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Assessment of the Effectiveness of Teaching in Large Groups Using the Strategy of Think-Pair-Share

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ABSTRACT
Student-centric teaching or approach, also known as learner-centered approach, clearly emphasizes the needs, skills, and interests of the learner. The focus is on the learner and authentic problems rather than on the structured analysis of the curriculum content. However, assessment continues to be vital to the education system. The present paper analyses ways of assessing the effectiveness of teaching in large classrooms with the help of interventions that enable the shy and not so active students to participate and involve themselves in the classrooms. A general lack of interest and involvement among students defeats the entire purpose of teaching, and to counter the same the intervention of the Think Pair-Share technique was adopted while teaching a large group of first year students. It is further discussed how the intervention and the criterion-based assessment emerged both as a formative and a summative assessment. Thus, the present thesis intends to highlight the redundancy of the age-old norms, criteria of assessment and bring the role of innovative techniques like TPS and mentimeter to the fore, as more effective and student centric approaches influencing contemporary pedagogy.

Keywords: Think-Pair-Share, Student centric teaching, assessment, formative assessment, summative assessment, criterion-based assessment, interventions.

INTRODUCTION:

In the realm of higher education, the challenge of effectively engaging and educating students in large lecture-based classes has been a longstanding concern. (Elliott & Guest, 2019) As class sizes continue to grow, instructors are faced with the daunting task of fostering active learning and meaningful knowledge retention among their students. Researchers have explored various strategies to address this challenge, including the implementation of the think-pair-share technique, which has shown promise in enhancing student engagement and learning outcomes in large post-secondary courses (Elliott & Guest, 2019; Suchman et al., 2000; Aburahma, 2015; Quinlan & Fogel, 2014).

It is observed that a general lack of interest and involvement among students defeats the entire purpose of teaching today. Learner-centered teaching, also known as student-centered teaching, is an instructional approach that prioritizes the consideration and resolution of students' concerns, interests, and personal backgrounds. Switching the focus of pedagogy from the teacher to the student, this pedagogical practice comprehensively promotes learner autonomy. It places an emphasis on centralizing the learning experience around the students, empowering them to assume an engaged and autonomous role in their academic journey and the instructional environment fosters a positive and supportive climate, where students feel valued, motivated, and confident in their potential to achieve success. At the same time student-centered classrooms prioritize student interaction and active participation in the learning process, rather than relying solely on the teacher as the main source of knowledge. Some key principles and characteristics of student-centered teaching include Active learning, Individualized learning, collaborative learning, student autonomy, real world relevance, teacher as facilitator, feedback and assessment, reflection and metacognition.

The implementation of think-pair-share in large lecture-based courses represents a strategic approach to promoting active learning and student engagement. The think-pair-share technique, a widely used active learning strategy, involves a three-step process in which the instructor poses a question or prompt, students are given time to individually reflect on their response (the "think" step), they then discuss their thoughts with a peer, and finally, select students share their ideas with the larger class (Wirth, 2007; Kugler et al., 2019; Stevenson & Gordon, 2014).

This process encourages students to actively engage with the course material, articulate their understanding,

and learn from their peers (Wood et al., 1997). The value of think-pair-share lies in its ability to foster critical thinking, knowledge sharing, and a sense of community among students in large classroom settings.

This paper explores the use of think-pair-share, a cooperative learning strategy, as a means of fostering active learning and engagement in large post-secondary lecture halls (Quinlan & Fogel, 2014). As "students participate [in active learning] when they are doing something besides passively listening," (Bonwell & Eison 1991) activities such as conversations, group projects, problem-solving, and hands-on experiences engages them as opposed to the conventional passive learning process and leads to active learning. Therefore, while the teacher centered learning, places the teachers in the center of the system, and the students in the margin, student centered learning makes the students an active participant of the process bringing him to the center. Disagreeing with traditional teaching methods that empower the teacher to dictate the concepts being taught, the way they are to be taught, and then assessed, student - centered learning allows the students themselves to make these decisions and become active members of the system. It promotes the concept of student autonomy according to which, the autonomy and authority that students have on their educational journey is expanded. They assume accountability for their academic goals, ascertain the most efficient approaches to learning, and evaluate their personal growth. Consequently, the responsibilities of the educators undergo a transformation, and changes from being a dispenser of knowledge to that of a facilitator or guide who besides sharing information, facilitates the academic journey of every student and enables him/her to assume accountability for his/her personal growth and development.

