
Perspectives of E-Learning Pedagogy in Teaching and Learning of Physics Course During COVID Era

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Abstract

The authors have tried to implement an effective approach of using flipped classroom as e-learning as its major instruction for teaching and learning (T&L). The teaching and learning activities based on technology enhanced digital media was done via e-learning which included their assessments in the form of multiple choice based quizzes, rubrics based physics lab journal submission etc. We have also tried to conduct problem based learning in physics using poster making on the given topic, PowerPoint presentation or making screencast video of their presentation. This methodology is an educational approach where the students act as active learners who are guided by facilitator. E- Learning and problem based learning techniques are one of the alternative approaches to the traditional methods of teaching. A set of questionnaire was floated among the students to get their feedback on the new methods of teaching learning involved. Students' response towards e-learning is also discussed in the paper. The paper presentation activity used in the problem based learning involves the group activity as a flipped classroom teaching medium. Poster presentations are now being used quiet frequently as one of the teaching method. These sessions are beneficial for the students as it promotes learning, serves to be an excellent tool for developing their soft skills. At the same time, it also encourages students to explore the given topic thoroughly and provides opportunities for think-pair-share learning thus, promoting a positive attitude among the students.

Keywords: *flipped classroom, critical thinking, technology-enhanced learning, e learning, poster presentation, problem based learning*

I. INTRODUCTION

The education system has reformed after the Covid-19 breakdown. Many new educational technologies have come up within a period that facilitates the learning system that promotes student teacher interaction, both with in the class and out of the class. The learning model which we have presented in the paper is based on the use of learning management system or can also be termed as E-learning. It is basically an education system that can be accessed online and it can also be used to store information that can be used to share information and knowledge transfer that is also useful for further studies. The impetus of using E-learning is to create a platform for the teachers to deliver learning material resources in the form of notes, PowerPoint presentation; you tube links etc. at any time which can be freely accessed by the students from anywhere outside the class. E-Learning platforms helps the facilitator in giving online quizzes, assignments, allows the student to submit their work which further helps in bridging the gap between the teacher and the student. The instructor and the learner can undoubtedly adapt to study material that makes interaction easy for the students with their peers by being online. However, the content that teacher chooses to deliver in online mode should be interesting for the students so that they feel the importance of E-learning [1-3]. This paper aims to identify the pedagogical tactics that can be implied to promote the upgraded education system and effective learning using flipped classroom activities. Although it is not a very unique method of teaching, flipped learning as e-learning is still ascribed in ICT supported teaching learning which describes the reversal of traditional teaching methodology adapted in class and out of the class.

O'Flaherty and Phillips [4] described the flipped classroom as learning strategies that can certainly improve the learning experience of the students through increased interaction. They further suggest that the facilitators /educators who are involved in curriculum revision or restructuring may not be fully aware of the pedagogy that brings the flipped classroom activity into practice. This study tries to convince that using such e-learning model helps clarify the teaching practices used but at the same time there is not only one approach to flipped learning. A flipped learning model requires



the teacher presence consistently for active or inquiry-based learning to the student to help them in taking decision during the learning process. The design focuses more on enhancing skills or capacity building thus improving their interaction among the peers as well as with the instructor. Typical strategies followed in this technique includes (i) learning out of the class as the instructor uploads video or audio lectures; assessment using quizzes to supervise students understanding and chatting with the instructor (ii) in class activity involves the discussion related to problem based learning using problem sheets; class discussions with the instructor and having Q & A session. Online teaching activity involved the use of audio/videos recorded lectures and assigned test series that were used to assess students' knowledge about the introductory concepts of physics which further addresses the learning outcomes of the course. The in-class activities involved in this teaching learning pedagogy are modelled in a way that addresses the high levels of observational learning outcomes suggesting the engagement of students in learning the concept in depth. This model also includes problem-solving tasks assigned to the student, think-pair-share activity engaging students to discuss the problem assigned, and predict observe-explain activities. This structure helps the students to engage with the course, interact with the content during this act of learning which helps them to construct their own knowledge by further discussing the problem with the teachers. Additional study materials like youtube links, tutorials, discussion forums etc were made available outside the class using the LMS platform to address further questions from students [5-8].

