Managing and Assessing Senior Project Capstone Design by Implementing ABET Criteria

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Abstract
Prior studies on educational engineering has shown that the graduates from engineering colleges were lack of practical skills which are not given enough attention in the existing curriculum of engineering. From this study, it has been shown that Senior Project Capstone Design can train students with practical skills and prepare them to real engineering life, if it is well managed by the department and assessed through ABET criteria. Engineering Graduate Students suffer from lack of practical experience. In this study, practical experience of the students is enhanced through Project based learning in Capstone Design Project. It is expected that by the end of this study a well-structured design course that can prepare student well for the real engineering environment will be developed. Six factors that affects the design courses are explained. Then, a detailed procedure that contains a work plan (described with the flow chart) and assigning the responsibility of each contributor to the implemented process are fully described. An example of assessments results is given and effect of the current model on the performance of the student for several years are given. Overall, Faculty members and students responded well for the new organized work. Almost three papers out of six projects are published. A Patent is also submitted and pending for approval. With well written report, students have better chances to pass their interview and secure a job with the company.

Index Terms— Capstone, senior project, Engineering, Rabigh

I. INTRODUCTION

Current engineering curricula in most of the Saudi's universities is based largely on an "engineering science philosophy" model, in which the core engineering subjects are taught only after studying sciences and mathematics. It usually takes more than two years of student's life in the institutions to complete their sciences and mathematics subjects. Dym,C L *et al* [1] stated that the "engineering science" model ignores practical learning, which is necessary for the work environment.

As the result, many of the engineering graduates are not able to practice in industry. Dutson, A J, *at al* [2] was referring that to "the change of focus from the practical (including drawing and shop) to the theoretical" .

Senior project design course (capstone) eventually has become the model that the institutes focus on, with the strong encouragement of the Accreditation Board for Engineering and Technology (ABET). ABET, defines senior project course as the course where "Students must

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be prepared for engineering practice through a curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating appropriate engineering standards and multiple realistic constraints"[3]. ABET requires programs to show evidences that students has developed the "ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability" [2].

Available research suggests that project-based learning (PBL), appears to improve different factors for students such as satisfactory, decent variety, and learning [1]. However, the cost is raised, since it will need to have less student numbers in every section with expert faculty members. This cost is nothing as compared to the experience and skills that students might gain [1]. With this, the department should enhance outline teaching method as their most noteworthy need in any without bounds asset distribution choices. Six factors mainly affect the senior design course as shown in Figure 1, will be discussed in detail below.

A. Periods of Capstone

Howe, S. and J. Wilbarger recommended that a one-to-two semesters course with synchronous class and venture segments stays well known [4]. However, some university like Columbia Missouri, the Capstone project has one semester of 4 months to be completed while it is two full semesters for students in King Abdulaziz University [5, 6]. Students who are not able to finish the course by that time are extended to summer time and then are evaluated.

B. Faculty Involvement

To allow the students to develop their design skills, faculty advisors of the project (Mentor) should furnish them with "open doors for inventiveness," and for them to show the capacity required by ABET. Mentors should do whatever it takes not to make huge innovative commitments to the project. They should fill in as subject specialists and focus on technical things, spurring, instructing, giving good assistance, and controlling the group along the plan procedure [7]. Institutions used to involve few faculty in the design course and a lot in formal instruction, [4]. There is a great need to increase the faculty number to fulfill the requirement [1]. As an example, it is required to prepare the workshop, getting fund for the project, establish relations with industry and assess the project. On the other hand, assessment and reward of the participating faculty in design-related teaching, is a challenge. They are engaged with imaginative combination or outline exercises that might be hard to quantify or that are less promptly acknowledged in the scholarly world than conventional investigation situated research [8].

As a result, some faculties may choose to stay away from mentoring students in the design courses. Efforts need to be taken to increase the appreciation of the design-oriented faculties. Since it has been demonstrated that resources time spent on instructing or research is primarily a component of what is esteemed by their establishment [8]. Engineering faculty members should be challenged to consolidate the instruments of design thinking into considerations in all parts of the engineering curriculum [1].

