

The Influence of Innovative Teaching Methods on Students' Learning

Sanjaykumar Ingale¹ and Pankaj B. Gavali²

¹Associate Professor, ²Assistant Professor,

Department of Mechanical Engineering, Sanjay Ghodawat University, Kolhapur, Maharashtra, India

E-mail: sanjaykumar.ingale@sanjayghodawatuniversity.ac.in, pankaj.gavali@sanjayghodawatuniversity.ac.in

(Received 20 September 2021; Revised 18 October 2021; Accepted 5 November 2021; Available online 13 November 2021)

Abstract - The emphasis of outcome-based education has changed from teaching to learning. Stakeholders are calling for high-quality education. In the evaluation and accreditation process, more emphasis is placed on the teaching and learning process. Students' knowledge and skill set are becoming increasingly crucial. As a result, it is critical for a teacher to use an original technique when presenting the course. It is necessary to categorise the learners in order to construct these techniques. This article focuses on the categorization of SY B Tech learners at the start of the manufacturing processes course. The strategies that must be used to accommodate these various sorts of learners are also explored. Aside from typical teaching methods, think-pair-share, flipped classroom, and blended learning tactics were employed. The criterion for evaluating these techniques has been developed. It is proposed that these tactics be used to different courses for different programmes to confirm the outcomes or, if any, variances before being implemented across institutions/universities.

Keywords: Evaluation, Innovative Strategies, Learners, Outcome Based Education, Teaching

I. INTRODUCTION

In outcome-based education curriculum is designed based on the required ability of the learners at the end of the program. Faculty members play a vital role on in the process of learning by students. As a starting point while preparing a plan to deliver the course content, it is essential to know the types of learners enrolled for the course. As one of the best practice in our university we make conduct the faculty development programs at the beginning of every academic year. We discuss different innovative practices which the faculty can use while delivering the course. The faculty members are encouraged and motivated to share the practices they have followed for helping the students for better learning. Learning abilities of the students is necessary to be assessed for successful learning process. Pre-assessment of the students based on objective test is done for classification of learners. This test is useful not only for the learners but also for the faculty embers so that they can adopt some appropriate strategies while delivering the course.

This helps to plan the activities for the entire semester based on the classification of learners. Preparing good lesson plans by adding activities is a huge task. But it surely helps in achieving the course outcome Learners will also enjoy the process of learning. The ultimate aim of developing the skills and knowledge among the learners will be achieved.

II. LITERATURE REVIEW

Robert J. Boland *et al.*, [1] have simplified neurocognitive approaches, personality-based approaches, and metacognitive approaches. Neurocognitive approaches were based on how our senses assimilate information and what we do with it. Personality-based approaches include theories of personality and how they influence the learning process. Metacognitive approaches considered the role of our motivations and strategies in the learning process.

Yugo Hayashi [2] investigated the design of effective interactions using pedagogical conversational agents in a learner-learner collaborative learning activity. He showed empirically how multiple PCAs can be effectively designed to implement roles yielding different types of suggestions.

Pavel Trofimovich [3] suggested that certain types of instruction could be more beneficial for learners with certain learning profiles and highlight the importance of investigating interactions between learner background variables and type of instruction in authentic learning contexts.

Jin-Young Kim [4] identified four types of learners viz. e-Education Interested Type, Traditional Lecture Friendly Type, Social Interactionist Type, and Mixed Type. He found that those who have either higher academic self-efficacy or extraversion achieved higher academic achievement. It was also concluded that female students in general have less interest in blended e-Education.

Meehyun Yoon [5] observed, were classified participants into two clusters Based on the behavioral patterns. Participants in the active learner cluster exhibited frequent use of social interaction, information seeking, and environment configuration, while participants in the passive learner cluster exhibited only frequent browsing. They found that active learners exhibited higher learning achievement than passive learners.

As discussed by other researchers, it is necessary to classify the learners based on the certain criterion and then adopt different strategies for maximizing the effectiveness of learning process. Methodology is discussed in next section.

