

Review of lecturing characteristics in engineering education

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Abstract: There are different methods for teaching a subject among which giving a lecture is one of the most common. The purpose of this study is that lecturing is described and explained. The study's findings are interpreted using library resources. The disadvantages of giving a lecture are students are usually inactive and technological advancements and innovations in printing and information has reduced the need for attending lecture sessions. The advantages of giving a lecture are Planning a lecture is easier and less expensive than other methods. the students are given the information by the lecturer and then required to combine the new information with their previous knowledge schemata. The lecturer is the source of knowledge and a supervisor and guide for the students. Students are given the information by the lecturer and then required to combine the new information with their previous knowledge schemata.

Keywords: Lecturing, Engineering, Education.

INTRODUCTION

Today almost everyone feels that education is a basic need. Educational systems and programs are constantly transforming as other social, scientific and technological changes occur. Educational skills and preparation are highly important and require to be evaluated for their efficiency while an effective use of symbols and patterns in teaching should be included in designing a training program (Barrows & Tamblyn, 1980)(Barth, Griebel, Keyes, Nieminen, & Roose, 2005) (Prober & Heath, 2012).

The growing scientific and technological advancements and the shift from a teacher-centered to learner-centered education in higher education has raised a new responsibility for the teachers as well as the students to carefully choose the best teaching and learning method. Currently most universities around the world are trying to find teaching methods which could improve decision-making skills and dynamic learner-centered education (Boling & Robinson, 1999)(Borrego, Douglas, & Amelink, 2009) (Hafezimoghadam, Farahmand, Farsi, Zare, & Abbasi, 2013). It should be noted that in performing any educational program choosing an appropriate teaching method is one of the most important steps for achieving the planned goals, because more than anything else optimal learning is the result of efficient teaching (Boud & Feletti, 1997) (Grollmann & Rauner, 2007). In contemporary context, giving a lecture is the most widely used method which has its own advantages such as being economically cost effective as it can be used for teaching large groups of students (Brown & Manogue, 2001) (Safari, Yazdanpanah, Ghafarian, & Shahrzad, 2006).

Lecturing is one of the traditional teaching methods. Despite modern teaching and learning methods, lecturing remains a well-established practice. It should be mentioned that lecturing can lead to positive effects if it is based on good material and the lecturer is skilled enough (Grollmann & Rauner, 2007). Even today there are many scholars who believe that a well-organized lecture is one of the most effective teaching methods (Crawley, Malmqvist, Ostlund, & Brodeur, 2007) (Heravi, jadid Milani, & Rejeh, 2004).

In one stage of education listening to a lecture seems inevitable because it is a good way of communicating the basic information to someone. In fact, in some situations, lecturing is the best teaching method (Doucet, Purdy, Kaufman, & Langille, 1998)(Ebner & Holzinger, 2007). However, it lacks any attention to the critical thinking skill of the learner – which is an essential part of learning. According to previous studies, almost more than 80% of information gained by means of listening to a lecture is forgotten in eight weeks (Dahle, Brynhildsen, Fallsberg, Rundquist, & Hammar, 2002) (Safari et al., 2006)(Education & McLeish, 1968)(Felder & Silverman, 1988).

Table 1. The steps of the lecture and the points required for each step

Stages for giving a lecture	Necessary considerations	Notes
1	Preparing for the lecture Preparing the materials and instruments Emotional preparedness Time management	Using the university facilities(Geyer & Effelsberg, 1998). Confidence and controlling stress(Giangreco, 1997). Managing the presentation time(Hall, Waitz, Brodeur, Soderholm, & Nasr, 2002)(Milton, 1986).
2	Introduction Establishing a relationship Attracting the attention of the audience	To establish an effective relationship, the lecturer might begin with some personal comments(Jordan, 2008). Inclusion of questions, discussions and multi-media material. Four things are important: a) knowing the interests of the audience; b) promoting motivation; c) stating the goal of the lecture in a clear way; d) using a pre-test and activating the knowledge of the audience (Kariya, 2003)(Jordan, 2008).
3	Presenting the body of the lecture Comprehensiveness Logical organization of the material Attracting the attention of the audience during the lecture	The lecture should meet all the educational goals (McDermott, 2001)(McGarr, 2009). Skinner believes that when the teaching material is properly organized, learning is facilitated because organization improves comprehension (Mills & Treagust, 2003). Using different ways for improving motivation, e.g. a) gestures and posture while presenting the lecture; b) shifting form audio to visual media; c) involving the audience by asking questions; d) addressing individual students and asking their opinion; e) break times during the presentation for free discussions; f) enthusiastic presentation and sense of humor (Milton, 1986)(MONCADA, 1982).
4	Summary and conclusion Reviewing the main points of the lesson Paying attention the questions and answering them Discussing non-academic issues Pointing out the topic of the future sessions	Asking the audience to review the main points and comment on them (Moore, Armstrong, & Pearson, 2008)(McDermott, 2001). In this stage, the questions should be answered with an emphasis on wrapping the lesson up (Young & Diekelmann, 2002)(Woolnough, 1994). The teacher should discuss non-academic issues to establish a rapport and increase interest and motivation for future sessions (Wulf, 1998). In the end, the lesson should be concluded and the next session's topic should be mentioned to create a relationship between the sessions (Wieling & Hofman, 2010).