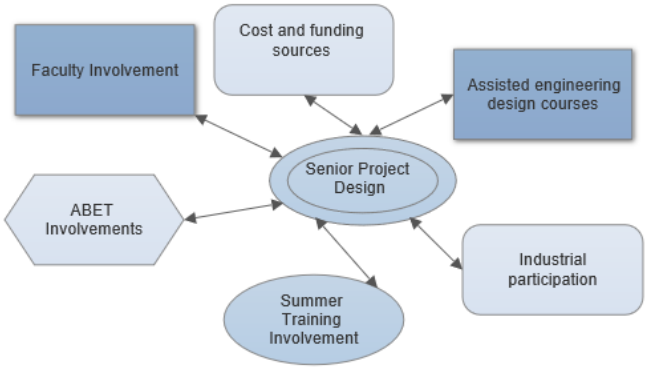

Figure 1 Capstone project influencing factors

C. Assisted engineering design courses

The first-time students meet their supervisor/mentor with engineering background are in the year following the two basic years of study. During this period, a design course might be implemented in the curriculum to expose the students with some flavors of what the real engineers actually do [1, 9-11]. Engineering Design 1 and 2 courses are implemented in all engineering departments in Engineering college at King Abdelaziz University for both Campuses Jeddah and Rabigh [5, 6]. In these two courses all soft skills are taught to the students by practice. At the end of these two courses the students are asked to come up with innovative ideas and expose them in a gathering day of the design engineering course by the end of the semester. All other engineering courses are encouraged to have projects imbedded in their contents and activated by the instructors. During the time of the project mentors may suggest to the students some suitable courses which help them to complete their project.

D. Summer Training Involvements

As other engineering colleges, students are required to participate in the summer training (internship) program either in local or overseas. Students are encouraged to go for the internship during the summer just before their final year. During the internship students are exposed to the work environments and have a chance to connect what they have learned to the real-life industry. Students are highly encouraged to involve in a case study or a problem-solving activity where they have to apply their earlier skills and knowledge to propose the potential solution to industry where they undergo the training. With the help of their academic advisor or project mentors as well as their industrial mentor, they need to formulate senior project subject which can benefit both the academia and industry. By having the students to know their Capstone mentor early and based on what they have agreed to work, students can come with real engineering problem and solve it with the supervision of his mentor. As a result, the students may have ended with a funded project to work on.

E. Multi-disciplinary Project

In most industries, the engineers are exposed to combined problem that may involve multi-disciplinary, *i.e* electro-mechanical or civil-industrial. The engineers from different specialty need to set together and solve any raise up issue.

This is the reason why in the capstone projects, students are encouraged to engage in a multi-disciplinary project, in which students from different specialty set together and come up with a design that involves multi-engineering background, and sometimes business or management as

well. In the University of Houston, the capstone project has been implemented with multidiscipline teams, Mechanical and Industrial Engineering or Electrical and Computer Engineering. For the year 2015-2016, the course had 147 students working in 39 teams on 34 different projects. Eight projects join a competition of 2016 Formula SAE in Lincoln, NE and one of the projects manage to get the 26th out of 80 participants. Multiple teams are permitted to deal with similar activities under specific conditions [12]. As a result of this good experience from University of Houston, the competition and patents were increased throughout the states, as stated by the Capstone coordinator in Houston Engineering College, 2012.

F. Cost and Funding Sources and Industrial Participation

Most of the expenses are regularly secured by the organization. However, industrial sponsorships have turned out to be more incessant. Among the expanded level of foundations with industry backers, national and provincial affiliations are developing, supports are regularly allowed some or all protected innovation rights, and supporting organizations have a tendency to have more continuous contact with their students teams [4]. A closer look from an engineering-industry perspective, the well-prepared engineering graduates to satisfy employers requirement, is a challenge, to be addressed by both academic institutions and industry together [13].

Outer task sourcing, either through industry or outline rivalries, has expanded in recurrence and is the most well-known approach. Industry sponsorship plays a considerably bigger and more changed part in capstone [4]. In some university, the senior project course (*Capstone*) has developed to become industry-sponsored projects. But before that, the faculty members were supposed to propose the problems. On the other hand, the companies can provide "real" problems, that they need a solution for it. For that, the company has to provide their involvement like expertise and financial support [1, 2, 14].