III. METHODOLOGY

The learners were asked to respond to questionnaire. They were classified from the responses into different categories. The strategies are then adopted to suit the different types of learners. The evaluation of the skills sets of the students are done by different methods for all learners. Conclusion is presented at the end after comparing the different strategies used for better learning.

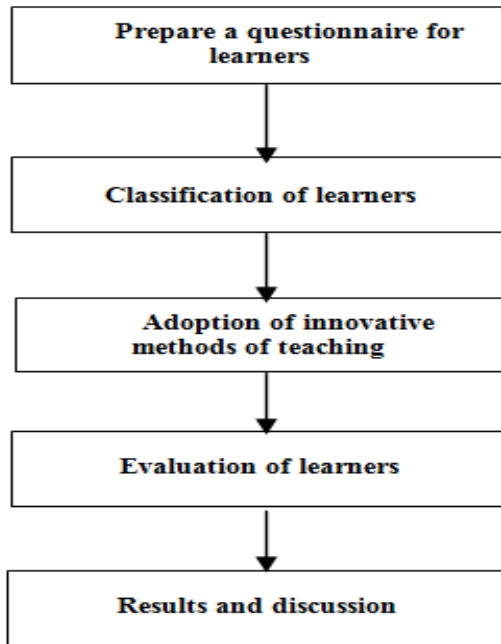


Fig. 1 Methodology

IV. CLASSIFICATION OF LEARNER

At the start of the academic year, a group of students was given a questionnaire. An online survey tool for assessing preferences on four elements of Richard M. Felder’s learning style model [6]. One of the classifications of learners is active and reflective learners [7]. By doing something, active learners retain and comprehend knowledge. Reflective students might rather ponder about it quietly at first. According to a poll of SY B Tech students, 59 percent were active learners and 41% were reflective learners.

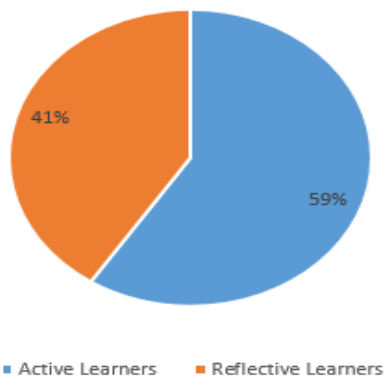


Fig. 2 Percentage of Active & Reflective Learners

Learners are categorized as Sensing learners or Intuitive learners in the second category [8]. Learning information is a favorite pastime of intuitive learners. They like to solve difficulties using tried-and-true ways and avoid complexity and surprises. Intuitive learners often prefer discovering possibilities and relationships. They like innovation and dislike repetition. In the survey of SY B Tech students we found that 56 % are sensing learners & 44 % are intuitive learners.

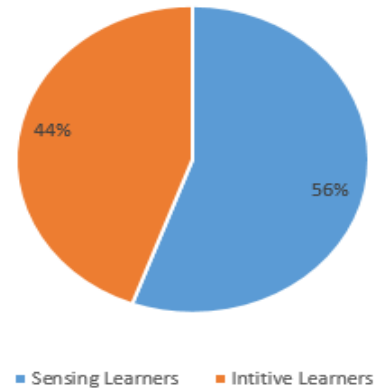


Fig. 3 Percentage of Sensing & Intuitive Learners

The students were then divided into two groups: visual learners and verbal learners. Pictures, diagrams, flow charts, time lines, videos, and demonstrations help visual learners learn more effectively. Words - written and spoken explanations - help verbal learners learn more effectively. When knowledge is given both visually and vocally, everyone learns more. According to the results of a poll of SY B Tech students, 89 percent are visual learners and 11 percent are verbal learners.

