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Handling Classrooms with Students having Heterogeneous Learning Abilities.

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Abstract: Classrooms in educational institutions consist of students with varying learning abilities. Faculty delivering a lecture in a uniform pitch in such classrooms will fail to teach and reach the learning levels of heterogeneous student groups. In every classroom, the faculty members deliberately experience low, medium, and high learners/readers as measured by assessments. In fact, it is biggest challenge faculties are facing to overcome. Faculty following traditional teaching techniques fails to achieve optimized classroom audibility levels and optimize the students learning in the classroom. With faculty's uniform approach to teaching, the learning needs of individual students may not be fully met in heterogeneous classroom environments.The teaching strategies followed to optimize the learning of heterogeneous students with experimental results and handling such classrooms are discussed in this paper. This study will help faculties wishing to improve the quality and effectiveness of teaching and learning in heterogeneous classrooms.

Keywords: Higher education, Educational equity, globalization, active learning.

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1. Introduction

India's higher education system is the world's third largest in terms of students, next to China and the United States [3].In India Higher Education institutions classrooms are highly heterogeneous in nature. Lower Tier Institutions highly experience such students. They get Students admitted from various schools from different geographical locations, medium of study. Faculty experience students with varying learning levels. i.e. students have mixed learning abilities.

They are influenced by their earlier learning styles, different attitudes, personalities, cultural backgrounds, interests and earlier institutional teaching model. Most of the students learning is restricted only to the lower levels of Blooms Taxonomy [4]. We want to propose that we look at our students as individuals, identifying their unique problems and indicating the appropriate solutions in each case.

A. Heterogeneous classroom:

A typical heterogeneous classroom consists of different kinds of learners, in contrast to a 'homogeneous classroom', where the almost student's learning ability and competency will be similar. However, in real world scenario, no two learners are perfectly similar. Here we are speaking about classrooms where learners ability to learn, variation is very high. i.e. students with mixed learning abilities and mixed proficiencies [5].

2. Review of Related Literature

Teachers delivering a lecture at the same phase for the heterogeneous classroom will fail to reach higher audibility. In such classrooms, students combine with other students and exchange their learning and complete assigned tasks and assignments and will produce group effort. In a group,each student may be assigned a different role to play. Task completion depends on the cooperation existing among the group members. The students should be made familiar with group learning strategies and teacher should mould them practice within the classroom under mentoring and beyond the classroom. Teachers should monitor the group's formation and verify each group contains students with mixed abilities. The evaluation of group assignments and learning is typical. The group's collective product is required to be evaluated. Each student's performance is judged based on this evaluation and, in addition, includes the individual score for the subtask completed by the student. Rubrics design plays a vital role in assessing groups. For each assignment, group members should be changed. Here the complete learning will be within the group, learning will not be exchanged with the class and there will be no intergroup competition.

A. Learning Together:

Students are divided into small groups and each group is allocated with one assignment. Each individual group completes and submits the allocated assignment. Evaluation is based on how students worked together to complete the assignment and their performance in given assignment.

Concept development:

- Small groups of four to six students are formed. Generally, the students in each group have diverse characteristics. Tasks assigned to groups are complex.
- Groups engage in learning activities. Students plan and complete the assigned task. They will redistribute the work among themselves if required.
- Groups are evaluated frequently for qualitative and quantitative outputs.
- Groups are temporary.

Long Term Ability Groups:

- Students are assigned to groups based on their academic ability and earlier performance reports.
- Faculty changes in group assignments occur only when a student's the complexity of assignments only when the academic performance of the students within the group improves.
- Learning in a small group is teacher-directed.
- Instructions related to assignments and evaluations are taken care by teaching assistants who are different from the one who teaches the class.
- Group instruction may take place beyond the regular classroom.
- Students are evaluated through groups and individually.

Academicians and researchers had proposed various grouping techniques earlier. Each strategy is having its own advantages and disadvantages. I will be discussing few here.

1. Peer Tutoring:

A small group of four to six students with mixed abilities is formed. Teacher assigns tasks to these groups on topics taught earlier to the entire class by the teacher.