The most-favored pedagogical model for teaching design, is project-based learning (PBL), which involve corporation between academia and industry. Course industrial advisor was proposed in one of the fruitful meeting between KAU and Petro-Rabigh back in 2014. The aim is to involve the practiced engineer with his field experience in teaching of the course. The industry can involve in Capstone either with engineering experience or with direct fund. Some companies like Technia allows students to fabricate their system in the factory workshop, which shows unique way of collaboration.

G. ABET Involvements

ABET sets 11 student outcomes (SOs), for engineering program as was stated in [15]. Six of them are professional skills (outcome d, f, g, h, i and j) which should be covered by project-based courses such as Capstone. The remaining five are considered as technical outcomes which can be covered by regular courses. Achievement of these results prepare graduates to enter the expert routine with regards to designing.

ABET also put constraints, [15] for the senior project design to be applicable for the industry and community.

The review presented above describes design thinking as right now seen by design specialists and professionals [1]. This paper portrays the standard practices and existing condition of capstone design education through the nation as described by literature review. Innovative procedure for the Capstone which is practiced at the Faculty of engineering in Rabigh is addressed in detail. This includes assigning responsibility for project coordinator, mentor, department admin and students. Details evaluation according to ABET criteria is explained and

applied. Studying the effect of the implemented factors on student's performance for five years are conducted.

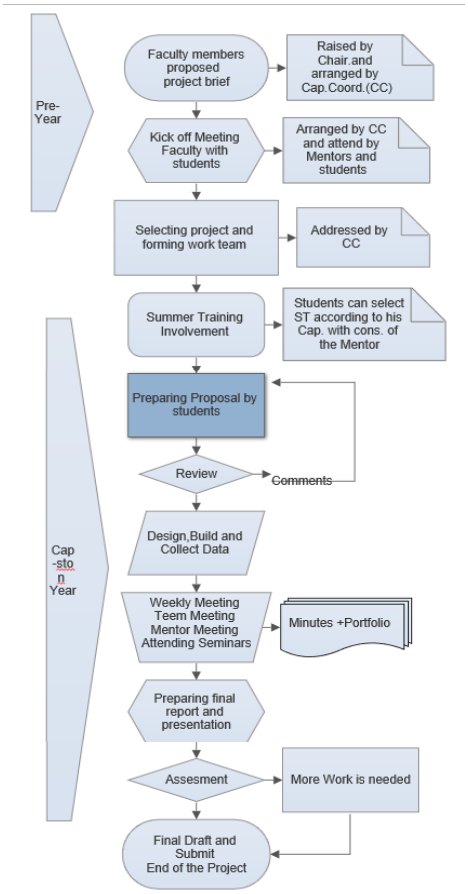

Figure 2 Flow Chart of the Capstone for senior students

II. IMPLEMENTATION PROCEDURE

The general approach undertaken is to deliver the senior project design course as highlighted in Figure 2. The process starts in the year prior to the Capstone year. All suggested projects were proposed to the students using standard template form. After that, the Senior Project Coordinator calls for a project kick off meeting. In this meeting all mentors present the highlights about their project. Based on that, students will form their team and decide on which project they want to work on. In this way, by the senior project year and with the involvement of summer training, all students are ready and will be prepared to start their project. Each team prepares its own proposal with the help of the mentor and submitted to the coordinator within one month from the start of the fall semester. All proposals are assigned to referees to put remarks on them and return to the teams. Only then, students can start the project officially s. The 1st draft of the final report will be sent to the senior project coordinator who then pass it to the examining committee. SDC set a time for presentation and respond to the final draft from students after fulfilling all remarks from

the examining committee. As encouragement to the students, extra 5% is given to the team if they managed to establish any paper or poster from their work.

A. Assigning responsibilities:

Senior Project Coordinator (SPC).

Undergraduate students usually have their academic advisors who take care of guiding the students to complete all required courses according to the department's curriculum in order to complete their Bachelor's degree. Other faculty members may involve in guiding the students in certain part of their academic life, such as English Program Advisor, Summer Training Coordinator and other courses coordinators. For the Capstone course it is necessary to have a General Coordinator for the program. It is needed to open a wide opportunity for students to select suitable project to work on. It is also essential to provide students with certain skills that cannot be gained through other courses. Moreover, students have the right to gain what they expect from the Capstone and be evaluated fairly. The senior project coordinator (SPC) is assigned in each department to full fill this issue.

