Exploring opportunities to enhance ABET criteria - Life Long Learning : A learner centric approach

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Abstract :

This paper discusses various ways of graduates participation in a classroom, course plan by the educator emphasizing on the effective classroom practices to facilitate lifelong learning which is ABET criteria (3i). Various techniques to increase the graduates learning ability are discussed. Challenges faced by the educators to implement these techniques in the classroom are presented. The approaches for encouraging learners' ownership, using techniques for the students to be self motivated.

Various pedagogical ideas are presented for enhancing learning needs of the graduates. This understanding seems crucial for the course instructor to organize how each class of 50-60 minutes should be, bi-directional knowledge sharing. Identifying the students' classroom behavioral pattern, comprehensive techniques to create opportunities for learning is presented. Life long learning is essentially the overall growth of an individual, practicing **L**eap before you look, having **I**ntrinsic motivation and **F**aith in future with great **E**nthusiam.

Section 1 : **Introduction**

The vision that reflects the quality of students graduating from an Engineering Institution plays a key role in their career. The career progress of the student depends on the opportunities provided at the Institute, which facilitates their learning experience and skill development. In India the National Board of Accreditation (NBA) in the year 2013 [1] has introduced a framework for Engineering Education where technical knowledge, problem analysis, modern tool usage, project management, communication, lifelong learning are the parameters that the engineering graduate should acquire. The process of acquiring these parameters and promote Engineering Education in India is the aim of this accreditation body. Rising the level of the technical and communication skills of the graduates is the objective behind formulating these graduate attributes in par with the international ABET accreditation body.

The potential of this accreditation system depends on, how each Institute understands this and adapts various reforms in the education delivery system. One salient feature to be observed in the graduate attributes to be specified by the Accreditation body is, the responsibility of achieving these depends on the participation of Institute management, faculty and stakeholders (students).

Keenly looking at the attributes mentioned above, it is clear that they should be handled at the course level and the laboratory level. ABET is as International accreditation process introduced in 1990, where the attributes of a graduate are the Program Outcomes (3a – 3k).

Accreditation process is not merely a report preparation at the end, but is a continues process, which when methodically involved for each program yields better framework. In [4] the author describes the assessment models one can use at the course level in engineering education. In [5] James et.al. discuss how active listening improves communication skills by paying attention to the speaker.

Outcomes 3h, 3i and 3j are more related to the graduates of skill development, career growth and how he/she excels in professional front. These attributes are a bit tricky to measure directly as a graduate assessment parameter. Nevertheless, some yardsticks/milestones can be specified in the program roadmap, where good distinction is observed.

In this paper the focus is ABET criteria (3i), "A recognition of the need for an ability to engage in lifelong learning". In section 2 the overview of the ABET criteria 3a – 3k are presented. Outcome 3i is discussed briefly indicating steps to be taken by the Institute, course instructor and students. In section 3 the students learner kit is presented, addressing how a student learns, student classroom behavior, skill development path followed.

Section 3 also gives how can a graduate work to the best of his/her potential and increase their self esteem. Section 4 and 5 presents the opportunities a course instructor gets to alleviate the lifelong learning ability of the graduates. Pedagogical ideas to be used in the classroom are presented to enhance the planning and teaching methods during a class. The challenges faced by the educator to create a learner centric classroom is discussed. Section 6 concludes the paper linking the theme of the paper to other ABET criteria 3a – 3k.

Section 2. Overview of ABET program outcomes (3a – 3k)

This section presents the overview of program outcomes (3a – 3k) as defined by ABET accreditation body where programs must demonstrate that their graduates have:

3a . an ability to apply knowledge of mathematics, science and engineering.

3b. an ability to design and conduct experiments, as well as analyze and interpret data.

3c. an ability to design a system, component, or process to meet desired needs.

3d. an ability to function on multidisciplinary teams.

3e. an ability to identify, formulate, and solve engineering problems.

3f. an understanding of professional and ethical responsibility.

3g. an ability to communicate effectively.

3h. the broad education necessary to understand the impact of engineering solutions in a global and societal context.

3i. a recognition of the need for and an ability to engage in lifelong learning.

3j. a knowledge of contemporary issues.

3k. an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Since the main objective of this paper is to investigate classroom/laboratory techniques to achieve outcome (3i) lifelong learning, a brief discussion is given on the meaning of lifelong learning in the context of engineering education. The platform for creating a lifelong learning environment during the course class is sometimes difficult, but it is still possible with careful pedagogical course planning and teaching methods. The graduates should **learn** to **earn** a prosperous livelihood with attentive **ear** for procedures and skill development, **lean**ing on the principles of self evaluation with a precise **len**s for conceptual key points adapting to **real** time scenario. The graduates should focus on future, which is one of the prominent soft skill required for an engineer during his/her professional career.