The successful learning/understanding of the physics course is when the students have the ability to solve problems by associating with the faculty. Learning through problem solving requires a systematic and consolidated knowledge gained during the theoretical study of study material/resources provided by the instructor. As each course module contains a descriptive methodology and examples related to the problem solving on the subject. In order to monitor the analytical and observational approach of the students and to judge their knowledgeable skills and abilities; they are supposed to perform in a team/group as well as should be able to present their



work individually. This is implemented by means of assignments/assessment sent to the students and after the given stipulated time students sends the answers back to the teacher in the form of a file or is uploaded in LMS. Integrating information and communication with the technology supports LMS MOODLE and also allows the teacher/student interaction beyond the classroom as well. It also serves as a very useful tool to receive students' works right away where the faculty can check them, correct the errors, send back for revision and can upload the grades on the same platform. The results of the graded/ungraded work help to evaluate the level of understanding by the students of the physics course. Pedagogy involving flipped learning originates from the environment of inquiry-based philosophy. With the growing teaching learning approach using ICT and the information available on the internet, the traditional teaching model of teacher as an administrator of knowledge has become old fashioned. In the era of technology, teachers have procured a new role as that of a mediator, who helps students to restructure the information. The aim of this paper is to identify the teaching learning pedagogical approaches essentially used in flipped learning strategy and to create a platform that helps in providing guidance to the students in operating the learning approaches.

II. METHODOLOGY

In the present study, two of the skills and ability of the learners have been extensively embedded in the teaching methodology for the students of first year studying engineering physics course. One of the first capacities acquired by the learners during the activity is to be independent and collaborative: the undergraduate learners should be able to work independently and also should be able to collaborate with others so that they can satisfy their curiosity and have a strong urge to meet new challenges. Secondly, along with the technical knowledge student should gain skill in communication also in order to become skilled communicators. There are many benefits of using poster presentations for the assessment of students' knowledge; the preparation required for poster/PPT/video presentation promotes learning as it is an excellent medium for developing



communication skills and at the same time encourages students to investigate a topic thoroughly. The topics given are a part of syllabus taught in the class as well as real life application based self-learning topics. For the implementation of this assessment technique using poster presentations, students are divided in smaller groups (3-4) to design and further develop their posters in the form of PPT/video or ideas carved on a chart paper.

During the presentation of their poster, all the peers/other students of the same class were present in a group in the classroom serving as their audience and the facilitator who would records/assess the presentation. The intention of doing this research on a group of students is to understand if the preparation of self-learning topics or real life application based topics for the poster preparation in a group is a good fit to the new model of learning-and-teaching tool using flipped classroom approach. This also serves as a good medium to assess the effective learning of the students based on their communication skills used during the poster presentation and understanding the concepts of physics in-depth. The study demands the involvement of each student in their class groups created by the facilitator to produce a poster of the most topics given from the theory chapters/self-learning beyond the syllabus that improves their analytical thinking skills and creating ideas during the poster making. The group presentation of the poster, peer/faculty assessing the poster presentations along with an online quiz were done using google drive/google classroom as well as utilizing the institutes LMS. Nichols et al. have reported in their paper about using video in the education system that, depending upon the use envisaged by the instructor, it also covers the three diverse domains of learning: that are the analytical skills/cognitive skills, controlling emotions/being affective and psychomotor skills, while using students' video recordings. Thus, this paper discusses to which extent the poster presentation has been successful in assisting students to improve their presentation skills, understanding the content of the course and hence, become better skilled communicators of physics course concepts.

As the teachers are highly experienced in teaching Applied/Engineering Physics course in higher educational institute, interacting with higher class students, literature survey from research papers

helped the physics teachers to list down topics for poster presentation that are within the syllabus as well as few which were out of the syllabus. These interesting topics which were chosen are real life application based as well as related to the theoretical concepts studied.

After the topics were assigned to the students, they were given two weeks of time to explore the given topic. The instructors encouraged the students to refer various resources available online/offline such as webpages, journal papers, YouTube channels, books etc. The students were expected to investigate and assess the gathered information and then demonstrate the understanding of their innovative idea on the assigned topic in the form of a poster after surveying the available literatures. Each of the students was expected to put forward some different ideas in their posters enriched with unique information. This helped the students to indulge in peer learning and also gave them the possibility to use their thinking and cognitive skills to arrange and present the information in the form of a poster with their idea of design.