SPC is the one that students have contacts first to register for the Capstone. In the beginning, the coordinator gathers all suggested topics from faculty members and students. He arranges a kick off meeting with all faculties who have a Capstone course with the registered student. In this meeting each faculty member has to proposes his idea in a given time. By the end of the meeting each group of the students has to put up three choices for the proposed ideas. The coordinator assigns the suitable project for the students after consulting with the faculty members. After that, the coordinator conducts several meetings with all SP students to follow up with their progress, arranges seminar and workshops to deliver the requires skills for them. The jobs list of the senior project coordinator can be summarized as follows:

- Contact all faculty members to propose projects for students using standardize format in one page, usually contains: Title, key words, brief description, some pictures.
- Register all students who need to take up capstone project.
- Conduct the project kick off meeting.
- Assign students with their suitable project by consulting with faculty members as described above.
- Conduct seminars and workshops for the capstone project students to fulfill the skills needed for the program, Table 1.
- Evaluate and follow up with student's portfolio and weekly meeting.
- Review the required ABET criteria for the Capstone and make sure that it is fulfilled with the project.
- Arrange the presentation time and the evaluation form.
- Gather all scores and put the final grade for the student.
- Attend all meetings on the College level regarding the Capstone.

Table 1Various skills that might be given for SP students.

Classification	Skills	Hours
Managements	Team forming	4

skills	Meeting management	2
	Planning	4
	Project management	8
Technical skills	Microsoft project	4
	Microsoft offices: word, Excel and power points	6
	Writing report	4
	Conducting presentation	2
	End notes	2

Senior Project Mentor

Mentor of the project is the keyperson for the project. Mentor is the one who initiate the idea of the project with students, involves with their daily works and solve the main technical and scientific issues of the project. The job list of the senior project mentor can be summarized as follows:

- Propose the idea of the project using the certain form, to the SPC.
- Attend the startup meeting and propose his idea to the students.
- Conduct the weekly meeting with students and approved the minutes of the meeting.
- Supervised all technical issues related to the project like equipment and devices, place, keys for labs and rooms.
- Help the students in all scientific problems related to their project.
- Evaluate the student individually according to ABET criteria.
- Help the students in preparing the project proposal according to the required format.
- Prepare the students to present their work to the examine committee.
- Audit the final report and make sure it covers all the required items.

Examining committee

The work of the students should be evaluated by the independent committee. This is to fairly appreciate the work of the students and make them feel confident of what they have done (in most of cases). The chair of the department forms this committee and authorize them to evaluate the work of the students through the presentation. The examining committee use certain criteria to evaluate the presentation. Additional details will be discussed below in the section of Capstone evaluation, on the rule of the examining committee and presentation evaluation.

B. Team Formation

Team forming is the first important step in determining the future success of the project. Being able to move the team towards the goals is not an easy task. There are many elements that need to be considered in the team formation process. Team leader and members are encouraged to participate in short course about forming effective team, which is available though many website [16-18] or through some university program. During the project, team members must conduct several meetings in order to achieve the required milestones of the project. The team should meet with their advisor weekly and at the same time be in contact with each other, before and after the advisor's meeting to follow up with the work. Figure 3 shows the common team weakly activities to meet the outlined milestones.

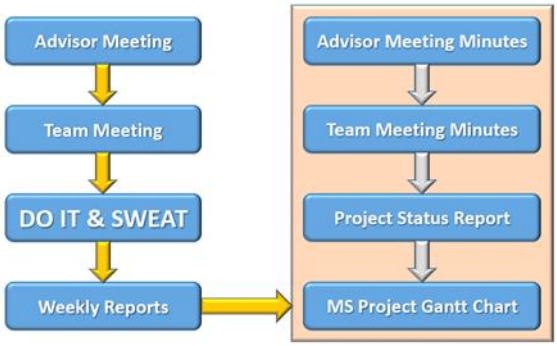

Figure 3 Team Weekly Activities

C. Project Proposal

The next important step in project implementation is preparing project proposal. This step is very crucial as the objective and scopes of the project will be identified and finalized before the actual work started. This should be done carefully with thorough screening by the mentor/s. A good proposal will save a lot in terms of money, time, energy, resources… *etc*, during the actual implementation of the project. Thus, spending time in preparing good detail proposal will be very beneficial and contribute a lot in the overall implementation of the project.