- **Peer tutoring approaches include:**
- Team Assisted Individualization: Each student will be assigned an individual assignment based on learning needs. The goal of the team is to help one another complete assigned tasks successfully. A quiz is conducted to measure the skills and content covered in the student's individual assignment. Students receive individual scores. The team receives recognition based on the aggregate score of the team and each student's score exceeds average or past performance on skills and content covered in the individual assignment.

- Instructional Grouping Technique: Students may feel themselves discriminated socially if they are asked to go for a "special" class every day, and could find themselves the targets. Classrooms with heterogeneous students present different challenges for teachers and on the other hand, the teacher has to ensure everyone in such classroom is being challenged and learning is happening. The needs of every individual student may not be fully met in heterogeneous classrooms, but the students are exposed to students with different learning abilities.

2. JigSaw :

The teacher has to divide the material to be learned into sections. Each student has to learn a section allocated to him and then explain learned topic to the other student/team. Each student is Assessed and graded individually on an entire set of material. Student teams are temporary based on the material to be learned.

Active Learning [7] :

Marchesa (1998) says "Active learning has the ring of a slogan; passive learning is an oxymoron." "Active learning", in short, anything students do in class related to learning other than passively listening to an instructor's lecture [6]. In active learning class students are engaged with the material, participate in the class, and collaborate with each other [5]. In passive learning, students listen to lectures and memorize. Whereas in active learning students demonstrate a process, analyze an argument, or apply a concept to a real-world situation. Mayer (2004) emphasizes that "learning may be best supported by methods of instruction that involve cognitive activity rather than behavioral activity." The key to active learning is the learning activity taking place within the student's brain rather than the observed behavior that is a means to that cognitive work.

A. Active Learning Techniques [7] :

In active learning model faculty divides the whole session into segments and usually each not more than 20 minutes and teaches for a short time and then gives time to the students for discussion/activity. Active learning helps students develop cognitive and higher-order thinking skills.

- Think Pair Share (TPS):

This is a collaborative learning strategy in which students work together to solve a problem or answer a question about an assigned reading. This technique requires students to (i) think individually about a topic or answer to a question, and (ii) share ideas with classmates. Discussing an answer with a partner serves to maximize participation, focus attention and engage students in comprehending the reading material

- Just in Time Teaching(JTT):

Students will attempt a short quiz/examination on upcoming session either within the initial minutes of class or few hours before class. Faculty reviews the responses and develops in-class learning activities targeting the learning gaps identified from the responses.

- Listening Teams:

This strategy encourages students to listen critically to the faculty lectures and encourages discussion after the lecture. Faculty divides students into four teams. Each team will have a specific assignment for discussion on the session.

- Questioners - After the lecture, this team raises two questions about the material.
- No-Sayers - After the lecture, this team comments on two points with which the team disagrees.
- Yes-Sayers - After the lecture, this team comments on two points with which the team agrees.
- Explainers - After the lecture, this team has to give two specific examples or applications of the key concepts.

4 Corner Method:

This strategy is useful to extract collaborative content from students. Students will get up and out of their seats to work in a team to explore concepts, ideas, or content.

Procedure:

- Choose different content topics/concepts for each corner. Provide flip chart paper for each corner and mount these papers in the 4 corners of the room.
- Divide the students into 4 groups and allocate a corner for every group.
- The students record their ideas on the flip chart paper mounted on the wall.
- Once the groups have completed recording, faculty will ask the groups to move one corner to the left. All students will now be in a new corner of the room, looking at new content on the wall.
- Students will be given a couple of minutes to read the information on the wall and add to it if they like. Then move the students two more times, until everyone is back to their original corner.
- Now have the participants quickly present their content back to the entire group.

3. Problem statement

Faculty aim to reach every student in the classroom. However, it is well known that every student has a different way of learning, and learns and progresses at different speeds. Some students may find learning a topic very easy to deal with, while others may find it difficult to understand. This eventually results in ineffective learning. It is quite difficult for the teacher to know about each student and to follow what each one does during the lessons even in small classes, it is important for teachers to monitor each and every student and to reach their needs in a variety of ways to achieve effective teaching.