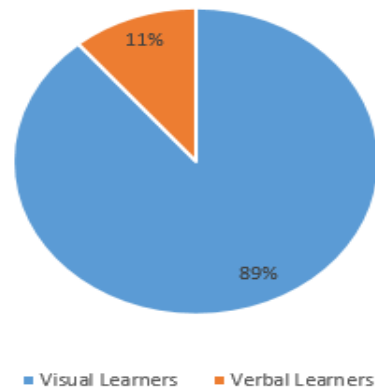


Fig. 4 Percentage of Visual & Verbal Learners

Finally, the learners are classified as Sequential learners and global learners [9]. Sequential learners tend to gain understanding in linear steps, with each step following logically from the previous one. Global learners tend to learn in large jumps, absorbing material almost randomly without seeing connections, and then suddenly “getting it.” In the survey of SY B Tech students we found that 70 % are Sequential learners & 30 % are global learners.

V. ADOPTION OF INNOVATIVE METHODS OF TEACHING

Not only the learners are classified into different categories but their learning style index is also calculated so that appropriate teaching strategies may be adopted while conducting lecture and practical sessions.

The following figure represents learning style index of SY B Tech students.

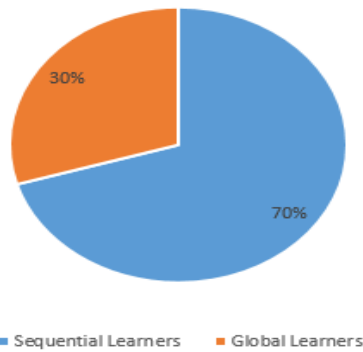


Fig. 5 Percentage of Sequential & Global Learners

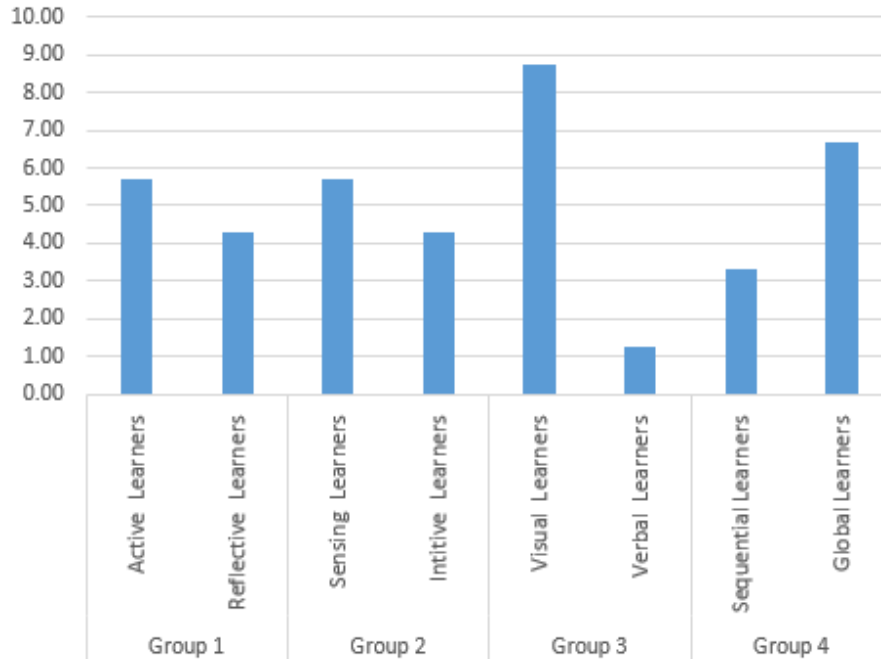


Fig. 6 LS Index of different types of learners

As the balanced approach is required while developing the strategies so that everyone in class learns it better irrespective of their preferred learning style. We had assigned different activities in such a way that almost all learners will participate in the same. Though the above chart indicates the average values of Learning Style (LS) are different for learners, it is not mutually exclusive in a single group. It only indicates that inclination is more towards one of the type of learning style.

