

Recent Techniques of Teaching in Engineering

Humera Nafees

Department of Humanities & Sciences

K.G.Reddy College of Engineering & Technology, Hyderabad, Telangana, India

K.Satayanarayana

Department of Humanities & Sciences

K.G.Reddy College of Engineering & Technology, Hyderabad, Telangana, India

Abstract- This paper is discussing about new/recent trends of teaching in Engineering. How time by time changes have been occurring as per the demand of the course and need of the learners as well as educator. It gives the clear picture of successful techniques of teaching and new approaches introduced by the teacher/mentors in their respective subject.

Keywords – epitomize, overwhelming, pertinent.

I. INTRODUCTION

This paper emphasizes on the importance of communication for engineering students and different techniques introduced by a mentor to improve an engineering student's communication skills which includes L, S, R, & W. On the basis of the observation and feedback from different job providers it is a major issue with their weak communication because of which students are unable to get placement even though they have good scores in their respective streams. To overcome these problems, universities have taken a step by changing the course and introduced Professional English Communication. Which means previous English was also considered as a subject but now it's not just a subject but it is a skill-oriented course.

II. TEACHING TECHNIQUES

A-Critical Thinking

Critical Thinking is an important and vital topic in modern education. The purpose of specifically teaching critical thinking in the sciences or any other discipline is to improve the thinking skills of students and thus better prepare them to succeed in the world. But, you may ask, don't we automatically teach critical thinking when we teach our subjects, especially mathematics and science, the two disciplines which discipline which supposedly epitomize correct and logical thinking? The answer, sadly, is often no.

Consider the following two quotations:

"It is strange that we expect students to learn, yet seldom teach them anything about learning". Donald Norman, 1980, "in Problem Solving and Education: Issues in Teaching and Research, edited by D.T. Tuna and F.Reif, Erlbaum Publishers .

We should be teaching students how to think. Instead, we are teaching them what to think". Clement and Lochhead, 1980, Cognitive Process Instruction.

All education consists of transmitting to students two different things: (1) the subject matter or discipline content of the course ("what to think"), and (2) the correct way to understand and evaluate this subject matter ("how to think"). We do an excellent job of transmitting the content of our respective academic disciplines, but we often fail to teach students how to think effectively about this subject matter.

Many 17-year-olds do not possess the "higher order" intellectual skills we should expect of them. Nearly 40 percent cannot draw the inferences from written material; many students – including our own—never develop

critical thinking skills. Why? The first goal of education, “what to think” is so traditionally obvious that instructors and students may focus all their energies and efforts on the task of transmitting and acquiring basic knowledge. Indeed, many students find that this alone is so over whelming that they have time for little else. On the other hand, the second goal of education, “how to think” or critical thinking, is often so subtle that instructors fail to recognize it and students fail to realize its absence.

Definition of Critical Thinking: Critical thinking means correct thinking in the pursuit of relevant and reliable knowledge about the world. Another way to describe it is reasonable, reflective, responsible, and skillful thinking that is focused on deciding what to believe or do. A person who thinks critically can ask appropriate questions, gather relevant information, efficiently and creatively sort through this information, reason logically to live and act successfully in it.

Children are not born with the power to think critically, nor do they develop this ability naturally beyond survival – level thinking. It’s a kind of learned ability that must be taught. Critical thinking cannot be taught reliably to students by peers or by most parents. Trained and Knowledgeable instructors are necessary to impart the proper information and skills.

Critical thinking is also known as critical inquiry, so such critical thinkers investigate problems, ask questions, pose new answers that challenge the status quo, discover the new information that can be used for good or ill. In this regard most people do not think for themselves, but rely on others to think for them. Critical thinking skills are problem-solving skills that result in reliable knowledge.

Raymond S, Nickerson (1987), an authority on critical thinking, characterizes good critical thinkers on terms of knowledge, abilities, attitudes, and habitual ways of behaving. Following are some of the characteristics of such a thinker.

- Uses evidence skillfully and impartially
- Organizes thoughts and articulates them concisely and coherently
- Attempts to anticipate the probable consequences of alternative actions
- Can learn independently and has an abiding interest in doing so
- Applies problem-solving techniques in domain other than those in which learned
- Understand the idea of degrees of belief

(Schaferman, January 1991 An Introduction to Critical Thinking)

Course Areas In Which to emphasize Critical Thinking:

Critical thinking can be presented or emphasized in all classroom areas: lecture, homework, term papers, and end exams. For this method slight extra effort on the part of the instructor will be necessary, but the effort will be worthwhile because the result is so valuable for the student.