The implementation of think-pair-share in large lecture-based courses represents a strategic approach to promoting active learning and student engagement. The think-pair-share technique, a widely used active learning strategy, involves a three-step process in which the instructor poses a question or prompt, students are given time to individually reflect on their response, they then discuss their thoughts with a peer, and finally, select students share their ideas with the larger class (Suprapti et al., 2019; Wood et al., 1997; Serva & Fuller, 1997; Stevenson & Gordon, 2014). This process encourages students to actively engage with the course material, articulate their understanding, and learn from their peers. The value of think-pair-share lies in its ability to foster critical thinking, knowledge sharing, and a sense of community among students in large classroom settings (Sandybayev, 2020; Serva & Fuller, 1997; Stevenson & Gordon, 2014).

By utilizing learning strategies that can include small-group work, role-play and simulations, data collection and analysis, active learning is purported to increase student interest and motivation and to build students 'critical thinking, problem-solving and social skills" (Scheyvens, et al 2008).In accordance with this pedagogical practice, collaborative endeavors/ learnings among students are frequent, they frequently work in small groups or pairs to investigate concepts, resolve problems, and construct knowledge. Bonwell and Eison suggested that role-playing, debating, engaging in case studies and other teaching methods which include active participation of students encourages collaborative and cooperative learning. This promotes active participation from peers, improves proficiency in communication, and enables the sharing of ideas and perspectives. This active learning depends on the level of student's involvement in the active or experiential learning process (Bonwell & Eison 1991). Scheyvens, et al further noted that technology-based learning, activity-based learning, group work and project method are some of the strategies of active learning. Opposed to the teacher centered passive learning process such active learning methods encourage students to participate and think simultaneously, enhancing their thinking capabilities. Thus, in an active learning environment, learners are immersed in experiences within which they engage in meaning-making inquiry, action, imagination, invention, interaction, hypothesizing and personal reflection (Cranton 2012). Active teaching techniques in the classroom can create better academic outcomes for students (Hanson and Moser 2003) and active learning can be used effectively for teaching comprehension and memory. (Freeman, Scott; et al 10 June 2014). Some of the widely used techniques of active learning include learning cells, reactions to videos in class, group presentations, small group discussions and short written exercises such as one-minute papers.

Overall, active learning strategies have been found to be effective in promoting student engagement, critical thinking, and long-term learning. By engaging students in the learning process through activities such as think-pair-share, instructors can foster a more dynamic and collaborative classroom environment that empowers students to take an active role in their education.

Acquiring knowledge and skills in groups to accomplish a shared learning objective makes learning a collaborative engagement in which every group member's active involvement is imperative. Negotiating meaning and engaging in social interaction to generate knowledge is consequential to collaborative learning which provides opportunities for students to share their unique insights and learn from the perspectives of their peers. ensuing to a diversity of perspectives and development of skills.

According to Freeman et al. report, the positive impact of active-learning pedagogies was clear enough that the authors proposed that, rather than continuing to compare the results of traditional lecturing and active learning, research should focus more on how and for whom active learning is most effective (Hodges, 2018). Learning activities that require students to think critically, problem solve and apply concepts have been shown to improve retention and develop higher-order thinking skills that enable students to transfer knowledge to new situations (Stevenson & Gordon, 2014). Active learning

also benefits students by increasing their motivation, interest, and engagement in course material.

