Orchestrating Active Learning in Hybrid Classroom: A Case Study and Recommendations For Instructors

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***Abstract*—Implementing active learning (AL) strategies in hybrid classrooms is a challenging endeavour that holds immense potential for enhancing student engagement and learning outcomes. However, the hybrid classroom, which merges the physical and virtual realms, introduces a distinctive set of complexities for educators. Instructors grapple with the task of seamlessly integrating AL methodologies to ensure that both online and offline students reap the benefits of active learning. This paper delves into the practical implementation of AL strategies within the framework of a semester-long project-based course designed for postgraduate students, thereby proposing guidelines on the effective orchestration of AL activities in a hybrid class. In this observation and reflections based study, the focus remains on three core AL activities: (a) in-class discussions, (b) project discussions, and (c) the cultivation of student reflection for both online and offline students. The results showed that implementation of AL strategies through a project-based course in a hybrid classroom setting had (i) a positive impact on learners' engagement, (ii) increased interaction with content, peers, and instructors, (iii) led to promoting student reflection, and (iv) contributed to maximising student engagement and learning outcomes.**

***Index Terms*—Active learning, Think pair share, Hybrid classroom, Recommendation, Instructors.**

I. Introduction

Active learning (AL) strategies, such as Think-Pair-Share (TPS) and Peer Instruction (PI), have been widely acknowledged for their benefits in classroom environments, fostering increased learner engagement, interaction, and enhanced learning outcomes [1]. As education continues to evolve in the digital age, researchers have diligently explored the nuances of AL in various contexts, encompassing traditional classrooms, online platforms, and remote learning environments.

Extensive research has focused on the challenges faced by instructors when designing and implementing active learning strategies in various educational settings, including face-to-face, online, and remote classrooms. However, hybrid classrooms, which combine the physical and virtual teaching-learning aspects, initiate a new set of challenges for educators. Instructors struggle to seamlessly integrate AL methodologies for both online and offline students. Studies have observed that it is essential to incorporate an active learning environment as it has been reported to increase student involvement, responsibility, and enthusiasm in projects [2].

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Thus, a significant gap remains in the understanding of how to effectively design and implement AL activities in hybrid classroom environments. This is evident where both online and offline students are present synchronously while ensuring optimal and meaningful interaction between both groups of learners, as well as between learners and instructors. This also raises the question – *what pedagogical approaches should be implemented to address this challenge?*

This study discusses the factors that underplayed the design of AL activities in a semester-long hybrid classroom with 27 postgraduate students. The focus was on activities that were adapted to promote student engagement, interaction, learning, and reflection. This paper presents the Literature Review in Section II, Course Design in Section III, Teaching Learning Activities for Course execution in Section IV, simultaneous semester-long course Project execution in Section V, and Our Learnings and Recommendations in Section VI, with the conclusion in Section VII.

II. Literature Review

A. Active Learning as a pedagogical tool

The research by [3], and [4] showed that "Active learning encompasses pedagogies focusing on student activity and student engagement in the learning process". Active learning activities also enhance the chance of a deeper understanding of the subject [3]. It improves the following major areas in students' learning - (i) improvement in higher-order thinking processes [5], [6], (ii) promotes creativity and critical thinking, (iii) provides feedback, and (iv) increases student engagement and learning outcomes [6], [7]. Also, the active engagement of students with the instructor, course content, and their peers plays a pivotal role in creating meaningful and impactful learning experiences [8].

B. Implementation of active learning in Hybrid classrooms and their challenges

The convergence of active learning and technology in the hybrid mode represents a promising paradigm shift in education. Researches [9], [10] have consistently depicted the transformative potential of active learning in hybrid education settings, as it plays a pivotal role in not only drawing remote students into the learning process but also in significantly enriching the teaching-learning experiences for all participants. Various implementations, such as the use of wiki platforms,

have been explored to overcome the complexities of in-class discussion for students on distant campuses [10].