All students have tried very hard to explore the topic and have presented beautiful posters. Some of them are shown in Fig. 1.

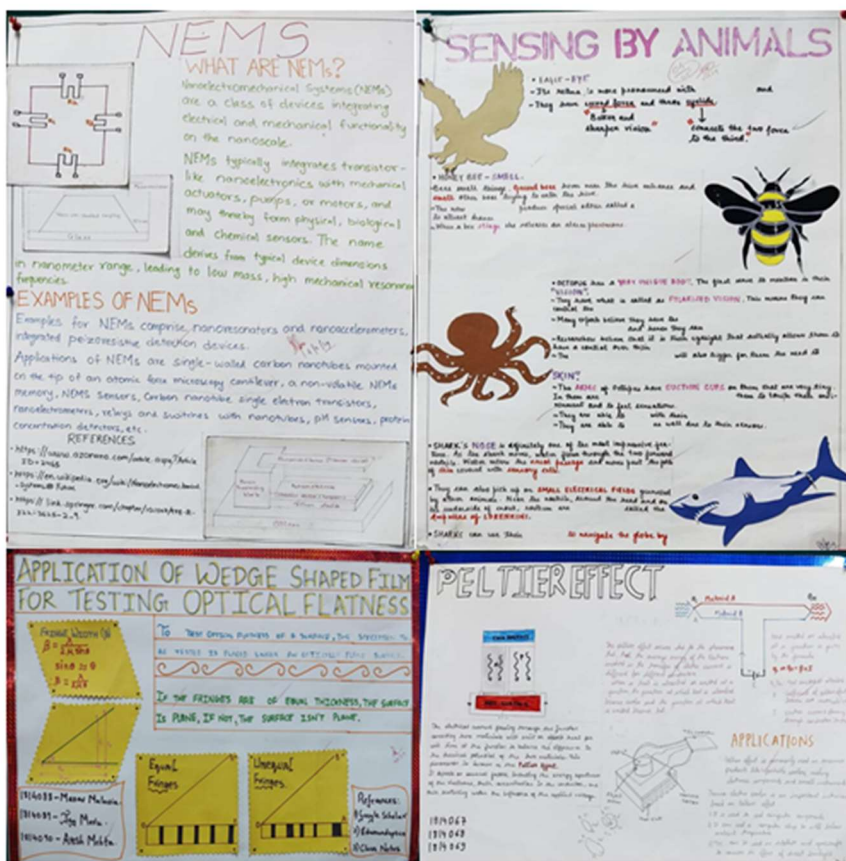
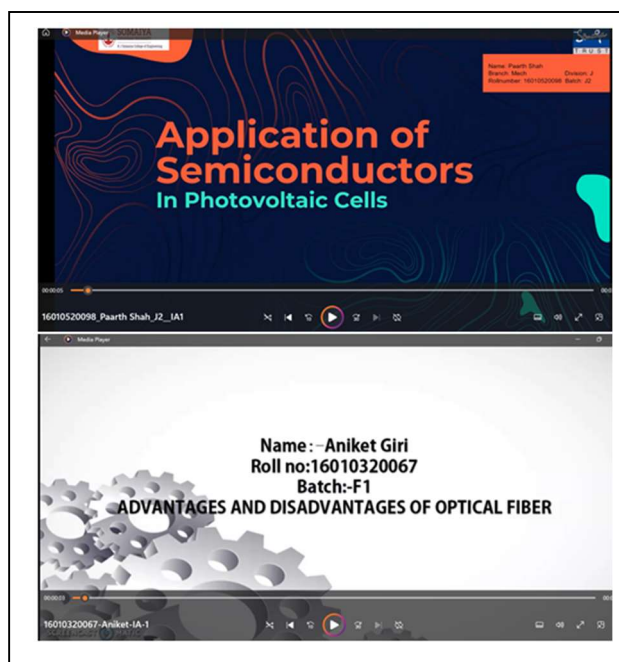


Fig. 1: Students poster made on A3 size paper

Some of the students also presented their work in the form of recorded video using screencast-o-matic software as represented in Fig 2.