As a first activity to fulfill active and reflective learners' requirement we have formed the group of the students and given them assignment of an estimation of material cost and decide which is better from weighted average of cost and strength point of view for a work piece raw material to be manufactured from different types of materials such as Cast iron, Aluminum, steel and Brass. Also the size of the work piece was mentioned as a function of roll number of leader in the group formed. Active learners enthusiastically participated in the activity and Reflective learners guided the other members in a group. Student learned to work in a team

a concept Think-Pair-Share [10] was used as one of the teaching strategy. The students were asked to submit a report on comparative study for evaluation.

The next activity of calculation of machining time and cost of manufacturing was assigned to the students by changing the members of group to fulfill the requirements of sensing and intuitive learners. all the necessary resource material was given to the students. A flipped classroom [11] strategy was followed and the machining time and machining cost estimates was discussed in the classroom by the different teams of the students.

As another activity, for visual and verbal learners, videos of different types of metal casting processes were shown and shared with the students in advance. Then the blended leaning approach [12] was followed and the students were asked to present in the class about the application of all these processes.

One more activity was given to the students related to layout for the products to be manufactured from sheet metal with an objective of reduction in scrap and better sheet metal utilization. Students were asked make use of software simulations for comparing different solutions. This gave enough scope to both sequential and global type of learners.

VI. EVALUATION OF LEARNERS

It was observed that these strategies when used for teaching resulted in better understanding by different types of learners. Learners were evaluated based on the report submitted, presentation given practical performed and demonstration. The performance evaluated is then compared with past performance. It is shown in figure below.

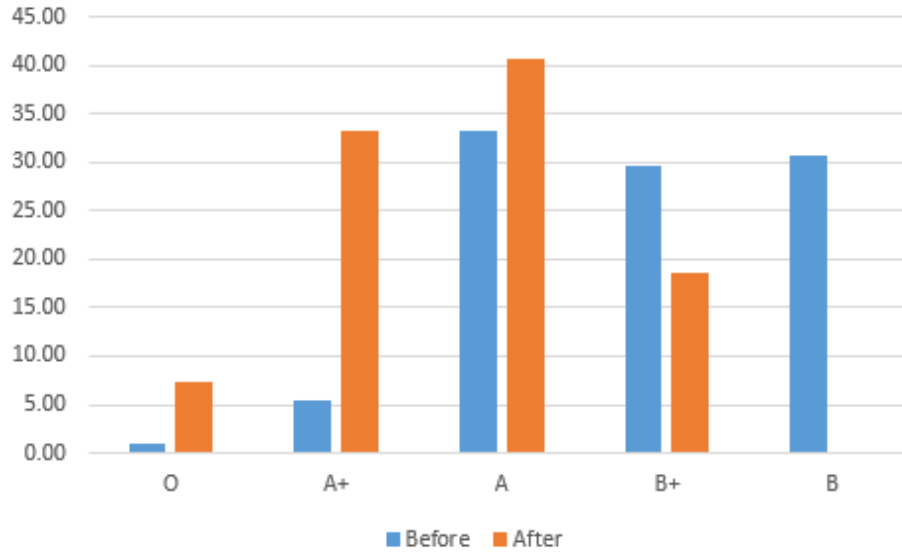


Fig. 7 Grades obtained by the students (in %)

VII. RESULTS AND DISCUSSION

It was observed that after classifying learner and adopting innovative strategies for teaching there is shift in average

grade point of the students for this course. It indicates that learning is better through those strategies designed specifically after knowing the learning style of the students.

TABLE I % NUMBER OF STUDENTS WITH DIFFERENT GRADES

Grades by students	Before Implementation	After Implementation
	Values in %	
O	0.90	7.41
A+	5.41	33.34
A	33.33	40.74
B+	29.73	18.51
B	30.63	

It was observed that there is 6.51% in increase in students who have obtained in grade O. There was increase by 27.93% for the grade A+. The increase in the students with grade B+ was by 7.41 %. As most of the students have obtained better grades it leads to decrease in the students by 11.21% in grade B.

