Determining the effect of an engineering overview assignment on first year students

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Abstract

An engineering overview assignment given in the Introduction to Engineering course aims to support first year students to learn about engineering, and motivate them to see it as their future career. In addition to learning from the literature, students also interviewed at least two practicing engineers to produce the group report and presentation for the assignment. To determine the impact of the assignment, a study was conducted in one of the classes by analyzing the group reports and individual reflections written after its completion among 40 students. Thematic analysis technique was used to identify what the students gained in this assignment. After completing the assignment, many of them believed that they have chosen the correct path and interviewing engineers had strengthened their determination to become engineers. They found out what engineers do, motivating them to have the desire to become excellent engineers in the future. The engineers reminded them that in addition to technical skills, it is also important to learn about sustainable development and engineering ethics as well as other professional skills to be good engineers. Students also reflected that the assignment helped them develop communication, time management and team-working skills. Therefore, the simple engineering overview assignment given to the first year students right at beginning of their study had managed to lead them into the desired mindset of what they should prepare themselves for while learning to be future engineers.

Introduction

In the 21st Century, there is a high demand for engineering graduates who have sound technical knowledge as well as positive attitude and good professional skills, such as problem solving, communication, teamworking, etc.[1, 2]. Nevertheless, learning engineering content in itself can be challenging to most students, resulting in problems on maintaining students' interest and motivation to learn, as well as retaining them[3]. In addition, the lack of understanding and connection of how the material they have to learn or the skills they have to develop will be useful in their future career leaves students feeling lost and unmotivated to go through the rigors of learning engineering. For this reason, the first year in engineering has always been seen as crucial for providing support, as well as an overall view of engineering so that students will be better equipped and have a better idea of what is to come, as well as the potential that they have ahead of them if they were to continue on as an engineer.

As part of the effort to enhance students' first year experience, Chemical Engineering students in Universiti Teknologi Malaysia are required to take the Introduction to Engineering course. This 3-credit hour course is designed to support students in bridging the gap between learning in school and university, and to assist them in developing the mindset

and fundamental skills in preparing and learning to gain the most in the university to be an engineer in the 21st Century. Right at the beginning of the course, to ease students to understand engineering and to motivate them to see themselves as future engineers, an engineering overview group assignment was given to them as the first assignment of the semester. This assignment also aims to support students in developing team working, communication and time management skills.

The engineering overview assignment is designed based on Bransford's How People Learn (HPL) framework[4] and Bigg's Constructive Alignment[5]. Students are required to find out what engineering is and a specific question related to engineering (such as "What is engineering ethics, and why is it necessary?", "What is engineering problem solving", "How to become a professional engineer?", etc.) from the literature, as well as through interviews with at least two practicing engineers. As part of the deliverables for the assignment, in addition to a short report and presentation, students video recorded their interview with the engineers to edit and make a short ten-minute video that can help others to understand engineering and the specific topic that was assigned to the team.

This paper reports the findings of a study conducted to determine if the aim of the assignment is attained. In addition to investigating the impact, the result is useful for understanding students so that they can be taught in a manner that motivate and support them to learn, and thus improve the way the course is conducted. The findings will also be significant if a similar assignment should be recommended to other engineering programs, given the potentially immense benefit compared to the simplicity of conducting it.

Theoretical Framework

According to a report published by the Center for the Advancement of Engineering Education[6] (CAEE), engineering students in the US perceived that most of their engineering knowledge is gained during their co-op and internship experiences. The experience in the workplace actually put students into a learning environment that will motivate and prepare them to pursue the related future career. In learning engineering knowledge, they also gain some important soft skills such as communication skills, teamworking skills, problem solving skills, leadership and so on[6]. However, in Malaysia, the internship experiences are only introduced to engineering students after the second semester of their third year, right before their senior year. The question is, how can first year engineering students also gain the engineering workplace knowledge, soft skills and motivation to be persistent in pursuing engineering study and eventually engineering career?