Thus, both collaborative learning and active learning emphasize the active engagement of students in the learning process and promote interaction among students. Constructivist learning ideas, which stress students actively creating their own conceptual understanding, are consistent with both collaborative and active learning approaches. Students build knowledge through practical experiences and reflections in an active learning environment. In collaborative learning, group members negotiate meaning and engage in social interaction to generate knowledge. This type of learning provides opportunities for students to share their unique insights and learn from the perspectives of their peer's advocating diversity of perspectives and development of skills.

The present study uses the strategy of Think Pair Share in large group teaching which is a large classroom, and measures how effective it is through assessment. Assessment is essentially a systematic process of documenting the acquired knowledge and skills of an individual community. Besides shaping the learning process at all points and giving insights into student learning assessment in its varied guises, influences almost everything that goes on within a classroom. The major purpose of assessment should be to provide interpretative information to teachers and school leaders about their impact on students, so that the instructors have information about what steps to take with instruction and how they need to change and adapt. So, often assessment which is primarily used to inform students of their progress and attainment, also informs teachers about their impact on students. Using assessments as feedback for teachers is powerful and this power is truly exploited when the assessments are timely, informative, and related to what teachers are actually teaching. (John Hattie, a professor of education and the director of the Melbourne Education Research Institute at the University of Melbourne, Australia). (Airasian et al. 2007) explain that the purpose of tests and assessments is to gather evidence about student learning and conclude that it is up to the teacher to then choose the best assessment method for students. In agreement to this concept of assessment, the present paper analyses ways of assessing the effectiveness of teaching in large classrooms with the help of interventions that enable the shy and not so active students to participate and involve themselves in the classrooms.

It is observed that a general lack of interest and involvement among students defeats the entire purpose of teaching and therefore both active and collaborative learning have been experimented with and extensively used in classes. One of the most effective examples of active and collaborative learning is the Think Pair Share technique which is an active-learning strategy designed to give all students in a classroom the opportunity to think and talk about the ideas they are studying (Lyman, 1981). Originally proposed by Professor Frank Lyman in 1981, the think–pair–share has been widely {appreciated} as an effective active-learning strategy for more than 20 years (Sherman, 1991; Cavender and Rutter, 1997; Allen and Tanner, 2002; Tanner, 2009, 2013. Promoting peer cooperation and communication, it is a popular technique for posing queries in varied size classrooms in any subject and educators are largely acquainted with it. Nevertheless, it can be implemented in the classroom in using diverse methods, with varying degrees of success. According to this strategy, a teacher initiates a question to students and permits them to engage in individual reflection on the subject matter while frequently encouraging them to document their thoughts when employing a think–pair–share approach. Students are then organized into pairs or small groups to discuss the issue. In the end, several students are chosen by the instructor to present their respective viewpoints in front of the entire class (Reconsidering the Share of a Think–Pair–Share: Emerging Limitations, Alternatives, and Opportunities for Research, Katelyn M. Cooper, Jeffrey N. Schinske and Kimberly D. Tanner). Thus, TPS provides an opportunity for students to work in groups toward a common goal, increasing their own and others' understanding in a safe environment to make mistakes (Johnson & Johnson, 1999). Subsequently, the instructor who plays the role of a facilitator clarifies all the misconceptions and confusions during the formal class discussions making it an active learning exercise for students in which they involve themselves by thinking of the concepts and sharing of ideas in the class. This technique helps to encourage the collective classroom participation rather than involvement of few students. Clearly such an exercise enables the teacher to gauge how effective the teaching has been. (Robertson, Kristina 2006). Bonwell and Eison, however, do not consider Think Pair share as an effective strategy to use in large classes because of time and logistical constraints (Bonwell and Eison, 1991). Radhakrishna et al on the other hand believe that this practice is helpful to the instructor as it enables him to give shape to content and understand how clearly the students have been able to relate to the topic being discussed. Further as an active learning process it helps to make the class more interactive and vibrant (Radhakrishna, Ewing, and Chikthimmah, 2012).

