

A Case Study on 21st Century Teaching-Learning Methodologies

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Abstract: The 21st century teaching-learning concept is motivated by the belief that making the new era students learn, requires a change in teaching methodology. The objective of this paper is to present the impact of 21st century teaching learning methodologies on the outcome based education. A case study in the form of different teaching methodology for the two sections of the first year students for the Basic Electrical Engineering course has been implemented. The course outcomes for the said course have been compared. This paper shows how 21st century learning methodologies can be used to facilitate the production of qualified and well prepared professionals.

Keywords: 21st century learning; Passive Learning; Kinesthetic learner; visual learners

1. Introduction

“Education is the manifestation of perfection already in man” – (Swami Vivekananda)

The above quote by the great legend Sri Swami Vivekananda, conveys message that Education is an important tool for human kind which leads to the growth and progress of the individual and in turn the growth and progress of the nation [1].

Education is a light that shows the mankind the right direction to surge. Education should inculcate self-discipline, commitment and responsibility towards becoming a good citizen. To do so, the educators/teachers/instructors have to convert education into a learning process through which, student's interest towards learning will increase and motivate them for lifelong learning.

Education in Ancient India originated with the Gurukul system. This type of education in ancient Hindu school in India was residential in nature. Here the Shishyas or students and the Guru or teacher lived in the same house. Sravana (listening), Manana (contemplation) and Nididhyasana (concentrated contemplation) were the main traits of learning for the student during that period. There were Famous Gurukuls in Ancient India, for example, Takshashila, Nalanda, Banaras, etc. to which students hailed from outside India also [9]. But today's situation is different. Indian higher education is in need of radical reforms. The survey done by MHRD says that the number of universities/ colleges is being increased every year, but the enrolment ratio is decreasing. This calls for a change in the methodologies adopted for teaching/learning process.

Today is the era of science and technology and there is a great need to improve quality of education. The success of higher education lies in finding adaptable and innovative solutions. This can be possible by bringing changes through innovative techniques applied to course delivery methods by which teachers can provide students centered learning environment that can make learning process interesting and understandable to the young learners.

Technology in the classroom is continuously changing at a rapid rate. Technology in the classroom, whether it's for teaching, giving assignments, or evaluating, can help students learn better and faster, and help make a teacher's time more effective. A 21st century teacher should have a nice balance of educational tools in their classroom. For an effective learning, a teacher should know what technology in the classroom can truly help transform their students' education. They should know what the best tools are, and how and when to use them.

2. Methodology

Learning as seen from student's perspective can be classified into two types: Passive Learning and Active Learning.

A. Passive Learning:

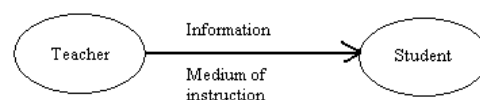


Fig.1 Passive Learning methodology

This is a traditional method where the students/learners receive information from teacher. This is teacher centric. In terms of the delivery medium, the teacher delivers the message via the “chalk-and- talk” method. In this mode of learning, learners play little role in the process of learning. Teacher has control over the delivery of information, which is for the entire class. Learners will just listen or hear to what the teacher is delivering. This is less effective and students are passive. Also the concentration of students fades off after 15-20 minutes. This directed instruction model is a popular technique, which has been used and being used even now since many years as an educational strategy in all institutions.

The limitations of this method of learning can be listed as below:

- One way flow of information
- Marks oriented rather than knowledge.
- No practical/ real life examples.
- No interaction between students and teachers
- Students are not engaged.
- Less learning material.
- Memorizing skill required rather than understanding the subject.

These limitations can be overcome by implementing Active learning/21st Century Learning.

B. 21st century Learning :

In this method students are involved along with teachers in the process of learning. It focuses on the responsibility of the learners in learning. In this method to learn, students must do more than just listen: They must read, write, discuss, or be engaged in solving problems. There are many methodologies which contribute for Active learning. To name a few are, Multimedia Learning Process, Problem based approach, learning through games, Competitions, Brainstorming, Peer group learning/teaching, demonstrations, innovative tools etc.