There are many research on engineering students' motivation and persistence in pursuing engineering study and career. Concannon & Barrow[7] reported that engineering students' persistence is best predicted by their career expectations. Positive career expectations ensure completion of the study. Furthermore, Jones et al.[3] reported that, value related constructs in the expectancy-value theory predict students' intention to pursue a career in engineering. The expectancy-value theory explains an individual's expectation for success and the importance

of value the individual attaches to the various options perceived by the individual as available. The expectancies and values directly influence performance and task choice while expectancies and values are influenced by beliefs, goals and affective memories. These beliefs, goals and affective memories are influenced by individuals' perceptions of other people's attitudes and expectations for them, and by their own interpretations of their previous achievement outcomes[8].

According to another related theory on motivation, the social cognitive career theory (SCCT)[9] explained that persistence is influenced by self-efficacy, goals, interest, contextual supports/barriers and outcome expectations[10]. It is reported that outcome expectations and self-efficacy influence engineering students' interest to study engineering[10-13]. Therefore, students' expectation is one of the very important factors to retain students' interest and persistence in studying engineering and eventually to pursue career in engineering.

In order to help first year engineering students to have the correct expectations of what is engineering, they need to be exposed to the real engineering workplace. In Malaysia, real engineering experience gained through internship is usually accessible after students complete their third year[14]. As an effort to educate first year students with the correct expectations of what being an engineer entail, they were given an assignment that requires them to read as well as meet and interview practicing engineers. Although this is definitely not as powerful as giving them real engineering experience through internship, this engineering overview assignment is expected to at least improve students' engineering knowledge and other professional skills [5], and motivate them enough to persist through the challenging path of learning to become an engineer.

The Engineering Overview Assignment

The Introduction to Engineering course, and thus the Engineering Overview Assignment, is designed based on the How People Learn Framework (HPL)[4] and Constructive Alignment (CA)[5]. The HPL puts forth four overlapping factors for designing an effective learning environment, which are knowledge centered, learner centered, assessment centered and community centered. The CA theory asserts that students should go through a constructivist learning environment, where the teaching and learning activity and assessment tasks support the attainment of the desired learning outcomes.

Combining HPL, CA, and SCCT, the simplest way to ease the first year students to understand engineering is by asking them to read from the literature and talk to practicing engineers. Each part of the activity within the assignment takes into consideration the three theories, in terms of contextualizing the knowledge taking into account the learner's perspective, alignment of activities and assessment for feedback, as well as the underlying value of the outcomes in relation to the knowledge and skills needed to be an engineer. Detailed instructions are given to students, as shown in Figure 1, to guide them through the tasks of the assignment step by step. The assignment and instruction have gone through

several refinements after conducting a similar activity in the course every year since 2006. Although the total duration of the whole assignment is two weeks, the class activity is not solely devoted to the assignment.

The course normally has 30 to 40 students in a class. In the particular semester this study was carried out, there were 36 students in the class. In small groups of three to four members, students were asked to find out about engineering in general, and a specific topic on engineering that was randomly assigned to each group from the literature, as seen in the instruction given in Figure 1, before they can interview engineers. The topics range from possible careers of engineers to the importance of sustainable development in engineering. Each student was asked to find the relevant literature and prepare peer teaching notes which summarize their understanding and questions that they have to share with their team mates. This activity does not only enhance their understanding on engineering, but also helps them to formulate better questions to ask during the interview session.

Assignment 1

- In your team, find literature for information on what engineering is in general and the topic assigned from literature search.
- Find credible literature (books, magazines, websites with credible authority) and summarize in your own words what you understand, and list questions on points that you want to verify and those that you do not understand (Sept 12). Come up with questions for interviewing the engineers (Sept 17).
- Progress check of Engineering Overview task (Sept 19).
- Interview at least 2 engineers for their opinion on what engineering is and the topic
    - Attach interview questions and their opinion(s).
    - Provide proof that you have interviewed them.
    - You can interview by meeting the person, virtual discussion (e.g Skype) or by phone. Create a video for one of the interviews. The video will be uploaded in UTMotion. Please get the permission of the engineer that you are interviewing if he or she agrees to have the video in UTMotion.
- Gather the points and make a power point presentation (presentation on Sept 24).
- Each team will be given **10 minutes** to present. Everyone must present. (see presentation rubric on evaluation)
- Summaries and analyze the points in a 2-page report – due Sept 24
- Write a 1 page reflection journal and submit it online (Sept 27)
- Please also fill in the peer rating form (Sept 27)