According to Radhakrishna et al. one {comprehensive} way to assess the effectiveness of the Think Pair Share strategy in large group teaching is through evaluating the gains in critical thinking among students. Critical thinking skills are defined as the ability to analyze and evaluate information and to apply that information to solve or pose problems (Ennis, 1985; Barr and Tagg, 1995; Halpern,1997; McKeachie, 1999; Tsui, 2002). It is, however, very difficult to measure critical thinking since it cannot be directly observed but only inferred from task performance or student responses. Critical thinking may involve the ability to distinguish fact from opinion, to pose relevant questions, to identify assumptions, to detect bias, and to engage in logical reasoning (Juita et al., 2022). Formative assessment tools based on rubrics and evaluation strategies that tap into such higher order critical thinking skills should be

employed to determine the effectiveness of the think-pair-share technique for large group teaching in classrooms (Chigonga, 2020).

The paucity of interest and little involvement of students in class defeats the entire purpose of teaching, and to counter the same the interventions of the Think- Pair-Share technique was adopted while teaching a large group of first year students. With the intention of overruling the time and logistical constraints suggested by Bonwell and Eison (Bonwell and Eison, 1991) the TPS intervention was followed up with an assessment of the understanding of the students using the mentimeter technique. An in-process evaluation of students, this scheme of teaching and assessment techniques were adopted because they give a continuous feedback about what students are learning (as evidenced in the TPS activity) or not learning (as evidenced in the assessment activity) so that instructional approaches, teaching materials, and academic support can be modified accordingly. Such in-process evaluations which are a part of formative assessments enhance the learning process because teachers use the results to modify and improve their teaching techniques.

METHODOLOGY

These interventions of Think Pair Share and Mentimeter were applied in a first-year course entitled 'Energy & Environment'. A mandatory course for all undergraduate students of Engineering, the course had around twelve hundred students and was being taught in ten different groups by five faculty members. Clearly every faculty member was teaching large groups of students. Since the students and the subjects were from Computer Engineering and Computer & Electronics Engineering stream, they did not find much interest in the course of Energy & Environment. Although they were good at learning the concepts taught in the classroom, the response was not satisfactory, and students were not able to answer questions from topics that were taught in the previous lectures. Moreover, individual attention was limited and students showed little interest in this subject as depicted by their nonverbals and body language. Some of the shy students seemed to be completely detached from the classroom. Considering that for effective teaching learning practice, the involvement of all the students is imperative, the 'Think-pair-share' (TPS) technique was implemented in the classroom. Since it is a form of student-centered learning (M. Kaddoura, 2013) wherein students actively involve themselves in thinking of the concepts and sharing of ideas in the class (Prince and Felder 2006) and helps to encourage the collective classroom participation rather than involvement of few students (Ledlow 2015 and Fitzgerald 2013) brilliant and hardworking students were paired with the less hardworking students in the class. In order to enhance the effectiveness of think-pair-share strategy it was applied in the large groups for several topics. Prior to this, a similar intervention was applied in a Post Graduate course of twelve students (Small Group). Based upon the positive feedback and response of the Post Graduate students on the think-pair-share strategy, the technique was implemented in a large group of UG 1st year students.

Think-Pair-Share Intervention

The topic discussed in this assignment for which the think-pair-share strategy was adopted was the regional current environmental issue namely "Techno-economic feasibility of alternatives to Stubble burning with regard to Indian context". The students were asked to divide themselves into different groups with each group comprising of four-five students. Thereafter, certain changes in some of the groups were made to redistribute the brilliant or less hardworking students so as to maintain a balance in each group. Guidelines regarding the think pair share strategy were already shared with the students. Once the topic was initiated, students were asked to think about it and document their ideas. About five minutes was given to each student to think and write the important points about the topic and thereafter, ten minutes were given to discuss the salient points within their group. This was followed by a formal round of discussions in which each group presented their views in front of the rest of the class.