After the topic or subject has been selected, the student/s need to work with their mentor/s (professor and industrial mentor if there is any) in preparing the proposal. The proposal should be the standard rules and feasible to be done in terms of time frame and resources. The common project proposal usually consists of the necessary elements as follows.

- Executive summary/Abstract.
- Project Introductory/Literature.
- Problem statement.
- Objective and Scopes.
- Implementation approach.
- Time Planning using Gannt Chart, Figure 4.
- Conclusion.
- References and Appendices, if any.

The SPC assigns referee for each proposal to have a written feedback, and return it to the project mentor. At this stage the final screening of the project is done before the actual implementation of the project.

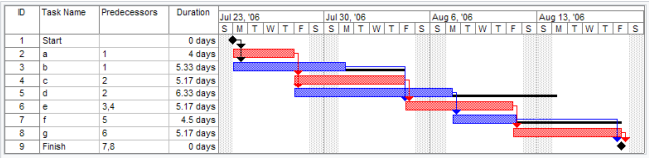

Figure 4 Example of Gantt Chart

Evaluation of the student's senior project is common operations that involves mentor, senior project coordinator of each department and the examining committee.

III. Project Evaluation according to ABET Criteria

A. Direct Assessment

One of the major difficulties which the project's advisors are facing is the evaluation of the students. The challenge become much more complicated when a group of students are working on the same project and submitting the same report. In some cases, not all students put the same effort for the project. It happens that some students rely on others, if they feel that they will get the same score.

On the other hand, fulfilling the ABET criteria is another challenge for the Capstone. Faculty of engineering in Rabigh agrees that all ABET criteria must be covered during the academic curriculum in each major. For the senior project design technical outcomes: a, b, c and k plus professional outcomes: d, g and h are mandatory to be fulfilled.

Tasks and expected products from students are shown in Table 2 and Table 3 respectively.

Table 2 Tasks that are presented to students in Capstone

No	Task	Related ABET outcomes							
		Technical				Professional			
		a	b	c	k	d	g	h	
1	Attending meeting and seminars related to the project					x			
2	Conducting literature review	x							
3	Design and fabricating the test rig			x				x	
4	Develop the required software				x				
5	Data Collections								
6	Analyzing the data		x						
7	Writing the report						x	x	

The evaluation and supervision of the capstone project can be divided into several elements.

The SPC conducts several meetings with students during each semester. The purpose of these meeting is to give general instructions for all senior projects students of the department about the required skills that they should adopt to make their Capstone successful. Some of the skills are leadership skills apart from the technical skills.

Table 3 Students submission products

No.	Products	Related ABET outcomes							Total weight %
		Technical				Professional			
		a	b	c	k	d	g	h	
1	Meeting minutes					3	3		10
2	Project proposal	5		4		5			10
3	Test rig		5	5					15
4	Software				10				10
5	Project portfolio					5			5
6	Presentation	5			5	10	5		20
7	Project report	5	5	5	5	5		5	30
Total %		15	10	14	20	28	8	5	100

It is very important for the students to meet at least once a week. In this meeting they should discuss the progress of the project, write down what has been achieved and keep track with their plan. They should assign the job to each team member. All of that should be recorded and hand it to the Capstone advisor and approved by their mentor. A special form is designed for this purpose. Moreover, Capstone project team should meet with mentor at least once a week to discuss the progress of the project, highlights the obstacles and seek solutions for them.

For each outcome rubrics have been developed that include KPIs to measure students' performance. Table 4 shows example of rubrics for outcomes c and g. Description for each KPI's must be rises. Example of this description can be seen in [19].