VIII. CONCLUSION

Classification of students helps in planning of the delivery of the course. The strategies used such as think-pair-share, flipped classroom and blended learning has helped the

students for better learning of the course. After using these strategies there was a shift in the average grade of the students. The other innovative techniques for teaching may be tried for the other courses of engineering and technology. In future, these techniques may be tried and verified for its usefulness in the disciplines other than engineering. Especially in the period of pandemic where online teaching is the only way to deliver the course, there is a need to search for some more innovative techniques for better learning of students.

REFERENCES

- [1] Robert J. Boland, Hermioni L. Amonoo, "Types of Learners, Psychiatric Clinics of North America," Vol. 44, No. 2, pp. 141-148, 2021, ISSN: 0193-953X, ISBN 9780323778312, [Online]. Available: <https://doi.org/10.1016/j.psc.2020.12.001>.
- [2] Y. Hayashi, "Multiple Pedagogical Conversational Agents to Support Learner-Learner Collaborative Learning: Effects of Splitting Suggestion Types," *Cognitive Systems Research*, 2018, [Online]. Available: <https://doi.org/10.1016/j.cogsys.2018.04.005>
- [3] Pavel Trofimovich, Patsy M. Lightbown, Randall Halter, "Are certain types of instruction better for certain learners?," *System*, Vol. 41, No. 4, pp. 914-922, 2013, ISSN: 0346-251X, [Online]. Available: <https://doi.org/10.1016/j.system.2013.09.004>.
- [4] Jin-Young Kim, "A study on learners' perceptual typology and relationships among the learner's types, characteristics, and academic achievement in a blended e-Education environment," *Computers & Education*, Vol. 59, No. 2, pp. 304-315, 2012, ISSN: 0360-1315, [Online]. Available: <https://doi.org/10.1016/j.compedu.2012.01.010>.
- [5] Meehyun Yoon, Jungeun Lee and Il-Hyun Jo, "Video learning analytics: Investigating behavioral patterns and learner clusters in video-based online learning," *The Internet and Higher Education*, Vol. 50, pp. 100806, 2021, ISSN: 1096-7516, [Online]. Available: <https://doi.org/10.1016/j.iheduc.2021.100806>.
- [6] ©1993 by Richard M. Felder and Barbara A. Soloman, *The Index of Learning Styles and the Felder-Silverman learning styles model upon which the ILS is based*.
- [7] R. M. Felder and R. Brent, "Teaching and Learning STEM: A Practical Guide," *San Francisco: Jossey-Bass*, pp. 107-109, 2016.
- [8] R. M. Felder and R. Brent, "Teaching and Learning STEM: A Practical Guide," *San Francisco: Jossey-Bass*, pp. 187-188, 2016.
- [9] R. M. Felder, "Meet Your Students: 2. Susan and Glenda," *Chemical Engineering Education*, pp. 7-8, Winter 1990.
- [10] Linda Ghout-Khenoune, "The Effects of Task Type on Learners' use of Communication Strategies," *Procedia - Social and Behavioral Sciences*, Vol. 69, pp. 770-779, 2012, ISSN: 1877-0428, [Online]. Available: <https://doi.org/10.1016/j.sbspro.2012.11.472>.
- [11] Rocío Martínez-Jiménez, M. Carmen Ruiz-Jiménez, "Improving students' satisfaction and learning performance using flipped classroom," *The International Journal of Management Education*, Vol. 18, No. 3, pp. 100422, 2020, ISSN: 1472-8117, [Online]. Available: <https://doi.org/10.1016/j.ijme.2020.100422>.
- [12] Lorico DS. Lapitan, Cristina E. Tiangco, Divine Angela G. Sumalinog, Noel S. Sabarillo, Joey Mark Diaz, "An effective blended online teaching and learning strategy during the COVID-19 pandemic," *Education for Chemical Engineers*, Vol. 35, pp. 116-131, 2021, ISSN: 1749-7728, [Online]. Available: <https://doi.org/10.1016/j.ece.2021.01.012>.