The students came up with various viable alternatives to stubble burning like use of bio-degradable mulches, crop residue management through baling, briquetting, pyrolysis etc. and also discussed techno-economic feasibility

The think-pair-share technique was implemented in the following manner:

- At the beginning of the class, the instructor posed a question or a problem based on the topic covered in the previous lecture.
- The students were given some time to think individually about the question/problem.
- Then they were asked to discuss the problem in pairs and share their understanding/solution with each other.
- After the pair discussion, few pairs were randomly selected to share their understanding/solution with the whole class.

This gave the students an opportunity to were otherwise shy or hesitant to participate in the class to voice their opinions/ideas in the smaller group discussions first before sharing with the whole class.

Mentimeter Technique

An online interactive tool, Mentimeter is an easy-to-use technique and facilitates everybody's interaction in the class/presentation. An effective method to get instantaneous feedback this method was utilized to get student feedback about the Think pair share strategy which was used to promote collaborative learning. It was also used to have the opinion of all the present students about the two questions in the form of 'Word Cloud' type and 'Speech bubbles Open Ended' type.

The first question was an open-ended question "What did you like the most in the Think Pair Share activity?" While the Think-Pair-Share technique was implemented

to enhance student engagement and participation in the class, the Mentimeter technique was used to assess the understanding of the students.

Mentimeter is an interactive presentation software which allows the participants to respond to questions asked by the presenter through their personal devices (smartphones/laptops). In this study, Mentimeter was used to ask questions related to the concepts covered in the previous lecture. The students could answer the questions on their smartphones, tablets or laptops by logging into the Mentimeter app or website.

Each student was asked to open the website http://www.mentimeter.com on their mobile phones web browser and fill the numeric code so that they could post their feedback online on the effectiveness of the strategy used and the results of the intervention applied in two different sections as shown in. Results were instant and were displayed on the projector. The students gave fairly encouraging feedback about the topics discussed in the lecture classrooms. Overall, 80-90% of the students were satisfied and enjoyed participation in the think-pair-share strategy. As already discussed, students performed well after working in groups (K. R. Pardeshi 2016). The brilliant students were seen discussing the key points with the weaker students to help them. Moreover, panel discussions were extremely interesting.

The Mentimeter questions included a variety of question types such as multiple choice, word cloud, open ended etc. which allowed the faculty to gauge the depth of understanding of the students. The utilization of pre- and post-class quizzes as well as peer assessments were critical motivating factors that likely contributed to the increase in student participation in class and helped place learning accountability on the students.

The results of this study indicate that the use of interactive technology such as Mentimeter along with the think-pair-share method can significantly enhance student engagement and participation in the classroom (Mitra et al., 2006; Dallimore et al., 2004; Park & Howell, 2015).

CONCLUSION

The implementation of the think-pair-share strategy along with the use of the interactive Mentimeter tool in the large UG classrooms showed promising results. The collaborative learning environment created by the think-pair-share method enabled the students to share their ideas and learn from each other. The Mentimeter tool was effectively utilized to obtain real-time feedback from the students and assess their understanding of the concepts covered in the class. Overall, the students found the teaching-learning process more engaging and interactive. (Simelane & Mji, 2014)

The disinterested behavior of students has always been disturbing and frustrating and the intervention of Think Pair Share helped to generate interest in the subject among the students. They really enhanced their active participation in the classroom discussions as depicted earlier. Due to these interventions, despite the large class groups, all the students were involved, and teaching was effective. Moreover, the weaker, hesitant and shy students gained confidence to discuss in the class. It is therefore observed that think-pair-share is effective teaching pedagogy in large class strength. Further the students scored well after the implementation of this strategy.

The results were quite motivating as active learning gained currency in class and the students enjoyed participating in both the interventions and gaining knowledge. This exercise therefore showed that despite a few limitations the interventions of collaborative teaching like think pair share and instant assessment in the form of mentimeter are very effective tools for effective teaching and learning. They not only authorize students to decide on the course of the lecture but also make them responsible students who feel the need to make this exercise a fruitful one. Thus, when compared to traditional forms of education Learner centric assessment and learning produces better learners and successful students.

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