The faculty has to ensure students learning reach higher level of Blooms Taxonomy. Faculties are experiencing students with heterogeneous learning levels in their classrooms. Many students graduating from colleges and universities are restricted with their learning to lower learning levels. Such students are not employable. The annual report from Nasscom says only 3% of the students graduating are employable. This indicates the change required in teaching and learning pedagogy to handle heterogeneous student learning groups.

4. Proposed Model

Differentiated teaching with active learning strategies to handle heterogeneous learning is the proposed model. Differentiated teaching means tailoring instruction to meet needs of individual students. In proposed model faculty differentiates content, the process of learning through student-centric activities and assessments. Continuous assessments and flexible grouping help the faculty for successful implementation of the model. However, session learning outcomes remain same for every student in the classroom. Creating small temporary groups confined for session or topic typically not defined by numbers. Based on the topic and teaching situation faculty goes for heterogenous or homogenous grouping. Collaboration within the group is highly required for learning.

5. Implementation

The faculty is still key to this learning. The session will be both faculty-centric and student-centric and flips between both. Beyond teaching faculty has to facilitate the student activities.

- Pre-Test: At the beginning of the course to understand how our students learn and their pre- requisite knowledge on the course pre-test is essential. The test helps both teacher and student to know each other with the ultimate goal of improving student learning.
- Session planning: session planning plays a key role in the success of the proposed model. The Faculty has to prepare micro session plan [8]. Faculty has to consider students learning style and their prerequisite knowledge level information received from the pre-test and continuous assessments for preparing session plan. Maximum time of the planned session should be student- centric. Session plan should include the session outcomes, required pre-readings, the teaching plan, activities planned and assessment to be conducted for the session. The faculty has to share session planning with students in advance.
- Session handling: Faculty begin session with "connect" activity. During the activity through

random questioning, I will connect the students to the current topic. Connect activity also helps the students in getting their doubts resolved. Then I begin with the session topic using talk and chalk or talk and presentation as planned in the session. This will continue for 15 to 20 minutes. Faculty will now divide the students into groups. The groups will be limited to the current session. Faculty will assign different assignments to each group. The complexity of the assignment varies from group to group. Learning outcomes remain same for all the groups. Faculty tutors the student groups in solving the assignments and will ensure that all the students in groups actively participate in the group learning.

- Continuous assessment: Faculty conducts a formative assessment to evaluate student learning at the end of the session. General assessment techniques include a short quiz, JAM, a short presentation on group activity, random questioning etc. This helps the faculty in evaluating the depth of learning happened during the session. Faculty also gives take home assignments to deepen learning.

6. Result Analysis

Considered the Mid-1 and final examination assessment results of two academic years. An improvement in learning is identified. Students participated actively in various activities planned during sessions and learned the course without any stress or burden. The assessment results indicated that the differentiated teaching with active learning strategies worked perfectly for the heterogeneous classroom.

Table-1 Students data.

Academic year	Good students	Above Average students	Below Average students
2014-15	18	26	19
2015-16	16	31	23

Table-2 Final examination results.

Sno	Academic year	Subject	Number of students	Results
1	2014-15	Artificial Intelligence	63	72%
2	2015-16	Artificial Intelligence	70	93%

Various parameters are considered for result analysis. Figure-1 shows students data for two consecutive academic years. Students are categorized based on their earlier results and considered pre-test results for the year 2015-16. Considered artificial intelligence course taught to VI semester computer science and engineering students for two academic years. During the year 2014-15, traditional teaching approach is followed and the end examination results are poor. During personal counseling with students, it is identified that students are heterogeneous and had implemented differentiated teaching with active learning strategies for the year 2015-16. An improvement in overall pass percentage, question wise average marks is achieved. Table-2 represents pass percentage of students in artificial intelligence for two academic years in final examinations.