Critical thinking can be taught during:

Lectures : We may of course teach directly critical thinking principles to our students during lecture, but this is neither required nor advisable. Stay with your subject matter, but present this in such a way that students will be encouraged to think critically about it. If an individual cannot answer a question, help them by simplifying the question and leading them through the thought process: ask what data are needed to answer the question, suggest how data can be used to answer the question, and then have the student use this data in appropriate way to come up with an answer.

Dr. Dennis Husten of Rice University, winner of numerous teaching awards, recommends asking such questions in class. Huston states that thoughtful and searching questions have uncertain and ambiguous answers. They will experience a responsibility for their own education and think about what they learn and read. Students will be involved with their own learning.

In class, encourage questions from students. Always respond positively to questions; never brush them off or belittle the questioner. Instead, praise the questioner. It may be helpful to them to think critically.

Laboratories : Many science courses have laboratories connected with them. Science laboratory exercises are all excellent for teaching critical thinking. The reasons should be obvious.

Homework : Innumerable opportunities exist to promote critical thinking by homework assignments. By giving any kind of assignment to the students we can evaluate their critical thinking ability.

For example : Ask students to write short papers about pertinent topics, review science articles, even paraphrase news articles and textbooks chapters etc. We grade their written efforts with oral quizzes that can be structured to require abstract conceptualization and graded as students speak, for most students will prepare carefully in order to avoid failing repeatedly in public. We also collect, grade, and return their written efforts. The ultimate goal of these exercises is to improve students ability.

Term Papers : The best way to teach critical thinking is to require that students to write . Writing forces students to organize their thoughts, contemplate their topic, evaluate their data in logical fashion, and present their conclusions in a persuasive manner. Good writing is the epitome of good critical thinking.

Exams : Exam questions can be devised which promote critical thinking rather than rote memorization. This is true for both essay question exams and multiple-choice exams.

Methodology

In this method teacher has to make every student to think critically to answer in their own way. It is a best process to motivate and encourage even a dull student in the classroom. In the classroom to the teachers every single student's performance is important. So I believe this could be helpful.

Outcome

Students will come up with new ideas to expose the answers in different ways and it gives a kind of attention to the remaining students to do well like other students.

B-Collaborative Learning

Collaborative Learning is technique designed to make learning lively and it's a successful process. We can also call it as peer learning/ team learning/co-operative learning/small group learning. Collaborative learning is aimed at producing academically stronger students. It is a pedagogical concept that has been widely researched, practiced and endorsed by many professionals. Collaborative Learning is a very useful and relevant tool.

According to Chinese proverb "**Tell me and I forget. Show me and I remember. Involve me and I understand.**" **(Brown)** involving students mean students will do works and they will think what they are doing, why they are doing, and understand the main objective of the activity they are doing.

Methodology

In this method teacher will be the facilitator, mentor and guide. In this process students will be divided into groups and each group consisting 5-8 members each. Teacher will select one person as a team leader. Teacher will assign different task to each group. All group members will together and discuss about the topic and share their views. If someone is getting stuck at any point and unable to understand the concept other member of group will help him/her in this regard. After the given time for practice and preparation all teams will give presentation

Outcome

Students will get familiar with each-other. They will get team work skills as well as team leader skills. And as they are giving presentations their stage fear will be removed and communication skills will be improved.

C. Digital Classroom/ Use of Technology:

Digital classroom is referred as the classroom where students learning and interacting with the instructor and peer is fully supported through strategic use of information and communication technology (HLWIKI, 2015). Most of the time it's used by online-course facilitators, distance course provider, where students can contact his/her teacher to speak and for clarify his/her doubt.

Methodology

Today's fast and well grooming scenario organizations are having many facilities to help teacher to give more interesting lecture to their students. In real life classroom teachers are using digital board to show videos or

play any audio sometime they use projector to show PPT documents for their subjects. Apart from this by using different tools instructor will precede her/his class.

Different types of tools are used as digital classroom teaching. Few example tools for digital classrooms

Clickers: are student response systems or simply "**clickers**"; they can be wireless handheld devices that allow students to respond to classroom polls and quizzes, regardless of class size.

E-portfolios: are online collections that allow you and your students to demonstrate your skills and interests to diverse audiences. Highly customizable, e-portfolios allow you to assemble your work to present to instructors, potential employers and others via login.

Learning Management Systems (LMS): are systems that allow you to present instructional materials (text, audio, video, etc.), interact with students, facilitate peer-to-peer interaction and manage grades within a secure environment.

Wikis: are collaborative websites which can be edited by anyone.

Blogs: offer a means to narrate your work online. Hundreds of web loggers at UBC are exploiting the simplicity and flexibility of their tools for a wide range of uses: instructors use them to communicate with their students, researchers track their progress and communicate with peers around the world, and project managers post updates and documents.