However, there are challenges in adapting AL strategies in interaction with student-content, and student-student and student-teacher interaction in online mode [1]. There is still a lack of clear guidelines on designing and adapting active learning activities in a hybrid classroom to ensure engagement, interaction, and learning for in-person and online students [11]. There are also significant challenges in implementing AL strategies in hybrid regarding creating collaborative groups, executing project-based learning, and encouraging reflection, interaction, and engagement among all students.

III. Course Design

The course "Instructional System Design (ISD)" is co-designed and co-taught by two instructors, author three and author four. Assisting them is a senior student who serves as the teaching assistant. This semester-long course spans 15 weeks, with approximately 3 hours of synchronous class time per week. Twenty-seven postgraduate students enrolled in the course in different categories (Credit = 10, Audit = 6, and sit-through = 11). Table I shows a breakdown of the student details. A hybrid learning approach is adopted during the course, with a few students attending the class online via Zoom video conferencing while the majority attend in person. The online students were either audit students or full-time faculties of other institutes currently enrolled in doctoral studies with the department under the 'College Teacher' category (E.g. Author 2). To ensure the effectiveness of the course for this hybrid audience, the instructors make deliberate decisions to leverage technology and AL activities effectively. This course is a semester-long project-based course, with the final output being the design of a training module for disability awareness in the form of a website.

TABLE I
Demography of the students

	Age Range	Credit	Audit	Sit-through	Total
Online	33-43	–	M = 0, F = 2	M = 1, F =2	M = 1, F = 4
Offline	27-50	M = 6 , F = 4	M = 1, F = 3	M = 3, F = 5	M = 10, F = 12

A. Teaching Learning Activities

In order to implement AL in hybrid mode, instructors used the following:

- First set of Google slides - Containing all the class contents such as topics from ISD (e.g. ADDIE model)
- Second set of Google slides - To record all the class responses by both online and offline participants
- Google doc - To record all responses for '*Homework 0*'
- Zoom Online Meeting - For class and breakout rooms

At the start of each class, the instructors shared the first set of Google slides with all the students. This slide contains the following - (i) the class content, (ii) activities, and (iii) a designated section for students to write and share their responses during the class. This allows for synchronous participation and engagement from both the in-class and online students. To further enhance participation, breakout rooms in Zoom are created on multiple occasions for the online audience to interact effectively.

B. Reflections on Learning

Additionally, the instructors create a post-class common document, '*Homework 0*', maintained throughout the course. This document provides a shared platform to post the reflections and learnings to others. Students and instructors can post their reflections asynchronously, providing an opportunity for further engagement and reflection beyond the classroom. The instructors also designed a few deliverables for groups as checkpoints to meet the project's end goal.

IV. Teaching Learning Activities for Course Execution

A. Classroom Based Activities

1) A discussion-based active learning strategy: In a traditional face-to-face Think Pair Share Activity, instructors can interact directly with students, dynamically controlling their thinking, pairing, and sharing phase [12]. Instructors can identify students' confusion and learning by class discussions. However, in a hybrid classroom model, this activity needs to be adapted and structured to ensure both sets of students are participating and are engaged synchronously. The instructors ensured that the online students did not deviate or were not overlooked and hence had to make use of slides and virtual breakout rooms to facilitate this activity. In the hybrid mode, the thinking phase remains the same, wherein the students are individually thinking in their own space. During the pair phase, students physically present in the classroom are paired together, while online students are facilitated by a teaching assistant (TA) who creates virtual breakout rooms in platforms like Zoom. This enables pairs to collaborate virtually. In the sharing phase, each pair writes their answer in the shared common slide deck accessible to the class. This provides an opportunity for instructors to attain class responses from all students in a structured manner. The average time duration of a TPS session was approximately 30 minutes. After this phase, the breakout rooms are disabled (in the online mode), allowing all students to reconvene. At this point, all the students read the publicly available responses of all pairs on the common slide projected in the class. The instructors initiate discussion among students on every response on the slide. Figure 1 shows a pictorial representation of the Think-Pair-Share in a hybrid classroom.