Figure 1. Instructions for the Engineering Overview Assignment

Referring to Figure 1, the next step after reading the literature and peer teaching is the progress check. The purpose of this step is to ensure that students have managed to find suitable engineers to interview, and to provide feedback on their understanding from the literature as well as the questions that they have listed for the interview. The requirement is for each group to have at least one face to face interview.

Although the instruction is somewhat detailed, students normally feel overwhelmed by the fact that they have to find their own material to learn, teach one another, and search for engineers to interview. To provide support for planning the tasks and seeing the "big picture" of the whole assignment, students are taught to develop a Gantt Chart to manage their time and expectations as a group. After conducting the assignment for several years, it is safe to say that most students have never talked to engineers. Ensuring that they have found engineers to interview is important for the success of the assignment.

Finally, after they have presented and submitted their reports, students have to write a learning and reflection journal, and rate their peers' performances in a peer rating form. To ensure that they take the journal and the peer rating serious, explanations are given on the purpose of the activities, and what they get from doing them. For example, the reflection is for evaluating their own actions and thoughts, and internalizing what they learned from the assignment, and how they can improve or do things better in the future. The peer rating is to evaluate their team performance, and what they need to do to improve and develop better team working for the coming assignment. To assess their team performances, the students were basically asked to do a "plus-delta" format, where the plus are good actions that were practiced and should be maintained, and the deltas are the matters or actions that need to be taken to improve how the team works. Both the reflection and peer rating are submitted on-line, and were given back to respective teams.

Research Method and Data Analysis

The purpose of this research is to identify what the students gained through the Engineering Overview assignment. The students were asked to complete a reflection journal at the end of the assignment. The reflection journal was written in the course e-learning system. The data was collected through the reflection journals and reports which were submitted at the end of the assignment. The data of the reflection journal and assignment reports from 36 students was analyzed using thematic analysis[15,16] to identify what the students learnt.

There are six phases in thematic analysis[15]. The steps are (1) to get familiarized with the data; (2) to generate initial codes; (3) to search for themes; (4) to review the themes; (5) to define and name the themes; and (6) to produce the report. The details of each step are explained in the next section. The analysis of data is divided into two sections based on the types of data, reflection journals and assignment reports.

Analysis of Reflection Journals

In the first step, one of the researchers who taught the course familiarized herself with the data by reading and rereading the data as well as to note down the initial idea. This was carried out by downloading all the reflection journals from the course e-learning site into printed texts. The reflection journals were read at least three times.

The second phase was to generate initial codes. The coding was based on the purpose of the research, to identify what the students gained. These were expressed in the reflection journals. Codes such as communication skills, teamworking skills, time management skills, motivation, technical knowledge, sustainable development, engineering ethics, interest, future career, challenge, problem solving, leadership and interpersonal skills were marked in the reflection journals. Later, all the codes were gathered together with the original texts in the reflection journals and arranged in a table. For example, Table 1 contains all the quotations found in the reflection journals that reflect the code for "communication skills".

In the third phase, all the codes were gathered together with the quotations to identify potential themes for all the codes. The themes were reviewed in the fourth phase by checking through the data and double checked by two other researchers. In the fifth phase, names were given to the themes. In all, there were three emerging themes found in the data set. Table 2 shows the themes and the related codes.