Wimba classroom: is a web-based meeting tool that allows you to teach classes online in real-time. Features include chat, audio, video, content display, application sharing, white board and polling. Wimba classroom can be used inside and outside.

RSS: is a family of web formats used to publish updated content such as blog entries, news headlines and podcasts in a standard format. A RSS file, called a web feed, contains a summary of content from the website or points to full text. RSS makes it possible for people to keep up with websites in an automated way.

Audio/video tools and other digital collections and resources are increasingly engaging, timely and relevant ways to deliver and/or supplement course content.

Podcasts: are audio or video files that are made available for download and playback using a computer or a mobile device such as an iPod.

Simulations: are programs that imitate real life phenomena, systems or environments.

Smart boards: are interactive whiteboards that use touch technology to detect input such as scrolling, right mouse-clicks or keyboard detects input. A projector is used to display a computer's video on the whiteboard, and then acts as a large touch screen. Smart boards often come with digital pens, which use digital ink and replace traditional whiteboard markers. Here is an interesting piece of research done at UBC regarding the use of Smart boards within the context of building design

Peer wise : supports the construction, display and organization of student contributed assessment questions. Students of a participating course develop multiple-choice questions with associated explanations and contribute them to Peer Wise. These questions are then available to other students in the course and can be answered for revision purposes, critiqued and discussed, and rated for difficulty and quality.

Electronic collections: SciFinder With a single source, you can explore scientific information in journal and patent literature from around the world. Google Scholar provides a search of scholarly literature in many disciplines and sources, including theses, books, abstracts and articles.

(HLWIKI, 2015)

Outcome:

Students can access the materail at any time by login fromtheir account.teacher can share subject related videos and e-material. Materail,audio and videos can be save for long time at anytime for reference.

D-Project Based Learning:

“Project Based Learning is a teaching method in which students gains knowledge and skills by working for an extended period of time to investigate and respond to an authentic, engaging and complex question, problem, or challenge”. This method stress on student learning objectives, including standard-based content and skill such as critical thinking problem solving, self-management. (Buck Institute of Education)

This method is framed with the goal of active learning and more understanding by practical rather than theory. Unlike many tests, homework assignments, and other more traditional forms of academic coursework, the execution and completion of a project may take several weeks or months, or it may even unfold over the course of a semester or year.

Methodology

Students will typically be assigned a project or series of projects that require them to use diverse skills—such as researching, writing, interviewing, collaborating, or public speaking—to produce various work products, such as research papers, scientific studies, public-policy proposals, multimedia presentations, video documentaries, art installations, or musical and theatrical performances. The project features real-world context, tasks and tools, quality standards, or impact – or speaks to students’ personal concerns, interests, and issues in their lives. Students give, receive, and use feedback to improve their process and products. Students make their project work public by explaining, displaying and/or presenting it to people beyond the classroom.

(Education Reform , 2013)

Outcome:

Students will be motivated towards project based learning and they will show interest to come up with innovative thoughts to present subject oriented information and it can be helpful for them to think critically.

E-Needs Analysis:

Need Analysis is a Process of identifying the problem and making a target to get rid of that problem by finding out the solution. Need Analysis is an important aspect and should be carried out in a systematic manner. We need to be aware of certain important aspects of needs analysis. The following are helpful to understand what needs analysis is.

Target Situation Analysis: It refers to what kind of level the learners will be able to arrive at the end of course. This can also be referred to setting goals and objectives. Goals as we have learned are “intended outcome” and “Objectives are statements about how goals will be achieved.”

Present Situation Analysis: This analysis refer to collecting information about the learners level of competence at present i.e., at the beginning of the course.

Context Analysis: It refers to the learning situation of the target group. It also means what kind of learning environment they are in. How much exposure do they get in subject? What are the sources of exposure? We need to collect information about these aspects.

Action Plan: We also need to design our plans of action. What language components are to be there in the course, what kind of practice should be included and so on?

(Mahanand, 2011)

Methodology

In this method teacher will take a test or have an observation on the performance of the students and find out what are the problems students are facing in learning process. And teacher will identify the reason of those problems by conducting written tests or have one-to-one words and give the feedback as well as suggestions for it. Also she/he will apply different methods in her/his teaching to see more improvement. (TESOL Notes)

Outcome

Needs Analysis is an excellent way to know the strengths and weakness of a learner/student. By knowing the needs of learner/students a teacher can take steps to develop his/her students' skills.

III. CONCLUSION

This paper "Recent Techniques of Teaching in Engineering" projects what kind of methods can be helpful to the students and faculties. By using technologies, especially critical thinking and collaborative learning makes students to think in different genres and give innovative answers. Project base learning and technology base learning will enhance their observation skill, team work ability, communication skills, and critical thinking skills of students.

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