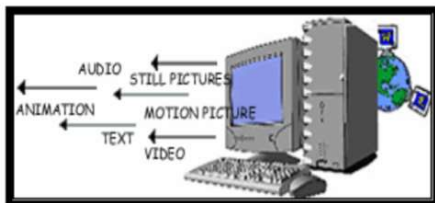
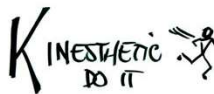


Fig.2 Examples of 21st century skills

21st century learners can be categorized broadly based on their learning style into four types:

- 1) Kinesthetic learners
- 2) Visual learners
- 3) Aural learners
- 4) Read/ Write learners

1) Kinesthetic learners:-Kinesthetic learners are those who learn best by experience or by movement. they want to incorporate action into their learning experience. The action enhances their learning experience, increases their ability to retain the information, as well as faster understanding of the material being presented.



2) Visual learners:- Visual learners are those who learn best when they use graphical or animated ways to represent what they are studying. They prefer it when information is represented in animations, diagrams or graphs for faster understanding of the material being presented.



3) Aural learners:- Auditory learners are those who find it easiest to remember what they hear. They concentrate best by receiving new or difficult information by listening to themselves or someone else talking, and they understand the information. They remember the key words and phrases for understanding of the material being presented.



4) Read/ write learners: Read/ write learners are those who learn best by reading and writing the information being presented. They will understand best by traditional way of teaching.

3. A Case Study

Basic Electrical engineering is a course offered to all the students in the first year of the engineering. This case study was implemented for one section of students studying Basic Electrical Engineering course. Initially, a survey was conducted to figure out which type of learner they are, depending on which, different teaching methodology was adopted.

Questionnaire for How do I learn best:

VARC (Visual Aural Read/ Write Kinaesthetic) Questionnaire provided us the profile of our teaching preference as well as how we process our information, because this questionnaire provides the choice of students learning preferences. This is very important for teachers and for students because it will help the teachers to learn more about teaching methods and students learning style and how students learn best, thus being able to be a more successful student. The questionnaire consisted general questions pertaining to the day to day activities. This would help the teachers to predict the preferred analysing method of the students and accordingly plan teaching methodology.

These Guide lines were given to the students while completing the questionnaire:-

1. *Be honest and selective:* Fill out the answers to this questionnaire as truthfully as possible; this is your learning style so be sure to be fully honest. The results will be even closer.
2. *Multiple answers:* If you see a question that has more than one answer that you agree with, check them. Don't limit yourself to just one choice if you feel that two, three, or even all of them suit you. This also isn't a bad thing, so don't worry about getting poor results.
3. *No time limit:* This questionnaire is only 16 questions long and seems short, but be sure to take your time and read the questions. A few wrong answers could skew the results, so proceed slowly and cautiously.

4. Leave blank: leave blank if any question does not apply any of your preference.

Sample question:-

You are helping someone who wants to go to airport, town Centre, or railway station in your city. You would:

- go with her.
- tell her the directions.
- write down the directions.
- draw or give her a map.

Scoring chart:- The following Scoring chart shown is to find the VARK category that each of the students answers corresponds to. Here letters have to be circled corresponding to the answers.

For Ex. if the answer is b and c for the above question, circle V and R in question 1 row.

Like this, VARK is categorized for all the 16 questions given to the student.

Question	a category	b category	c category	d category
1	K	V	R	A

Table-1: Sample scoring chart

Calculating scores: - Count the number of each of the VARK letters circled to get the score for each VARK category.

Total number of **V** circled= 2

Total number of **A** circled= 1

Total number of **R** circled= 0

Total number of **K** circled= 2

The above scoring chart is for the class of 64 students shown. From the above figures, we can conclude that majority of student's opted visual learning, followed by kinaesthetic and audio and then read and write.

To cater to the visual and aural learning style opted by the students, many topics, for example working principle of DC motor, induction motor, transformers, domestic wiring etc. were explained by using animations and video lectures.