In the final phase, the themes were cross checked with the data. Inter-rater reliability check was also conducted by two other researchers to ensure the credibility of the data analysis. The raters were given the themes and codes, and four reflection journals of the students which were randomly selected. This is to ensure that at least 10% of the data is checked by the raters. No discussion were carried out during and after the rating. Out of 23 different quotes in the four reflection journals, 15 were coded the same by all three researchers. The percentage of agreement among the three researchers as calculated using Holsti's inter-rater agreement equation[17] is 77.6%. This shows that the data analysis carried out by the researcher is reliable. Table 3 shows the themes, codes and vignettes from students' reflections.

Analysis of Assignment Reports

In addition to analyzing the students' reflection journals to determine the impact of the assignment, team reports have been analyzed after the completion of the assignment. Team reports were evaluated with regard to the introduction, conclusion, and organization, integration of material, flow and style, and most of all, the content. Each team was required to explain engineering in general and a specific topic assigned to them from the literature, and to synthesize what they have learned with the information obtained during the interview sessions with the engineers in the report.

Table 1: Quotations in the reflection journals that contains code of "communication skills"

Student	Quotation
Student M	At the same time, it helps me to enhance my confidence level when talking in front of crowds during presentation and talking with someone with professional career. For example we need to interview two engineers and ask questions which involving engineering.
Student L	During our presentation day, I was quite satisfied with our performance. I manage to enhance my presentation skills and increase my confidence level in delivering the contents of our topic. At the same time, I am glad that my teammates had such high potential to present! Both Team mate 1 and Team mate 2 did well in attracting the audiences' attention during the presentation while Team mate 3 will be a better presenter if he can improve in his confidence level.
Student H	At that time, I just realized the main purpose for me to interview the engineers which is learning to communicate with other people.
Student E	I learned how to present, make people understand and of course to gain soft skills which are most important to get a job nowadays
Student C	The next thing I learnt is the confidence and courage to speak in front of people. At the presentation part, I was able to present my work and speak spontaneously to the lecturers and my course mates without nervous feeling. Through the presentation from the other teams, I observed and learnt the way they speak in front of people, how they attract the attention of the listener and so on.
Student D	I saw many of my section mates were very nervous but I think that it will be fine anyway. Our turn arrived and with our high confidence level, we managed to present our assignment as what we have planned in the given time. It was a massive relief for us after finishing the presentation and we congratulated ourselves for the outstanding presentation.
Student S	I also learned the way to improve my English and to talk in English more clearly and fluently through my presentation to the class. I don't expect that i can be more confident be in front of the people when i do the presentation. Before this, I always shy to talk in front of a lot of people but now not any more. I'm very proud of myself with my performance.

Table 2: Themes and codes

Themes	Codes
Expectations and motivation	motivation, interest, future career, challenge, level of confidence
Soft skills	communication skills, teamworking skills, time management skills, problem solving, leadership and interpersonal skills
Engineering knowledge	technical knowledge, sustainable development, engineering ethics

Table 3: Examples of quotations for codes and themes from the reflection journals