2) Individual reflection activity: Promoting in-class reflection poses challenges in a hybrid classroom setup, as online students may face disparities in active participation and engagement during class discussions, feeling disconnected in the discourse. To address this, the instructors systematically and regularly present thought-provoking questions as '*Reflection Spots*' in their slide deck. This approach aims to facilitate conscious participation from in-class and online students by bringing their attention to a focal point in the slide, encouraging reflection, and identifying potential misconceptions.

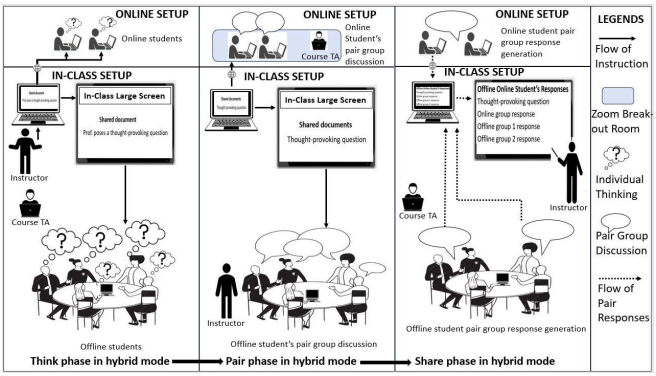

Fig. 1. A pictorial representation of the Think-Pair-Share in a hybrid classroom.

Students are given a minute or two to contemplate their responses individually during these reflection moments. They then write their answers, labelled with their names, in the class responses slide deck. In this form, the instructors ensure that each student not only thinks over his answer but also contributes their responses publicly to the rest of the class. The class response slide provides a platform to foster extensive interaction among both in-class and online students, as well as with the instructor, creating a dynamic learning environment. It promotes open dialogue and engagement as students can share their thoughts and engage in discussions based on those responses.

Findings: – There is a positive response among students on the value they see in making their class responses public with comments. According to the observations made by credit students, the following points were significant outcomes as it leads to "*..recall of the discussion..*," "*..construct on various ideas,..*" "*Enforces Peer learning,..*" "*Expands our thinking..*," "*Encourages to think of ways to incorporate others' ideas to my solution,..*", " *Help students and instructors to construct more knowledge about the topic,..*" "*Identify my mistake..*" and "*Integrate all the ideas and incorporate any new model/idea into one's thinking*" etc. The TA also responded that it builds a shift from individual to community when everyone discusses responses publicly and collectively as "*collective knowledge creation adds up to the shared knowledge for everyone such that knowledge points have transformed from individual to community*."

B. After-class reflection activity: The concept of 'Homework 0'

In hybrid learning mode, to ensure that students have learned the intended concept, instructors here use a unique approach called '*Homework 0*'. Homework 0 took the form of a shared Google document accessible to all students asynchronously serving as a platform for them to reflect on their learning after attending each class. The guidelines for this activity are explicitly outlined on the document's first page. The instructors broadly have two essential questions tailored to different sets of students based on their involvement with this course credit, audit, and sit-through. Every student has to write their reflection in two aspects – (i) what they did in the class, and (ii) followed by what they observed happening in the class. Doing this was strongly recommended after every class. Additionally, students have to articulate their learnings in terms of actively engaging in assigned activities, participating in group discussions, listening to other groups' conversations, and attentively observing the instructor's actions. They were also encouraged to share their expectations for the next class and any confusion or doubts they had, referred to as '*muddy points*'. All students and instructors provided feedback on each other's reflections in the form of a comment in the Homework 0. The document also captures written excerpts from students who had missed the class but claimed to have learned from the slides, class discussions, and the reflections from Homework 0. A snippet of the reflections made in Homework 0 is shown in Figure 2.

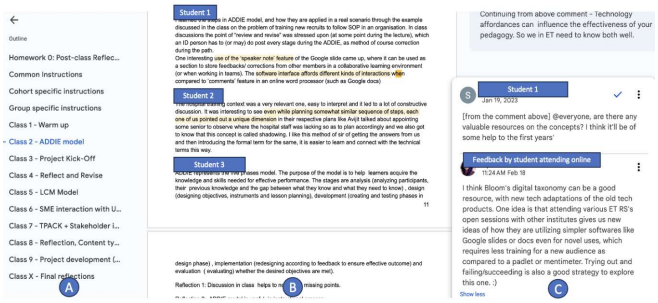

Fig. 2. A snippet of Homework 0 with the structure of the class on the left (A), reflections of learning by students in the centre of the document (B), and feedback in the form of comments by the instructors and other students on the right (C).