Lecturing

Choosing a teaching method is one of the most important decisions in the process of education. After choosing the material and prior to choosing the instruments, the teacher/instructor must adopt an appropriate method. A teaching method refers to a set of systematic plans which are employed in a specific condition to achieve a goal (Prober & Heath, 2012) (Golden, 1989).

Among the teaching methods, lecturing has possessed a traditional place. Lecturing is of the most conventional teaching methods which brackets the individual differences of the learners and is used for large groups. This method uses speech in explaining the materials. The method is based on the unilateral transfer of information from the teacher to the student (Heravi et al., 2004)(Mirzaei & Azizian, 2012)(Felder & Silverman, 1988)

It involves a kind of information transfer and mental relationship between the teacher and the student. In lecturing, the lecturer is required to present the concepts, principles and facts orally while the students are expected to listen and take notes. One feature of this method is that while the lecturer is active the students remain inactive(Fyrenius, Bergdahl, & Silén, 2005) (Grollmann & Rauner, 2007).

The lecturer takes the center stage in this method while the students are required to follow and agree with the lecturer. In such a context, there is little intra-group interaction; individual differences are ignored; there is no teacher-student collaboration; learning is limited to the materials of the textbook and the information is passively absorbed by the students. In situations where there is not enough library materials, the university teachers use lectures as a well-established teaching method. A lecture whether short or long involves introductory, middle and concluding sections. An effective lecture should be sensitive to the contextual factors. Table 1, shows the stages of giving a lecture.

The following are some of the important points in preparing and organizing a lecture in university context:

The aims of the lecture should be clearly understood by the learners.

The title and content of the lecture should be in line with the previous knowledge of the learners (Walters, 2001).

The lecture should be properly organized and include introduction and conclusion.

The pace of the presentation should be adapted to the learning abilities of the learners.

The lecture should be prepared in accordance to the needs of the learners.

Questions should be asked to check the comprehension of the learners.

The qualities, abilities and needs of the audience should be considered.

New and up-to-date material should be prepared and presented.

Take notes for the lecture. Have an outline of the main points of the lecture.

Use multi-media, especially visual, instruments (Rugarcia, Felder, Woods, & Stice, 2000).

Refer to the results of case studies in the lecture.

Determination and commitment of the lecturer.

Patience and controlling of the over-excitement.

Having a good command of the material (Richardson, 2008).

Be coherent and concentrate on the main topic.

Paying attention to the learners and their reaction to the topic of the lecture.

Respect the learners.

Checking the comprehension of the learners by asking questions.

Pros and cons of lecturing

Samuel Johnson and McLeish have levelled some criticism against the method of lecturing as in the following :

Printing and information technologies: the advancements and modern printing technologies have made a large amount of books and materials available to the public in a convenient and inexpensive manner and thus has reduced the need for lectures (Quistorff & Aspegren, 2003) (Hafezimoghadam et al., 2013).

New teaching methods: new interactive and communicative teaching methods can properly replace the traditional method of giving a lecture (Prober & Heath, 2012).

Passiveness of the learners: lecturing method is a monologic. Thus, the learners are passive. This leads to a superficial learning.

The art of speech: lecturing needs a skilled speaker. This involves the art of speech and training professional speakers which is quite difficult (Rosati, Dean, & Rodman, 1988).

Ronald Hyman, emphasizing the philosophical aspects, notes the following characteristics as the advantage of giving a lecture:

Exteriority of knowledge: the learners absorb the information presented by the lecturer and combine it with their previous knowledge so that they are able to enhance their knowledge schemata. In this view, the mind's function is to analyze, select and categorize the external perceived stimuli (Pendergrass et al., 1999).

Accumulating knowledge: lecturing facilitates the accumulation of knowledge. Because of the organized nature of the presented material, the gaining of knowledge is facilitated in lecturing (Powell, 2003) (Mirzaei & Azizian, 2012).

The ability of the lecturer to directly transform the information: the lecturer tries to organize and concretize the materials and topics in a way as to make them meaningful for the learners. The lecturer uses a finely selected set of words and adjusts the rhythm and pace of the presentation as to make comprehension more convenient.

The lecturer as the source of knowledge: the lecturer guides and supervises the students and introduces the required sources (Hafezimoghadam et al., 2013)(Olsen & Huckin, 1990).

Meaningful learning and memorization: meaningful learning is dependent on the newness of the material with regard to the cognitive structure of the learner's mind. The learner tries to create a relationship between the

new material and the previous knowledge schemata. However, memorization and rote learning is not a lasting form of learning. In Table 2, shows the characteristics of lecturing method.

Table 2. Characteristics of lecturing method.