Theme	Code	Quotation
Expectations and motivation	Motivation	Both engineers that i had interview had shared with us their experience as an engineer. Now I have been more excited and want to finish my studies as fast as lightning so that i can feel the moments of an engineer like what they had told me (Student S)
	Interest	From this assignment, I have made my own decision to choose industry as my part of career. I am very interested when heard all the experience from the engineer. I also want to improve my soft skill because it is the most important thing that i need to have to be an engineer. Now, I am sure and believe in myself that i will be able to be a good engineer 4 years from now. (Student S)
	Future Career	Through this assignment, I had a chance to interview and meet some prominent engineers. The experience was very beneficial for me. I had a chance to broaden my knowledge about engineering from this interview. Besides getting a more clear exposure regarding this field, I believe I had made a good choice. (Student U)
	Challenge	The difficulty of this course makes me more determined in every action I took so that I can avoid in making many mistakes in the future as an engineer. (Student E)
	Level of Confidence	When you are entering the world of engineering, there is one word that I want to emphasize which is "prepare". Yes ,to be an engineer ,you must get well prepared. There is a quote state that "The key to success is self-confidence and the key to self to self-confidence is early preparation" (Student F)
Soft skills	Communica-tion Skills	At that time, I just realized the main purpose for me to interview the engineers which are learning to communicate with other peoples. (Student H)
	Teamworking Skills	We help each other in much kinds of ways. We united as a team even though we faced hardship. A lot of meetings and discussion had been made to achieve our objectives. We often got to meet each other everywhere so we got to know each other well. (Student A)
	Time Management Skills	While doing this assignment in a team, I need to give more commitment and spend my time for team discussion. It taught me how to be punctual and responsive. (Student W)
	Problem Solving	I have actually learnt a lot of things through this assignment. I learnt the ways to solve problems, to find engineers for the interview. (Student Q)
	Leadership	Next, it is about leadership .Actually, I never ask my team member to assign me as their leader, but it just happen indirectly .Sometimes, the responsibility that have been given indirectly is more likely to be done. They are very easy to handle and follow my instruction very well. In giving the orders, I learn not to use bossy words. This will make them become friendly with me and try as best as they can to complete the task given to them. Besides, they do not feel being forced in finishing their part. (Student F)
	Interpersonal Skills	So, there are a few crucial value that I have got from working as a team. First of all, I have learnt to understand people better. For example, one of my team member comes late during our meeting. If you directly ask them the reason, it will not change anything. So I choose to make them tell their own problem by themselves. This way is very beneficial to me because I am not only becoming closer to them, but also can make them realize their own mistake. (Student F)
Engineering knowledge	Technical knowledge	Engineering is not solely Mathematics and Sciences, but a highly mind-challenging job. An engineer is often challenged by complex technical problems and it is a must for them to be critical and analytical all the time to solve the problems (Student L)
	Sustainable Development	Through my assignment there were many things that I had learnt about engineers especially in maintaining sustainable development .Sustainable development is the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. (Student W)
	Engineering Ethics	I also gained more knowledge on engineering ethics and the importance of it which I think it is very significant for an engineer to practice the ethics in their respective the field of engineering. I hope I can apply all these values in my university life and eventually in my career. (Student D)

Table 4: Quotations in the assignment reports that contains code of "communication skills"

Teams	Quotations
Team 1	The next thing needed is good communication skills. This is important to express ideas, to deal with bosses, clients, city councils and authorities. It is important to communicate with colleagues and other engineers as engineers cannot work alone.
Team 4	Engineers also need to have excellent communication and leadership skills. They need to convince and explain the upper management as much as possible to make a project happens.
Team 6	Engineers should also be equipped with soft skills such as communication and leadership skills to coordinate activities within a team, highly social, and have to be calm in all situations as field works may cause one to be under pressure due to the miscommunication and off-track project works.
Team 9	In order to become a professional engineer, we need to learn the ways to communicate with others especially the engineers all around the world. We can exchange ideas with each other through communication.
Team 7	Engineers always interact with different kinds of people with different mindset and also different views in seeing things around them. Thus, as a successful engineer, besides having great knowledge in engineering, he/she must always be skilled to communicate and socialize with people.

The assignment reports were also analyzed using the thematic analysis technique as previously explained. Table 4 contains all the quotations found in the assignment reports that reflect the "communication skills" code. The codes found in the assignment reports are similar to the reflection journals (refer Table 2). Table 5 shows the themes, codes and example quotations from different team reports.

Discussion

The Engineering Overview assignment was designed to introduce students to the scope and practice of engineering and the role it plays in today's society. It is the first assignment in the Introduction to Engineering Course, which had been shown to have an impact in developing skills required in preparing the first year students to be future engineers[19]. In going through the assignment, students practice and thus develop oral communication, team working, interviewing, time management and report writing skills. There have been many studies that have looked at the need for engineering graduates to develop these skills in order to meet the needs of industry[20]. Each team was asked to find out about general engineering and a topic related to engineering. Emphasis is placed on elicit information, gaining insight and understanding the profession of engineering, including the wide variety of fields of study and potential careers. The final deliverable of the assignment is an oral team presentation, a team written report, and individual reflections. Throughout the assignment, students were supported through detailed initial instruction, peer teaching, discussion and feedback sessions to ensure that they can complete the assignment successfully. Mini lectures on managing time, proper literature search, team working and report writing were also given at the appropriate time.