Table 4 Rubrics of outcomes c and g

Outcomes	**Ability to design a system, component, or process**				
	KPI's	**E**	**G**	**NI**	**U**
c.1	Define the Problem / Opportunity				
c.2	Develop and Compare Alternative Designs				
c.3	Implement Iterative Analysis and Synthesis to Finalize the Selected Alternative				
g	**Ability to communicate effectively.**				
	KPI	**E**	**G**	**NI**	**U**
g.1	Communicate Effectively in Writing				
g.2	Communicate Effectively Orally				
g.3	Use effective Technical Graphical Communication				
g.4	Demonstrate Effective Listening Skills				
	E: Excellent , G: Good, NI: Needs improve, U: Unacceptable				

The examining committee evaluates students work according to the presentations and the project report. The examiners focus on two main elements, organization of the presentation and the content. The presentation weighted 55% while the content weighted 45%, and most of the contents are evaluated by the Mentor.

Figure 5 shows average scores breakdown for 17 Capstone project students during Fall-2016 & Spring 2017. TMM and TMMM refer to the weekly meetings minutes of the team and the team with mentor, respectively. Analysis of Figure 5 indicated that students have problems in attending the weekly meeting with the coordinator. However, they got good scores in submitting the minutes for their weekly meeting. Their presentations for the project were satisfactory as well as their final report.

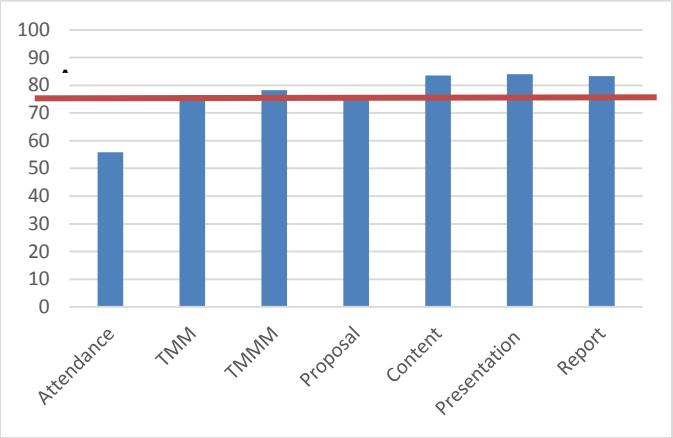

Figure 5 Average scores breakdown for Capstone students, 17 students, Fall-2016 & Spring 2017.

The average of the students' scores (the mean) is 80.29%. The score range which is the difference between the high score and the low score is 92-46=26, and the variance which is the average of the squared distance each score is from the mean and is calculated to be 229.8. Then the standard deviation is the square root of the variance which is 15.2. The normal distribution of the score can be graphed as shown in Figure 6. Since most of the scores are high, the normal distribution is not normal, but is should be negatively (left) skewed.

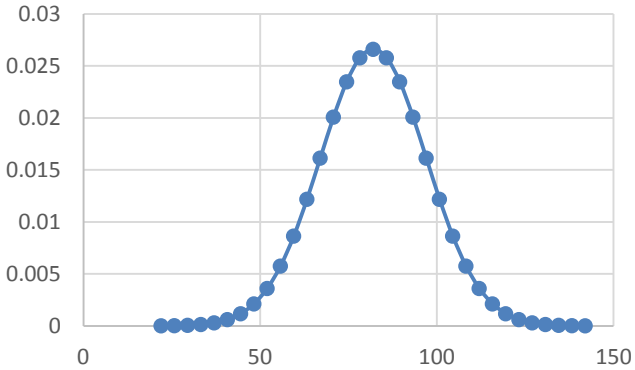

Figure 6 Normal Distribution of the scores for the Capstone students, 17 students, Fall-2016& Spring 2018.

The students are scored numerically and by rubrics. Figure 7 represents the results of applying the rubric of outcomes on SPCD. It can be seen that the overall achievement is satisfactory. However, weaknesses are shown in the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context, (outcome h) and an ability to communicate effectively, (outcome g).