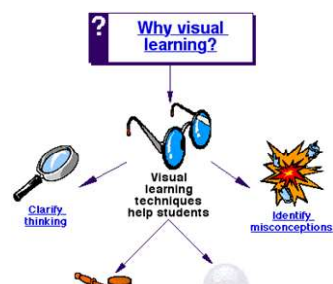


Fig 3:- 21st century learning methodology

For the kinaesthetic learners, laboratory experiments are introduced for the better understanding of the theory which is being taught in the classroom.

Also the quiz for their continuous internal evaluation was conducted online rather than offline since 21st century students are more inclined towards usage of modern computer tools.

4. Results

Course Outcomes defined for the course Basic electrical engineering are:

At the end of the course students will have the ability to:

CO1: Formulate and solve equations applying basic laws and determine various circuit parameters in AC and DC circuits.

CO2: Explain the construction, basic principle of operation, applications and determine performance parameters of electrical apparatus.

CO3: To sketch the wiring diagram of domestic installations and describe the safety measures in home and industry.

The following graph (Fig. 4) shows the course outcome attainment for the Basic Electrical Engineering course with 21st century Teaching Learning Methodologies which was adopted for one section of students.

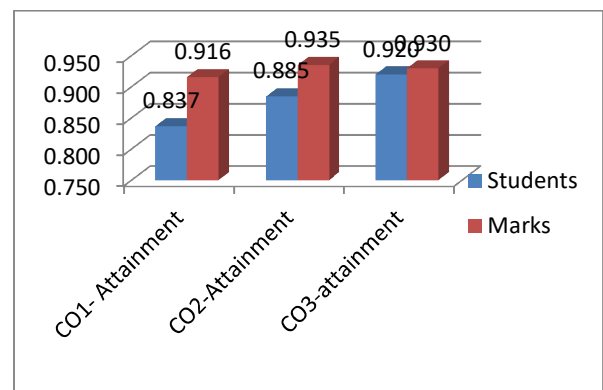


Fig.4. Measure of the course outcomes of the course with 21st century Teaching Learning Methodologies (All values are on scale of 1)

For another section of students, for whom traditional method of teaching i.e., without 21st teaching learning methodologies was adopted, the course outcome attainment is as shown below (Fig. 5).

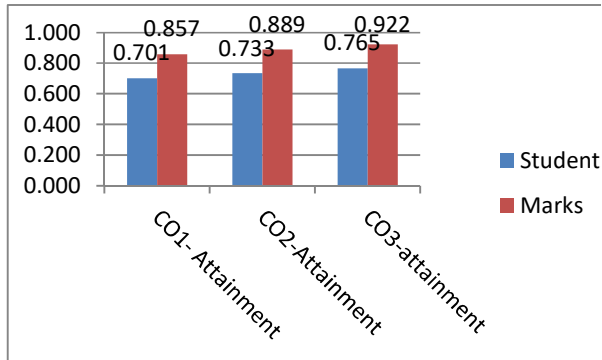


Fig.5. Measure of the course outcomes of the course without 21st century teaching learning methodologies (All values are on scale of 1)

Upon comparing the two figures, it clearly indicates that, the course outcome attainment is higher with new course delivery methods adopted.

Also, the number of Program Outcomes addressed by the course increases with the inclusion of new course delivery methods. The following table gives a comparison of Program outcomes addressed with and without 21st century teaching-learning skills for the course considered.

Sl. No.	Program Outcomes	With 21 st century teaching-learning skills	Without 21 st century teaching-learning skills
1	Engineering knowledge	✓	✓
2	Problem analysis	✓	✓
3	Design/development	✓	
4	Conduct investigations	✓	
5	Modern tool usage	✓	
6	The engineer and society	✓	✓
7	Ethics	✓	✓
8	Team work	✓	
9	Communication	✓	

Table-II: Comparison of PO's addressed for the course with and without 21st century teaching-learning skills.

generations. For that, teaching method also needs to be changed accordingly.

In this case study, it is observed that for the same syllabus content, by adopting 21st century teaching-learning skills, along with traditional method of teaching, learners will have better understanding of the concepts being taught during their course. It is reflected in course outcomes attainment which shows enhancement in learning outcomes and achievement of holistic learning of students.

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5.Conclusion

There is broad agreement that today's students need different skills than were earlier perhaps taught to previous