Findings: - Post-class asynchronous discussion with peers using shared document Homework 0 helped students collaborate, ask questions, seek feedback, clear their misconceptions, and meaningfully engage in the content regardless of their class attendance. It was also observed that many students reported the number of skills they learned in the course in the Homework 0 activity. They also mentioned the usefulness of interacting with other groups: "*...commenting or giving feedback to other groups' ideas helped to understand what are the things in common, how our groups' ideas differ from others and are able to identify important things which our group might have missed*". Many students reported their reflections in the form of meaningful diagrams and handwritten notes, making it a structured yet flexible mode of communication.

V. Simultaneous Semester-Long Course Project Execution

The course included a major group project. It required students to develop a website[1] for disability awareness. For this, both synchronous and asynchronous modes were used.

[1]https://sites.google.com/view/iitb-pwdcell-training/

A. Synchronous Mode

The course aimed to enhance collaborative learning for both online and in-class students by utilizing technology and organized group discussions. The TA began discussions by dividing the class into groups of five, with at least one online student per group. Each group was assigned a designated area in the classroom, where one laptop connected the online student to the rest of the group via Zoom link. The instructors then presented a specific question related to the project on a shared Google slide, which served as a focal point for group discussions. The online student in most groups guided the discussion to ensure it stayed on track and avoided any potential distractions. Additionally, online students actively monitored the discussion and contributed to the group's collaborative efforts. At the end of the activity, all teams shared their insights with the instructors and other teams for feedback.

Findings: - When the online students were asked how they collaborate, a common answer that was emphasised was their focus on the question posed by the instructor on the common side deck. Most of them talked about the effectiveness of assigning roles in the group to address different tasks: Example – Online Student (Audit): *"...it was relatively easier because while we collaborate online, we have the slides in front of us as default. So we began reading the question first and then started with the discussion. Two of us were taking notes of the discussion in separate sections - what fits the broad question and what would fit the specific first module question, which we pasted in the class response slide at the end."*

B. Asynchronous mode

To promote effective project discussions outside of class hours, the instructors implemented a clear role allocation strategy for individual team members. These roles are intended to organize team collaboration and ensure that specific deliverables are met. For example, in-class credit students are responsible for asking multiple questions to their teammates and completing final tasks such as inserting content into the training module. Other team members monitor discussions to ensure that the output meets the instructors' expectations for the project. These deliverables act as checkpoints for the instructor to monitor progress and ensure that the project is moving in the right direction. While the roles provide structure, they are flexible, allowing students to switch roles as needed to meet deliverables.

Findings: - This approach facilitates an organized workflow and enhanced accountability within the teams. Each team member has a clear responsibility, ensuring that no student encounters social loafing or overlaps and that everyone actively contributes to the project.

VI. Learnings from this study

Shared Google Slides and Homework 0 document promote synchronous and asynchronous participation, engaging all students with course content, peers, and instructors. Break-out rooms and feedback guidelines aid learning, while instructors facilitate active learning with overall reflections. Based on this, we have listed a few recommendations for instructors which are as follows:

- **Usage of low-tech collaboration platform**: Utilize a common shared platform, like Google Slides, to collect students' responses during class activities like TPS, encouraging active participation through public sharing of views, fostering clarifications, and facilitating meaningful discussions among students and instructors.
- **Stakeholders driven open resources**: Design and maintain shared documents, such as Homework 0, accompanied by clear guidelines throughout the course. This approach promotes meaningful post-class asynchronous reflections, fostering peer learning and knowledge construction with students and instructors.
- **Continuous shared actionable responsibility**: Divide actionable deliverables for small group projects, ensuring progress in the right direction.

VII. Conclusion

This study may not work for all levels and streams of education. It's helpful for corporate training with diverse stakeholders, but may not apply to a specific group like middle school students in one grade.

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