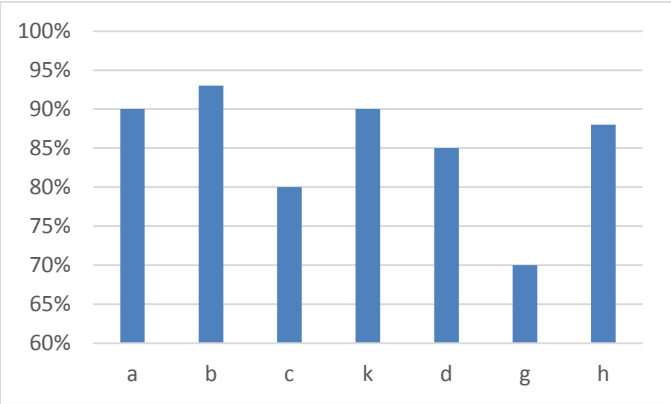

Figure 7 Average achievement of the outcomes b-j (17students Fall 2016 & Spring 2017)

Criteria g which is the ability of the students to communicate effectively was assessed through KPI's mentioned in [19]. Figure 8 shows the average achievement of outcome g for a group of 17 students in Fall-2016 & Spring 2018. It can be shown that the written and oral communications skills for students are weak. It was noted that most of them were in "needs improvement" field. For that, the students have to give more attention to their communications skills, since these skills are of the main attribute that required by job market. Students who need to improvement were asked to re-deliver the presentation and re-write the project report, to get passing grade for this KPI. The Faculty of engineering at Rabigh has established a new English Support Unit at the college, where students can utilize it to improve their communications skills.

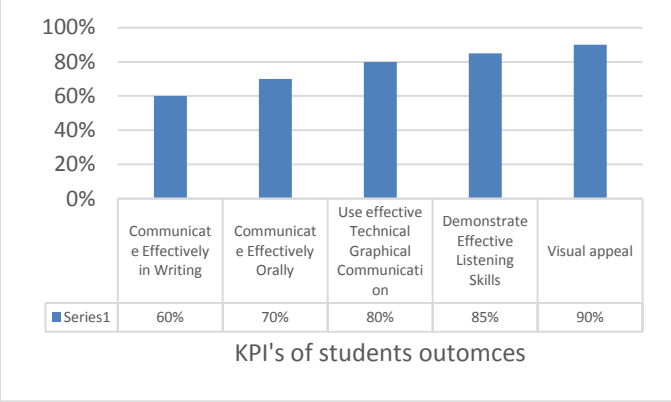

Figure 8 Average achieve of outcome g

B. Indirect Assessment

Students themselves were continuously evaluating the course according to the ABET criteria. They should evaluate each outcome and give a feedback on their performance. Table 55 shows the sample of the indirect assessment for the three outcomes.

Table 5 Indirect Assessment for student to the Capstone

Student Outcome (a): An ability to apply knowledge of mathematics, science, and engineering		
No	**Attribute**	**Question**
a1	Mathematical Modeling	Your ability to combine mathematical and/or scientific principles to formulate engineering models
a2	Terms	Your ability to interpret mathematical and engineering terms
a3	Theory	Your ability to understand the application of theory to the problem
a4	Calculations	Your ability to perform calculations both by hand and by using relevant software
a5	Statistical Analysis	Your ability to perform statistical analysis of data
Student Outcome (b): An ability to design and conduct experiments, as well as to analyze and interpret data		
No	**Attribute**	**Question**
b1	Lab Safety	Your ability to consistently observe laboratory safety procedures
b2	Data Collection	Your ability to develop an experimental plan of data gathering
b3	Experimental Procedures	Your ability to develop and follow experimental procedures
b4	Tool Selection	Your ability to select appropriate equipment and instrumentation
b5	Tool Operation	Your ability to operate instruments and process equipment
b6	Application of Theory to Data	Your ability to apply appropriate theory for data analysis
Student Outcome (e): An ability to identify, formulate, and solve engineering problems		
No	**Attribute**	**Question**
e1	Resources	Your ability to utilize appropriate resources to solve problems
e2	Component	Your understanding of the whole

	Relationship	problem as well as its related components
e3	Strategy	Your ability to formulate and apply problem solving strategies
e4	Outcome Prediction and Defense	Your ability to predict and defend problem outcomes
e5	Solution	Your ability to answer correctly with proper reasoning
e6	Validation	Your ability to check for alternate solutions and validate

A sample of student indirect assessment is shown in Figure 9. The results show overall satisfactory of students which occurs in area above 70%.