Table 5: Examples of quotations for codes and themes from the assignment reports

Theme	Code	Quotation
Expectations and motivation	Future Career	However, engineering fields are really enjoyable. These fields are really suitable for those who want to start a business because there are many engineers who have become successful businessmen. The top companies, Microsoft and Facebook are creation from engineers. (Team 2)
	Challenge	Challenges and rewards always come together, not every cup of tea tastes the same, and same do the human personality. Being well-prepared in terms of knowledge and skills all the time is crucial to face different kind of people as well as situations. The challenges met by engineers actually bring tense to them greatly which might affect their mental and physical health, if there is no proper management of stress. (Team 8)
	Level of Confidence	Instilling high confidence level and logical thinking is an extra point for successful engineer. (Team 8)
Soft skills	Communication Skills	Being an engineer, he/she requires effective communication skill to convince and persuade people to work hand in hand to achieve the identical objective. (Team 8)
	Time Management Skills	Engineers need to be punctual in everything. Punctuality is very important especially during the execution of the project. (Team 5)
	Problem Solving	Engineers also called as problem solvers; hence they need to have a very wise thinking in dealing with problems so that they can solve the problem in a proper way. (Team 7)
		It is essential for engineers to develop good critical and creative thinking skills apart from the ability to think outside of the box. Translating an idea from drawings or design into reality. (Team 9)
	Interpersonal Skills	Theoretical engineering is different from real life engineering, because in real life, the engineer needs to work with others, so the communication skill and teamwork are very important. Thus, the soft skills and the knowledge of engineering are vital for every engineer. (Team 6)
Engineering knowledge	Technical knowledge	Engineer plan and design products that they envisioned based on the application of theories and principles of science and mathematics for the benefits of the society. (Team 9)
		An engineer works using the combination of their knowledge of mathematics and science to create a new and innovative machine or building, introduce and improving existing technology in order to improve human life. (Team 7)
		Engineering involves the study of mathematics and natural or physical sciences and the practice to find link between them in order to find a solution to the entire problem that rises in human life. (Team 6)
	Sustainable Development	Engineer is a person that creates new interventions to improve quality of life. We as future engineers must practice the principles of sustainable development during the design, manufacturing, construction, production and operation stages in order to meet the need for economic growth of our country without compromising the need for future generations. (Team 3)
		Engineers also need to consider through analysis and research on the significant impact on their products or ideas towards the society and most importantly, the environment. To ensure sustainability of natural resources, engineers play a crucial role in generating ideas and creating eco-friendly and energy-saving products. (Team 9)
	Engineering Ethics	Besides, to be a successful engineer, they have to make sure they have the best engineering ethics in their own self. If an engineer has very strong ethics, they can come out with solutions which include the concern of their own ethics for the problem. (Team 7)

The analysis of team reports showed that the objectives of the assignment were achieved. Students demonstrated the ability to research a topic and write it up formally and in the correct form. They demonstrated the ability to document the role of engineers and the engineering job function. It is interesting to note that students show their understanding that as engineers later, they would have to undertake the responsibilities on sustainable development. Most students understand the social, cultural, global and environmental responsibilities of a professional engineer, and the need for sustainable development. Students also demonstrated the ability to make connection between literature research and information from interview sessions. The interview session allowed students to identify and engage enthusiastically with the assignment. Given that this is the first assignment of the semester, students demonstrated the ability to prepare for an interview as well as showed the ability to ask pertinent questions to the engineers with the guidance given in the assignment. They successfully conducted effective interview sessions and documented the interview, allowing them to obtain important information included in the report. Students demonstrated the ability to write down all the relevant points in their reports, and were aware of what is important and what is not.

