

Innovative and Effective Teaching Methods for Engineering Students

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Abstract

This article introduces effective teaching strategies suitable for teaching engineering, accordingly students will be able to explain, find evidence and examples, generalize, apply analogies and represent a topic in a new way. There are several teaching methods that teachers may use to achieve the goal. Among several modern teaching methods such as active classroom, problem-based learning and more, some or all may fit the nature of engineering disciplines. Therefore this study aims at understanding the student's point of view. In our technical society today, learning and teaching engineering is becoming more and more important. If teachers are going to begin teaching engineering they will, undoubtedly need some preparation before they begin. In this review, I look at subject matter knowledge, pedagogical knowledge, and expertise and discuss how, what has already been done in other fields. Conclusions about how subject matter knowledge and content knowledge impact teaching and learning.

Keywords : *Effective teaching method, engineering education, student's perspective, Technology in teaching*

I. INTRODUCTION

(Engineering is an essential and sensitive part of education as it shapes skilled individuals in whose decisions depend safety of mass population in all aspects of a society: whether it is infrastructure such as roads and bridges, or industrial environment such as mining or power generation or even natural calamity assessments like tornado and landslides (Glaser, 1984a, 1984b; Mager, 1962; Ramsden, 1979). But it is very unfortunate that the methodology of delivery of such a crucial subject is generally very uncreative, theoretical and unappealing (Felder & Silverman, 1988; Stice, 1976; Waldheim, 1987). Often it is just about getting required scores to get a degree or, on the upper level, getting record grades. But, in all circumstances, the 'book'-ish methodology of instruction severely lacks in development of engineering intuition and innovative thinking skills or acquaintance to engineering practice and work-relevant culture (Cross, 1993; McCaulley, 1976). As a result graduates may often find themselves at a puzzling situation after getting a job even though they are so well proficient in theoretical knowledge

(Felder, 1987). Hence, comes the so-called (often unpopular among fresh graduates) term of 'local experience' which ensures that the potential incumbent is evidently suited at a practical scenario. This in fact is a strong indication that there is serious lacking in the way engineers are prepared in the engineering institutions (Bloom & Krathwohl, 1984). Teaching innovation means the process of coming up with new ideas, theories, collaboration and solutions that can be shared in the classroom. Creativity is an essential part of innovation. Teaching creativity means creative efforts done by the teacher to bring out the innovation in classroom. In the 21st Century Innovation has become an essential component for endurance and success. Globalization and the Rapid technological change in education sector have created a need for change in teaching style, which leads to continuous innovation. Good & Experienced engineering and Management faculties have come out from the traditional way of teaching and learning. They should be innovative in finding ways to enhance the knowledge and skills of the student community. Apart from the conventional "Chalk and Blackboard" method, I apply different innovative teaching techniques to improve the standard or quality of teaching. Effective teaching is necessary for quality enhancement of the students and this can only be materialized by interactive sessions. Interactive session means both sided communication in between the faculty and students. For making my lectures effective, I first try to understand the target audience and collect information about their requirements, their strengths and weaknesses in the first two –three consecutive classes. Accordingly, I decide the important things to be taken into consideration at the time of delivering lectures. Example: - Identification of English speaking and Non-English speaking students, strong and weak students, Interested and uninterested students etc. This makes teaching very effective. For making the lecture session more interactive, I sometimes send students to the black board for explaining different topics to boost them up, build up their confidence level and also to make them aware about their strengths and weaknesses such as communication skill, knowledge base, self-confidence etc.

Each teacher has his unique style of teaching and the students have been seen to adopt the technique to some extent. However doing so, the students develop a tendency of selective studying.

This results in a framed development of the thought process and behavior of the student to bridge the knowledge gap. The goal of this review is to consider the research on teaching methods.

II. GENERAL STRATEGIES

Accordingly to Eggen & Kauchak, strategies are general approaches to instruction that apply in a variety of content areas and are used to meet a range of learning objectives. For example questioning, organizing lessons, providing feedback, starting lessons with a review and ending with closure, applicable in all teaching situations. These strategies are general and apply across instructional settings, regardless of the grade, level, content area or topic. Models are specific approaches to instruction that have four characteristics.

- They are designed to help students acquire deep understanding of specific forms of content and to develop their critical-thinking abilities;
- They include a series of specific steps that are intended to help students reach the objectives;
- They are grounded in learning theory;
- They are supported by motivation theory.

General strategies are incorporated within each of the models. For example questioning, lesson organization, feedback and other strategies are essential for the success of all models. A model provides structure and direction for the teacher, but it cannot provide all actions taken by a teacher. A teaching model is not a substitute for basic teaching skills, it cannot take the place of qualities a good teacher must have, and the different forms of knowledge. A teaching model is a tool, designed to help teachers make their instruction systematic and efficient

III. TEACHING FOR THINKING AND UNDERSTANDING

Experts define understanding as being able to do variety of thought-demanding procedures with a topic – like explaining, finding evidence and examples, generalizing, applying, analogizing, and representing the topic in a new way.

Teaching for understanding requires that teachers possess the different types of knowledge introduced earlier. According to Eggen & Kauchak and Burden & Byrd armed with this knowledge, effective teachers achieve deep student understanding by:

- Identifying clear learning objectives for students;
- Selecting teaching strategies that most effectively help students reach the objectives;
- Providing examples and representations that help students acquire a deep understanding of the topics they study;
- Guiding students as they construct their understanding of the topic being studied;
- Continually monitoring students for evidence of learning,

IV. USE COOPERATIVE LEARNING

Cooperative learning (CL) is an instructional approach in which students work in teams on a learning task structured, each student in the team is held responsible for doing his/her share of the work and for understanding everyone else's contribution. Students should be helped to develop leadership, communication, conflict resolution, and time management skills. Cooperative learning exercises may be performed in or out of class. Common tasks for CL groups in engineering are completing laboratory reports, design projects, and homework assignments in lecture courses.

V. FEW TEACHING METHODS FOR ENGINEERING STUDENTS

1. Content Delivery method
2. Assessment Method
3. Project based learning using ICT tool to achieve outcome for the course.
4. Assessing and enhancing creativity in a laboratory courses with project based learning.
5. A case study of implementing active learning techniques in engineering courses

Many innovative instructional methods have been developed for non-technical courses and emphasize free discussion and expressions of student opinions, with minimal teacher-centered presentation of information. We believe that involvement of students is critical for effective classroom learning; however, much of the basic content of engineering courses is not a matter of opinion. Educational approaches that emphasize process exclusively to the detriment of content will not be considered.

VI. CONCLUSION

Students have different levels of motivation, different attitudes about teaching and learning, and different responses to specific classroom environments and instructional practices,

understanding as being able to do variety of thought-demanding procedures with a topic – like explaining, finding evidence and examples, generalizing, applying, analogizing, and representing the topic in a new way.

Globalization and the Rapid technological change in education sector have created a need for change in teaching style, which leads to continuous innovation. Good & Experienced engineering and Management faculties have come out from the traditional way of teaching and learning. They should be innovative in finding ways to enhance the knowledge and skills of the student community.

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