 8) Lack of clear understanding of quality and methods.

## 3. Possible Solutions

On the other hand, the beneficiary prepares the basic engineering skills required for the current century as following [10]:

- 1) High technical capability.
- 2) Communication and follow-up skills.
- 3) Ability to lead and work effectively as a member of the team.
- 4) Understanding the non-technical motives that have a significant impact on engineering decisions.
- 5) Commitment to lifelong learning.
- 6) Hence, these skills can be gained through the following solutions:

### I. Developing the students' individual skills

The universities should increase the tutorial between the students and the lecturers in order to

discover the student's skills, hobbies and wishes to develop their individual characteristics and guide them into correct way with preventing the lost in time and money. In addition to that, the universities should share some lecturers during the courses in order to develop the students' critical thinking. So as to help them to plan and doing their plans after that check the work and finally study the action of their work on the environment and the full society as shown in Figure 1. In addition to that the university should teach the students before graduation how could they write curriculum vitae, show their abilities in the best way, and apply different courses during and after graduation to improve the students ability depending on the market requirements to avoid the disappointment during the job searching [8].

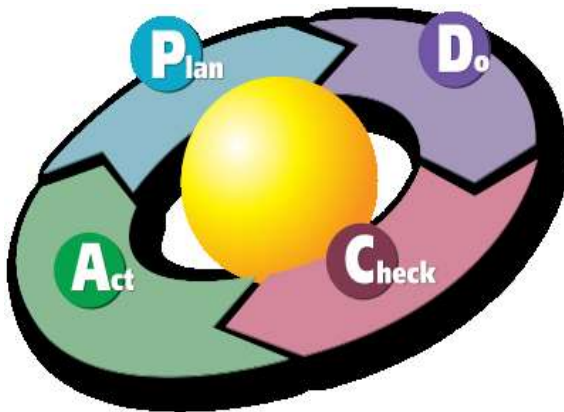


Figure 1: Self-improving circle

## II. BIM project

Building Information Modelling (BIM) became one of the global cooperative processes in the building field. Despite the short BIM invented period, it becomes one of the most popular processes and the using of this process was increased significantly in the last 10 years due to its main capabilities in constructing projects and reducing the errors during construction. As well as to know the construction field errors increase the project time period and increase the required money to complete the project which affects badly on the project scheduling time and cash flow. In addition to that BIM could produce a connection language between all project contributors and make them a full team. As well as BIM makes all engineers specialized in different specializations, such as architecture, Civil, Mechanical, Environmental, Electrical, Material, chemical engineers with a construction manager, where they are working as one team as shown in Figure 2. And many universities around the world nowadays regard BIM project as one of the graduation requirements for all specialization,

where they put one BIM course at the end of each year in order to apply all their knowledge that they got it during the year and discussion with other specializers how could they apply the specific knowledge or information in the real projects [11].

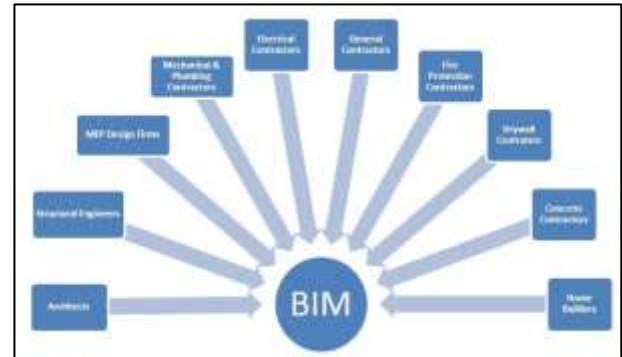


Figure 2: A case for BIM team

## III. Sandwich year

Sandwich courses are some courses that offered by universities for (one to two) years where the students study for two years in their universities and then working in the industries, factories, any company that related to their university specialization or studying abroad [12] as shown in Figure 4. The sandwich year courses were used for the first time in the United Kingdom in 1953 and there are two types of sandwich courses the first type could gain by work two days in the industrial field and studying for three days a week at the university they complete the full programme during three years which called thin sandwich as shown in Figure 5. While the thick sandwich courses usually happen in the third studying year in order to gain some work experiences or international foreign studies that will help the students in their near future. Where most of the students in the work field could get a contract to work in the same company after graduation, and if they don't take a contract with the same company the work experience in the company will help them to get work in the other companies. On the other hand, the students who spent the third year studying abroad will have a high opportunity to award a scholarship to complete their postgraduate studies, but it will depend on the students work [13]. These courses could apply to all engineering specialization (everyone could work in the field of the university specialization).

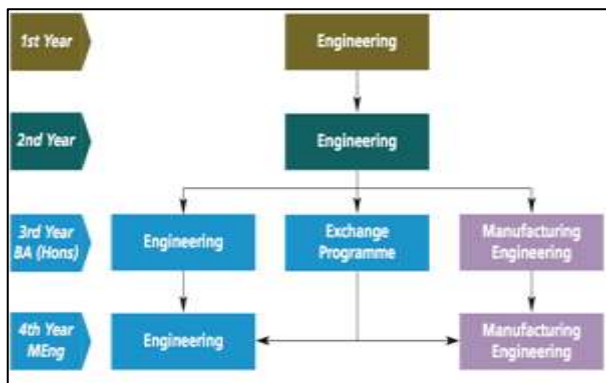


Figure 3: The Sandwich year explanation diagram

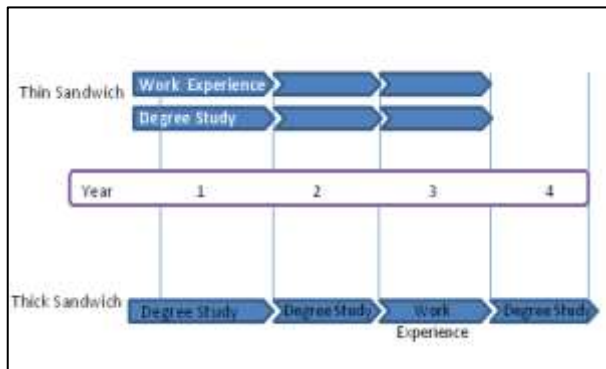


Figure 4: Thick and Thin Sandwich year explanation

#### 4. Conclusion

To sum up there are many challenges and issues related to learning the engineering sciences, and the issues related to both the educators and students. The learning environment, availability of the books and references, the ability to apply the knowledge are imposed issues on the students in addition to lack of jobs after graduation. So in order to improve this science and enrich the student's information about their roles in constructing the country and what engineering science could be done, should make the students apply their knowledge experimentally during their study. As well as the educational establishments should enrich the students with plans and courses to support their future experiences.

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