Lifelong learning is 'knowing what to do, how to do, when to do, when one doesn't know what to do and when to do' says Amit Malik, director HR Aviva Insurance Ltd. [6]. Empowering the graduates to handle their future applying the skills learnt in the engineering institute is lifelong learning. Future orientation is a direct function of learning from the past says J Subramanium, Chief Gati Ltd. Capture your journey in the last few years and figure out the changes in you says Arman Choudhary Head. Emaar MGF Ltd. To be up-to-date with latest trends in technology, foresee your future, it is more about 3s in the long term – sustainability, survival and stability. Individuals who are willing to rethink their own ideas adapt faster. They are rethinking learners, solution oriented in their thought process, work with long term success and collaborate to reach greater heights says Preeti Marwah Head, Power2SME Ltd. . The ability to identify and interpret changes and trigger appropriate responses to ensure long term survival and success is vital for a person says Rajesh Padmanabhan, President Sesa Sterlite Ltd. So the graduates should be trained to face the future, the opportunities should be created in the classroom by the educator to make him/her a lifelong learner.

Section 3: Students' Learner kit

This section presents the path followed by the students to learn during their education phase. It is important for the teacher to understand the psychology of the student in the classroom and laboratory before devising techniques for lifelong learning. The expectation of a students' mindset in an engineering course is a coagulation of Self awareness of learning ability, Self development, Self Attitude, Self motivation, Self direction, Student focus, Student preparation, Self monitoring, Self assessment, Sense of priority (time management), Setting targets, Sustaining enthusiasm, Set challenges, Self ability to develop cognitive thinking,

Sense of Self as rethinking learners, Self ability to put right effort for a successful graduation and Awareness of the future form the students' learner kit.
Learning in new ways graduates will be amazed at how much one can grasp and how much easier it is to remember the content.

Analyzing self motivation Zimmerman [8] describes that self motivation occurs in the absence of external rewards or incentives and therefore is a strong indicative that a learner is becoming more independent thinker. The students' learner kit should be facilitated in the institute by increasing their ability in problem solving, conceptual understanding and cognitive thinking. Graduates should be able to learn from past, work for their future and live in the present which is the very meaning of lifelong learning. An ability to live in the present for a good professional career ahead, is partly developed in the classroom and laboratory.
The student should consider the experience that is needed to acquire his/her professional roadmap. Students career building will be effective if it is well targeted. The technical education should provide them opportunities to ponder on questions like i) How does the graduate like to see himself/herself in 5-6 years from now and beyond? Ii) What are the means to reach that position? Iii) Do they appreciate that finally that, the ladder to reach that progressive path is their ownership? William Hazlit's quote is apt to mention here, " You have to make it happen. The more we do, the more we can do."

Section 4: Pedagogical Ideas : Classroom ambience

In this section the pedagogical ideas which can be used by the course instructor are presented to improve outcome (3i) lifelong learning ability of the graduate, basically strengthening the students' learner kit as described in the previous section. Human mind is the director of an individuals' personality. Higher the energy released from the mind, higher is the lifelong learning ability. Any activity, instruction, technique which increases the energy level of the student in the classroom/laboratory should be implemented. Remember every individual is born with the same mind and brain structure, the energy level released, the energy level utilized is different. Achievers energy level both released and utilized is high.

The opening remark in the class should be, what is the portion to be covered in this class using keywords or conceptual diagram. Develop the context for learning letting them know what they will do. This will facilitate the student to develop a mental framework. Make the students feel involved in the class. Create opportunities by asking them questions after a duration of 15 minutes. Those 15 minutes should be packed with technical information, concepts, problem solving approach, design model, design circuit basics, algorithm, process model, design platform, precise information that you want the students to know, remember, apply, derive, illustrate, develop, classify, identify, implement or solve.
Students appreciate a class which is well organized and structured without any confusion. One of the principles in lifelong learning is knowledge acquisition through smaller parts to sense their own intellectual growth. Voice of a teacher should be well modulated and energetic. The class should not be monotonic, but it should be enthusiastic and lively. Energy levels of the students should be increased, so that they are further motivated to work and gain knowledge. A classroom delivery is a teaching and learning process. Make the students active listeners, to reflect what they have understood. Increase the ability of the student to pay careful attention to