Fig. 2: Presenting the poster in the form of recorded video



III. RESULTS AND DISCUSSIONS

Rubrics were assigned for the assessment of the posters that measures the students' presentation based on the criteria like the information provided for the assigned topic is relevant, whether the content has been covered, utilization of space on the poster, creativity on the poster designing, adding the references, checking plagiarism as well as timely submission. The rubrics were floated well in advance about all the assessment criteria. Therefore, the students were encouraged to follow and understand the given conditions of each criterion so that their performance can be evaluated. The students were encouraged to present the poster related to their topic during an online lecture using zoom platform/MS teams that makes the assessment process transparent as the fellow students/whole class is also present. After the presentation, the session was kept open for Q & A to be asked by the students that puts an emphasis on the reflection of the presenter's better understanding about the topic. This technique helped all the students to be acquainted with all the information about the topic and hence further imparting of more ideas. The findings of the successful completion of poster presentation were measured by conducting a survey taking into account two aspects (i) to determine the effectiveness of the activity in the group of students' and. (ii) Students' performance in the poster presentation. A questionnaire was floated after the conduction of the poster presentation activity which focused on the motivation of

students', achievement and involvement of different objectives designed by the authors before the poster presentation. Student's survey shows that the students had spent appreciable amount of time to complete the poster making activity that includes gathering the information, sorting out the relevant content and creating a presentation. Students have referred to various available resources like books, webpages, websites, research papers, YouTube videos, and also interacting with their friends and taking teachers guidance.

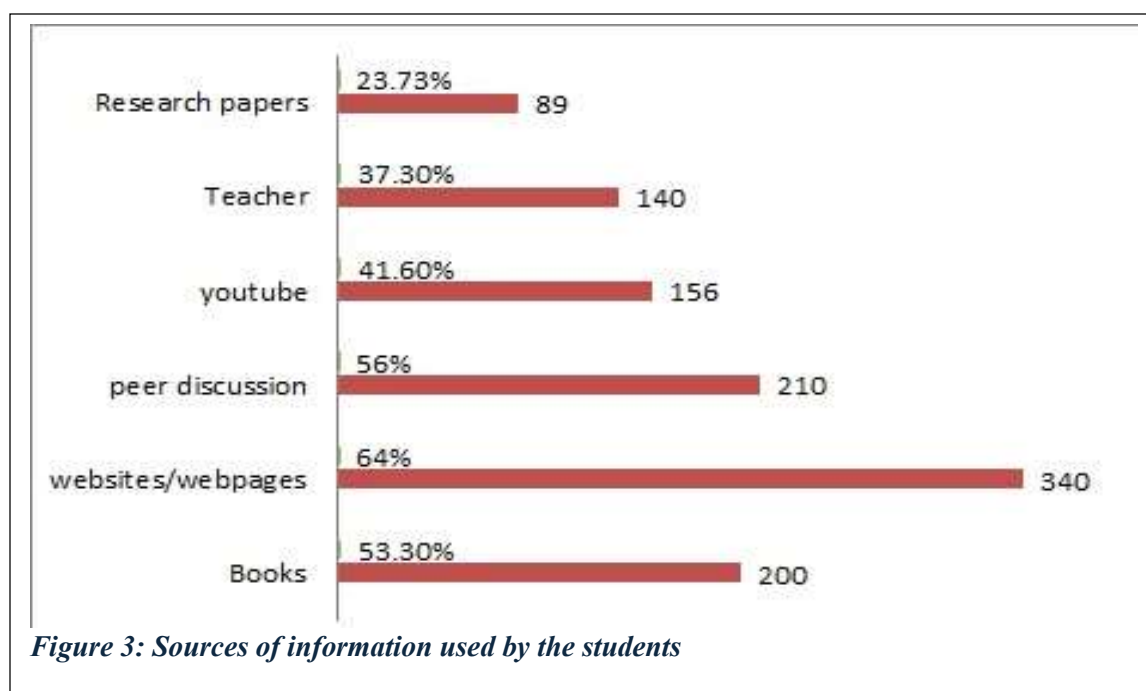


Fig 3 reveals that 64% students have used webpages/websites to collect the information while 56% students got help by discussing the topic with their peers. 41% of the students referred to YouTube videos while the rest have used research papers as well. The statistics revealed that 21% of students used research papers for the literature survey, as these students had never done any research - based activity before in their education life. The authors have received a good response on conducting such activity and therefore, the students expect to conduct similar kind of activities in higher

semesters as well as they were successful in imbibing various aspects i.e. Attention, Relevance, Confidence and Satisfaction in the students. The students accepted that the Poster activity has brought their attention to applications of the given topics based on the concepts of physics. 91% of the students admitted that their interest level in learning the physics concepts and the application has increased (Fig 4).