Table-3 Mid-1 question wise result analysis

2014-15					
	Max Marks/ appeared	Total marks scored	Average Marks Scored	Highest Marks Scored	Lowest marks Scored
Q1	5/63	221	3.5	5	0
Q2	5/59	238	4	5	1
Q3	5/43	141	3.25	5	0
Q4	5/50	179	3.6	5	1
Q5	5/31	79	2.6	5	1
Q6	5/24	85	3.54	5	2

Table-4 Mid-1 question wise result analysis

2015-16					
	Max Marks/ Appeared	Total marks scored	Average Marks Scored	Highest Marks Scored	Lowest marks Scored
Q1	5/70	299	4.25	5	3
Q2	5/65	267	4.1	5	2
Q3	5/52	237	4.5	5	4
Q4	5/67	260	3.9	5	1
Q5	5/34	146	4.25	5	3
Q6	5/38	172	4.5	5	3

The Table-3 shows question-wise marks scored along with highest, average and lowest marks scored for the year 2014-15. Table-4 shows question-wise marks scored along with highest, average and lowest marks scored for the year 2015-16. The comparative study shows that we are able to see improvement in marks scored with respective to every question. This indicates that learning had improved and maintained its phase throughout the course.

Table-5 shows a number of students appeared for mid-1 examinations for the year 2014-15 and 2015-16. The table displays median, average and below average marks scored by the students. Each parameter shows that learning had improved in the year 2015-16 when compared to the academic year 2014-15. The strategy helped us in improving learning in my classroom and I am confident that the strategy helps faculties suffering from heterogeneous student ability classrooms.

Table-5 Mid-1 result analysis

	2014-15	2015-16
Number of students	63	70
median Mark	11	11
Average marks scored	14	15
No of students scored below average mark	21	5

Figure.1, Figure.2, and Figure.3 represents a graphical comparison of the results discussed in above tables. The graphs give a better comparison of the results of proposed approach with traditional approach.

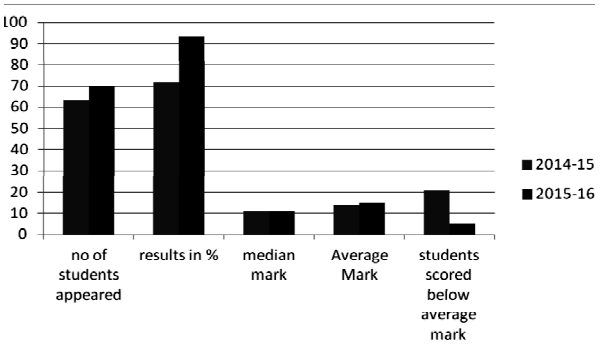

Fig.1 Overall result in comparison for the year 2014-15 and 2015-16.

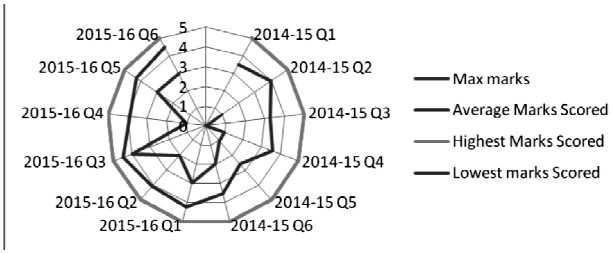

Fig.2 Question wise marks scored comparison for the year 2014-15 and 2015-16.

7. Conclusion

In summary, there are various techniques available to improve learning in classrooms with students having abilities. These techniques will not conflict with the regular teaching instructions. The strategy I had followed helped me in achieving good results as described in this paper. Differentiated teaching with active learning strategies helped students to overcome their intellectual incompetence with fellow classmates and learn better. Faculty requires extensive training to handle active learning classes and deliver differentiated teaching in the same classroom. Utilizing time effectively is the key to the success of the strategy. There is also need of development of curricular material for support of multiple ability students. Our results proved that the goals are within our reach to improve learning in heterogeneous student ability classroom.

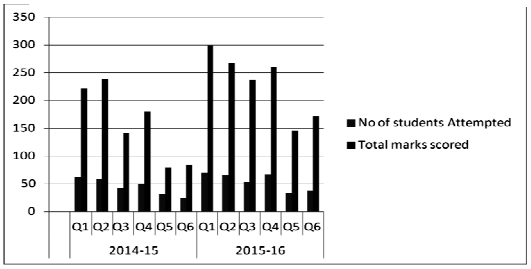

Fig.3 Question wise students appeared and total marks scored comparison for the year 2014-15 and 2015-16.

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