From the analysis of reflection journals, it is clear that the first year engineering students have gained a wide range of benefits from a very simple assignment given at the beginning of their study to become engineers. The reflection journal analysis managed to capture a variety of aspects on motivation, such that the excitement and eagerness can be felt from what was written by the students. For example, Student S wrote that:

"Now I have been more excited and want to finish my studies as fast as lightning so that i can feel the moments of an engineer like what they had told me."

From their reflections, it is clear that this assignment has managed to channel students towards positive mindset about being an engineer. As most literature pointed out that expectations will determine the students' choice of career in the future as well as their persistence in completing their study in engineering[3,6].

The gains that emerged from the analysis of both the report and reflection journals gave the same three major themes, which are motivation and expectation to become an engineer, soft skills and engineering knowledge. The codes that emerged for engineering knowledge, technical knowledge, sustainable development and ethics, are the same for both the report and the reflection. Nevertheless, there are more codes under the themes of soft skills, and expectation and motivation for the reflection compared to the report. This is expected, since the report is a formal submission on engineering overview and thus, mostly eliminate what the students felt and reflect on as they go through the process of learning. Soft skills and engineering knowledge are important to shape the students to become good engineers. Those mentioned by the students in the report and reflection journals are in line with those reported by CAEE[5]. Therefore, through this assignment, students believe that engineering knowledge and soft skills are important for them to be a good engineer.

From the experience of the researchers in teaching first year engineering students in Malaysia, engineering students usually have very little idea of what engineers actually do in their day to day work. Most of the students who enroll in engineering courses are influenced by their teachers, parents and peers who perceived that engineering is among the "elite" careers in Malaysia. Therefore, this assignment has put them into the right perspective of what they need to focus on while pursuing their study in the university in order to prepare themselves to become good engineers. A previous study[18] reported that engineering students need to see themselves as engineers in order for them to persist in pursuing engineering programs. From the responses of the students in the present study, the students are able to relate themselves with the expected job descriptions and requirement of an engineer through interviews with professional engineers.

The interview had a strong impact on students, where many begin to understand engineering better. Although most students mentioned in their reflections that it was challenging to find and interview engineers, they appreciate the opportunity to talk to them and found the information and advice obtained to be highly beneficial. Students became motivated to be an engineer after their interview. For example, student U reflected:

Through this assignment, I had a chance to interview and meet some prominent engineers. The experience was very beneficial for me. I had a chance to broaden my knowledge about engineering from this interview. Besides getting a more clear exposure regarding this field, I believe I had made a good choice.

The interview provided an opportunity to approach a professional in order to ask specific questions about challenges and rewards of being an engineer, engineering thinking & problem solving, educational requirements of engineers, and engineering ethics. The information obtained from the engineers also helps students to understand what it takes to be successful, both now as a student and in the future as a graduate in the profession of engineering. It is also interesting to note that most of the practicing engineers interviewed were very obliging and willing to impart their experiences and words of wisdom as advice in helping the first year students to prepare themselves to be good engineers. In addition to learning important tips for exemplary leadership and professional practice as an engineer, the engineers' experiences managed to inspire them to face up to the challenge of learning and being an engineer.

Conclusion

It can be concluded that from analyzing students' reflections and reports, that the assignment was successful in helping students to understand engineering knowledge and also the soft skills that they need, while also showing them how these are used in industry. They also realize that the ability to think creatively, write effectively, and analyze critically are skills that are essential for engineers. Even though they found out that engineering is not easy and can be very challenging, students were motivated and excited to learn to become good

engineers. Thus, this assignment has managed to attain what is normally elusive and difficult to attain in a traditional learning environment.

Although the engineering overview assignment is simple and not expensive to implement, the benefits, in terms of the attainment of outcomes and students motivation are very high. Students were shown to gain in knowledge of engineering, positive expectation and motivation to learn, as well as soft-skills. Most importantly, they acknowledge that in addition to learning the technical knowledge, there are essential skills and attitude that they need to develop while they are in the university. This is the desired mindset that hopefully, will help students to stay in the engineering field. Therefore, this simple assignment is recommended as a learning activity for first year engineering students to support them to learn and appreciate engineering.

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