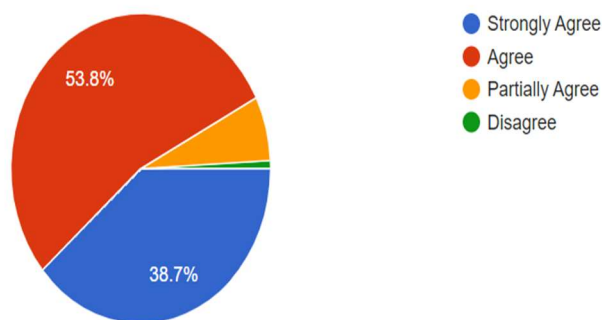


Fig. 4: Increased level of interests in students

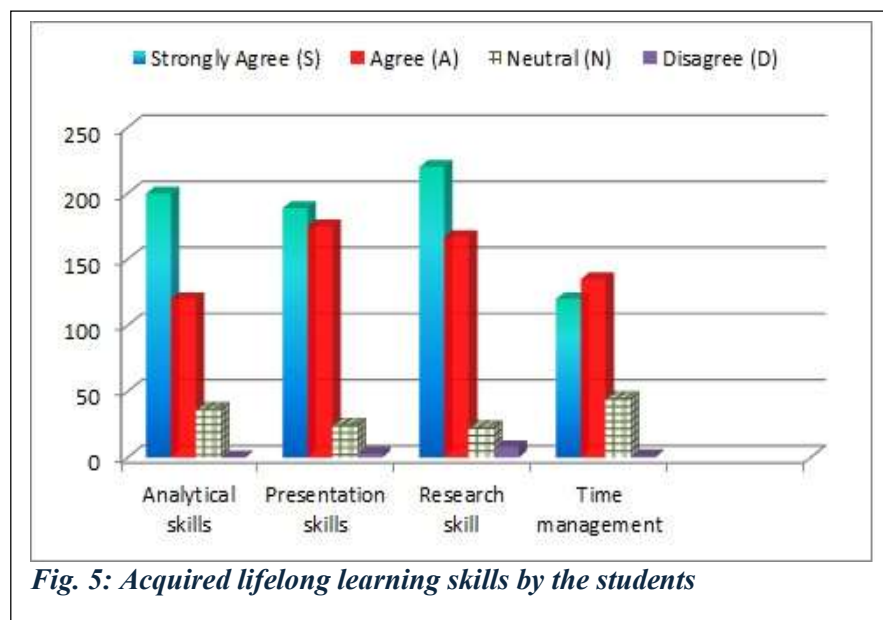


Fig. 5: Acquired lifelong learning skills by the students

From the feedback survey the students have given, it clearly shows that the students found this new technique to be more engaging and interesting as compared to the traditional method of assessment in physics course (Fig. 5).

The learners felt contented and were involved in the activity for more time as compared to the time spent in the traditional classroom. The teacher's works as a facilitator here and observes the active participation of the students and how engrossed they are in this activity.

CONCLUSIONS

The study reported here encourages and supports the learners to develop their way of thinking and demonstrating a positive attitude towards the learners' cognitive skills. Facilitators designed a rubric for the assessment of the activities which engaged the undergraduate engineering students. The facilitator continues enhance and involve critical thinking experiences in the learners by continuously refining the course. The well-defined objectives presented in this study make a simple poster presentation method into a powerful tool for online assessment tool for the physics course. This technique engages student learners and puts them at higher analytical levels of Bloom's taxonomy which is analysis, creation and application. This demonstrates the use of literature survey, provoked inquisitiveness in them, improved their observational, critical and analytical thinking skills that enhanced their creativity. Through this assessment technique, students get exposed to several physics subject related concepts which further helps them to relate physics with other real life applications that entitles them with life-long learning skills.

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