the portion taught in that class. Convey your enthusiasm during the class delivery, since students expect signs of increasing their energy level.
Fixed answer type questions often seems disinteresting to the students, reflective answer type questions trigger creativity in them. 20% of what speaker says is heard by the students. Repeat and summarize the class at the end to facilitate better learning. Make learning creative, dynamic and exciting.
Fill in the blanks, short answer, 2 minutes discussion, multiple choice, 2-5 minute recall time to ensure learning has happened. Maintain interest throughout the class. Maybe the student will barely use the concept taught in the class. The mental training that he/she undergoes in terms of developing problem solving skills, thinking, analyzing, precision, methodology applied, approach used to do/learn a skill remains as an asset.
Students should be certain about what they want to do, how to do and when to do? What is the use of postponing the work and mismanaging the time, basically without commitment? Appreciation and concern for the students progress is very important. Self realization about the learning ownership should be convinced to the students often and repeated often. Design some activity to unleash their potential and talkative nature, by allowing them to discuss the concept for 2 to 3 minutes and summarize. Mindset of any individual is triggers when sometimes visuals are presented. Strong emotions can be created by classroom attitudes to enhance their learning capability. Energy of a teacher will be profound if one prepares knowledgeably to classes, as a famous quote says “to give a pound, read a ton”. An energetic teacher is well remembered by students.
Cultivating and maintaining intrinsic motivation is a life-long skill that all students can develop because extrinsic motivation works for short duration. Self regulating attention is created intrinsically by observing other classmates doing the short activity, searching for worthy points in participating. Empowering ways of thinking often increases the self esteem of the student.
Another important pedagogical technique is give more importance to key points, emphasize the relational features, utilize illustrations to revise the important material.
Encourage the students to take short notes, to recollect at their study time later, basic points. Students enjoy concept demonstrations using flowchart, diagram or relevant points of interest.
One important technique to be convinced to the student is the benefit of consistency in their study pattern, Regular study creates a pace for learning and increases the analyzing ability and the interpretation skill, which is a key essence of lifelong learning. Hastily doing the study at the last moment, is rather confusing, since the neurons in the brain do not get sufficient time period to organize and register the concepts with confidence. Another important trait of lifelong learning is developing self confidence, in students about their ability to perform well. If the thinking ability of the student is increased deciding what to do and why?, it will help him find the reality of path to success, increasing the self confidence, by applying step by step reasoning process.

Finally the most important of all, to make the students lifelong learners the course instructor should be well equipped with technical knowledge, practical skills, be able to correlate the subject with other subjects, communicate effectively and energetic in each class to give their best, building on the basics. In teaching profession every class is a milestone to be achieved, as in industry every design delivery is a landmark. Prominent importance should be given to

read the subject as a whole, interpret the sub units of the portion, establish the relation between the entire syllabus for a course, spend sufficient time to prepare for a class, acquire ample knowledge developing design skills, programming skills and modeling skills to depict the real time scenarios. Connect to the industry trends and design to explain the importance of the subject. Preparation for a class should be thorough in terms of problems to be solved, concepts to be explained, algorithm to be developed, model to be designed, derivations to be used, mathematical steps used and analogy for the concept. Ability to inculcate Lifelong learning is a special art of an individual teacher. Create ample opportunities for students participation and knowledge retention activity, to unleash the true potential of the student. Encourage the students to try things out and share the learning process.

Section 5: Enriching interest levels of the graduate and challenges faced.

In this section challenges faced by the course instructor are presented. This section also briefs some tips to enrich the interest level in students. Table 1 presents the challenges faced, classroom techniques and the impact of the same. Student shortcomings are the challenges faced by the teacher in a classroom.

Table 1: Classroom techniques to enhance lifelong learning

Challenges faced	Possible activity/preparation	Impact
Students disengage	Concentrate on 65 students who are doing rather on 10 students who are not doing.	Self induction is expected
Students learning preferences	Increase curiosity, be energetic, change the mindset of the student, encourage discussion	Promotes creative thinking
Students want their teachers to understand what they know	Use reflective questions, Create active listening ambience	Promotes analyzing and interpretation ability
Student is disinterested	Explore and discuss contents to arrive at the answer rather than giving straightway the solutions	Promotes intellectual engagement
Students culture in the institution	A Institutional culture of high expectation of developing designs, fundamentals, prototype, regularity, high expectation in academics, learning environment, no spoon feeding.	Promotes self regulation, self direction
Students sometimes feel what they learn is irrelevant	Build a sense of purpose and learning experience. Relate to real time situations	Promotes intrinsic motivation. Acts as a stimuli
Students have lack of	Well organized and structured	Increases energy levels to

enthusiasm	presentation, giving hints to higher level of problem solving skills.	analyze the procedures to the solution step by step, increasing the reasoning power.
Students are not self focused	Keep them reminding of their goal and provide direction for their	Increases their ability to think in a particular direction

Section 6: Conclusion

In this paper the emphasis is on how to achieve outcome (3i) in the engineering institutes. Thoughts are converted into actions to have a good today, for a better tomorrow. It is conveyed here that, any techniques used to enhance the thinking ability of the student, will orient the graduates to a bright career. It is presented that how the course instructor should depict to the students, "Don't focus on conditions but focus on conditioning". The students' learner kit which is the mindset of graduates is described. Finally, the challenges faced by the course instructor and remedies for those are also given in the context of lifelong learning. The course instructor has to be energetic to create interest in the students. Students should be made aware of their ability of qualities like self direction, self motivation, self regulation and self evaluation.

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