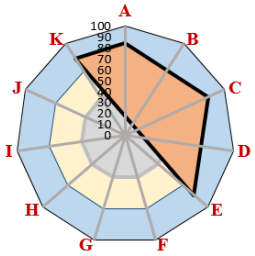

Figure 9 Sample of indirect assessment for the design course

C. Findings

The proposed new strategy, was implemented for two consecutive years and the results were encouraging. Faculty members were more motivated to mentor Capstone. Comparing with only two or three projects per department were offered for years between 2012-2015, it is increased now to an average of six senior projects per department. Accordingly, the students number for each project has been reduced from 4-5 per project to only 2-3 per project which gave more opportunity for students to focus and communicate with their mentor. The score of students has shown significant improvement. Feedback from the students also show that they were fairly evaluated throughout the whole semesters. The output of the Capstone project was also appreciated and organized systematically. Almost three papers per department were published in conferences and recognized journals. One patent is in its way to be filed. Figure 8 shows the performance of the department between 2012 to 2017 in implementing students' capstone projects.

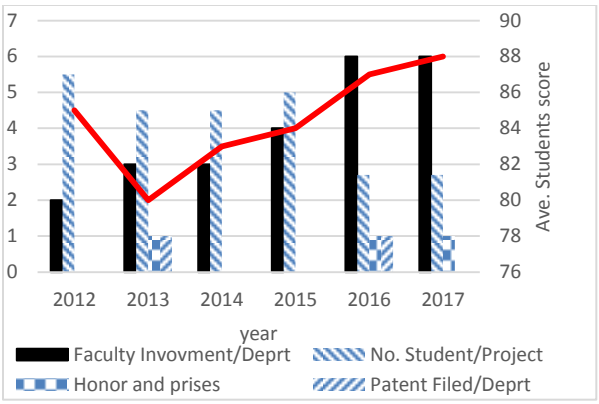

Figure 10 Performance of department of Rabigh Engineering College

D. Project Report

Students must write final report for their Capstone according to standard regulations that fit their institute. An example of this can be found in The Manual for Thesis Writing at King Abdulaziz University [20]. Details of format of the report are all well explained, including cover page, table of content, list of tables and figures, main contents, references…etc. Spacing and Margins are all describes in detail. The main elements of the report are the same as those mention in the proposal section above plus Results and Discussion which was not mention in the proposal.

E. Course Report

It is required by ABET to have a course report for each course. A sample of that report is shown in Table 6. It should shows the students' achievement of ABET outcomes for the course, highlight the students' weakness and actions that might be taken to take care of that weakness.

Table 6 Course report sample for MEN 498-499

Direct out.	Assessment method	Achievement	comments
a	Proposal/presentations /report		
b	Test rig/report	94	
c	Test rig/proposal/report		
k	Software/presentations / report		
d	Minutes/proposal/portfolio Presentations/report	92	
g	Minutes/ presentations	92	Need actions
h	report	94	

Actions for improvements						periods	Responsible
Training course for communications skills						12 weeks	Communications support center
Field trip						1 day	Instructors
Indirect assessments							Comments
	a	b	c	d	e	k	b and d need to be addressed
Score	82	70	80	70	75	75	
Actions for improvements						periods	Responsible
More emphasis on how to conduct experiments						2 weeks	instructor
Training course on the effective team buildings						12 hrs	Faculty

IV. Conclusion

Design courses in engineering curriculum should be given special attention to prepare students for the real engineering life after graduation. Senior Project Design (Capstone) has the rule in preparing the students for their future career. To have succeeded in SPD, rewards should be given to the in-charge faculty. An active relation with industry should be also be established. Summer training program and other design courses should be involved while Capstone is considered. ABET criteria is a key element for the Capstone that need to be implemented in all engineering courses. However, the actual implementation of the course should be customized according to the group of students that each Higher Learning Institution have. Most importantly, the objective of having Capstone project in preparing students for real engineering life should be achieved.

All of the necessary requirements towards achieving the objective of the capstone design project has been highlighted in this paper. The outcome from the paper will later be translated into the student employability after graduation and their career progression after five years in industries. The program is always being updated to comply with latest requirement especially from industries.

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