Factors	Explanation	Factors	Explanation
1 Innovation in teaching	It is a traditional view which can be integrated to other methods in an innovative way (Barrows & Tamblyn, 1980).	16 Evaluation based on the learning of the students	The students are evaluated through questions in the beginning and middle of the session (McGarr, 2009).
2 Considering the level of learners	In this method, the material is prepared according to the knowledge level of the students (Powell, 2003).	17 Discovering the problems by the students	In this method, the students are less prepared for discovering problems (Education & McLeish, 1968)(Dahle et al., 2002).
3 Teacher-student interaction	There is little teacher-student interaction and only through questions one can increase this interaction(Rugarcia et al., 2000)(Mills & Treagust, 2003).	18 Experience	The students hardly experience the real issues (Crawley et al., 2007).
4 Using the digital facilities	Nowadays, digital technologies are used in lecturing (Olsen & Huckin, 1990).	19 Curiosity and creativity	The students are less curious (Lamancusa, Zayas, Soyster, Morell, & Jorgensen, 2008; Litzinger, Lattuca, Hadgraft, & Newstetter, 2011) .
5 The need for expertise	The teacher should have a good command of speaking skills (Prober & Heath, 2012).	20 Interest and motivation	It is boring for long amounts of time (McGarr, 2009; Milton, 1986)
6 Plans for solving the problems	The teacher should manage the sessions according to a pre-planned syllabus (Wallace & Mutooni, 1997)(Pendergrass et al., 1999).	21 Group discussion	It can be used in group discussions (Pendergrass et al., 1999).
7 Costs	The costs of the performance are low (Wulf, 1998).	22 Clarity of complex issues	This method is hard to apply in discussing complex issues (Brown & Manogue, 2001).
8 Time	This method requires shorter time in comparison another method education (Young & Diekelmann, 2002).	23 Finding new learning habits	Solving problems is difficult in this method (Dahle et al., 2002).
9 Time for longer performances	This is not appropriate for long performances (Hall et al., 2002).	24 Collective unconscious	It does not increase collective unconscious (Felder & Silverman, 1988).
10 Time for shorter performances	This is appropriate for short performances (Dahle et al., 2002).	25 Concentration	It increases the concentration of the students to some extent (Hall et al., 2002).
11 Speaking skills	This requires speech skills for lecturing (Walters, 2001).	26 Self-evaluation	It does not increase (Mills & Treagust, 2003).
12 Teacher's skills	A medium set of skills would do for this method (Pendergrass et al., 1999).	27 Promoting learners' skills	The skills of the students are hardly improved (Pendergrass et al., 1999).

13	Teaching for large groups	It can be applied for large groups (Lamancusa et al., 2008)(Hall et al., 2002; Lamancusa et al., 2008; Lecture, 1996; McGarr, 2009).	28	Identifying key points	The key points are mentioned at the end of the class (Rugarcia et al., 2000).
14	Teaching for small groups	It is appropriate (Ebner & Holzinger, 2007).	29	Students' interest	It does not increase the students' interest about discussion (Education & McLeish, 1968).
15	Social control	Social control is difficult in the class (Rosati et al., 1988).	30	Students' motivation	It does not promote the students' motivation about discussion (Giangreco, 1997).

Table 3. advantages and disadvantages of lecturing method.

	The advantages of giving a lecture	The disadvantages of giving a lecture
1	Planning a lecture is easier and less expensive than other methods.	The students are usually inactive.
2	A large amount of information can be presented in a small amount of time.	Giving an effective presentation is difficult.
3	The learners can be gathered in discussion groups and concentrate on a specific topic.	Giving a long lecture without involving the students makes the class boring and tiring.
4	The syllabus and time can be easily managed as to be proportionate to each topic.	Giving a lecture is not effective in practical topics where learning a skill is required.
5	It is a familiar method for most learners and therefore can be easier to work with.	While giving a lecture, it is hard to decide if learning is achieved or not.
6	This method can be used for large groups as far as the lecturer is seen and heard by the audience.	Lecturing requires verbal and speaking skills.
7	This method can be used when there are physical and circumstantial limitations in terms of the facilities.	There is no mutual communication between the lecturer and the students.
8	The exteriority of knowledge (the students are given the information by the lecturer and then required to combine the new information with their previous knowledge schemata).	The technological advancements and innovations in printing and information has reduced the need for attending lecture sessions.
9	The ability of the lecturer to transfer the information (the lecturer tries to organize the material in such a way as to make it more meaningful for the audience).	There have been new teaching methods.
10	The lecturer is the source of knowledge and a supervisor and guide for the students.	This method requires a highly skilled speaker.
11	Lecturing facilitates the accumulation and learning of knowledge.	The lack of any group discussions about the topic
12	Learning is meaningful and based on memorization.	This method requires speaking skills which are hard to teach to everyone.

As for further research, it is suggested that these two method be tested to two theoretical and designing classes in engineering courses. The results of the effect of the methods and the satisfaction of the students can be compared. Moreover, one can study the integration of the method of lecturing with other methods and try to find the advantages and disadvantages of this method.

CONCLUSION

This article has tried to describe lecturing educational in engineering. In Table 3, shows the advantages and disadvantages of lecturing method.

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