

Evaluation of Students' Perceptions towards Active Learning Approach

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Abstract

This paper evaluates the effectiveness of active learning implemented in Unified Modeling Language (UML) subject at the University of Computer Studies, Taunggyi. Several learning activities were implemented during the class. The effectiveness of these activities was investigated using questionnaires to explore student attitude and to measure student perceptions to learning. Results showed that active learning made a valuable approach to teach the UML course. For instructors wanting to do well in UML (Unified Modeling Language) course, use only the traditional lecturing may not be effective. This paper intends an active learning approach to supplement traditional lecturing for teaching the UML course. The use of various active learning techniques and their implementation in the classroom is discussed. Feedback from the students suggests that students like the active learning-based approach and report increased levels of subject matter understanding and ability to apply the knowledge in real world application.

Keywords: Active Learning, Information Science, Teaching Approaches, Outcome based Education

1. Introduction

Educational processes are shifting towards a learning outcome-based approach in the active learning model. Knowledge, skills and competences achieved by the learner play an increasingly important role as the professional life introduces new lifelong formative challenges. With the increasing use of technology inside and outside of the classroom, instructors have additional options to incorporate different types of active learning techniques.

Because of these changes in the classroom environment due to technology, active learning has become a well-researched topic and many of the new, innovative techniques that are used in classrooms today are rooted in the concept of active learning.

Active learning is generally defined as any instructional method that engages students in the learning process. Active learning requires students to do meaningful learning activities and think about what they are doing. There is a growing trend to encourage students to take a more active role in their own education. The emphasis is more on learning and it requires the instructor to incorporate more active and student-centered learning methods into their courses. Therefore, the more active the students are in the classroom, the more engaged they are in the learning process, and the more they remember [1]. Rather than giving students the solution to their problems all the time, the instructors strive to teach them how to search for and construct complete answers and encourage students to pursue active learning activities.

Active learning can make the students capable of analyzing and evaluating on their own, promote active learning in and out of the classroom, and present students with creative problem-solving challenges. This will guide them toward becoming independent thinkers and lifetime self-instructors. Students learn when they are actively figuring things out, trying to teach themselves, not passively drifting through a lecture, expecting to be taught. Therefore, the class not around what teachers will do, but what the students will do, to let them take command of their own learning, and to teach Computer Engineering and Computer Science Education as

a way of thinking and learning all over the world. [2]

Learning outcomes are statements that describe significant and essential learning that learners have achieved and can reliably demonstrate at the end of a course or program. In other words, learning outcomes identify what the learner will know and be able to do by the end of a course or program. Knowledge means the outcome of the assimilation of information through learning. [12] Skill means the ability to apply knowledge and use know-how to complete tasks and solve problems. [12] Competence means the proven ability to use knowledge and skills in work or study situations and towards professional and personal development. [12]

Learning objectives describes what a teacher will cover in a course. They are generally less broad than goals and broader than student learning outcomes.

On the simplest level, active learning is introducing student activity into the traditional lecture. Traditional lecturing has both advantages and disadvantages. The problem is that student attention duration during lectures is approximately 15 minutes, a time beyond which the number of students paying attention decreases fast. [14] One example of this is for the lecturer to pause periodically and have students clarify their notes with a partner. This can be done two or three times during an hour-long class. Because this pause procedure is so simple, it provides a baseline to study whether short, informal student activities can improve the effectiveness of lectures.

The paper is organized as follows. In section 1, introduction to active learning is described. In section 2, related work on active learning is proposed. In section 3, design and implementation of active learning techniques in UML course is discussed. In section 4, qualitative and quantitative feedback from students is examined. Finally, conclusions are provided.

2. Related Work

In recent years, quite a few colleges and universities have gradually abandoned the phase that students take in knowledge only by instructions of teachers in classes during the practice of teaching. They are trying to a new teaching method that students learn their own. Learning theories are attempts to describe and understand the various ways in which people learn. They are an important resource for educational research, as they can both guide us in creating new educational approaches and help to analyze and improve existing approaches. [4]

There are many active learning activities in IS course. Active learning techniques, including individual based learning, collaborative learning and cooperative learning techniques have been proven to be successful in engaging students and improving students' skills as they become Information Assurance professionals in the future. [5]

The published articles are related to active learning in IS courses and to consolidate prior research to provide a meaningful list of strategies that encourage active learning. To demonstrate how IS faculty might begin to introduce more active learning techniques in their teaching, the discussion includes a sample agenda for a class that uses a mix of active and passive learning techniques to engage student learning. [6] Active learning has been championed in academic circles as the pedagogical fix to boring lectures typically found in introduction to information systems courses. However, the literature on active learning is mixed. This paper examines about active learning research and discovers a misplaced emphasis leading to paradoxical findings. [7] Active learning approach, Case Method (CM), is realized necessary for SE education to improve realism where the students can be exposed to real scenarios and learn to apply those theories through discovery. This paper presents a survey conducted to a set of students who employed CM in learning SE from the University of Computer Studies, Taunggyi. [8]

The evidence for the effectiveness of active learning defines the common forms of active learning most relevant for engineering faculty

and critically examines the core element of each method. It is found that there is broad but uneven support for the core elements of active, collaborative, cooperative and problem-based learning. [10] Traditional and flipped classroom delivery strategies are discussed as well as topics like pre-requisite knowledge preparation prior to class, course module presentation sequence, homework, team/individual work, collaborative discussions and assessment tools are deliberated. The student questionnaire data from the two University Partners who used the V&V instructional activities were quite positive and showed that students were interested in the activities, saw the real-world applications, and communicated with their classmates as they solved the problems. Educational outcomes assessment demonstrated more effective learning in all key learning areas. [11] There have been a few recent uses of active learning techniques in computer science [9] and [13] especially in Information science.

3. Design and Implementation of Active Learning Approach

Several active learning techniques were selected and used to teach the UML course. The course was taught in Fourth year Computer Science students from the University of Computer Studies, Taunggyi. The class size was 33 however only 22 returned the surveys. A few students were also absent. The instructor used the book title “Practical Object-Oriented Design with UML (2nd ed.)” authored by Mark Priestley and most of the active learning exercises were developed from the content of the textbook. When preparing active learning exercises, the following definition of active learning is considered “any activity that substantially involves students with the course content through talking and listening, writing, reading and reflecting counts as active learning”. It is important to note that the traditional lecture format was not completely abandoned. Rather than, several activities were designed to complement lectures, aid with student not taking and for students to work outside the class.

3.1. Benefits of Active Learning

Active learning fosters students’ learning and their autonomy, giving them greater involvement and control over their learning and giving them skills to foster life-long learning in the future. It is closely associated with learning how to learn.

3.2. Obstacles to Active Learning

The main reason for the criticism was their incompetent instructors. Other specific obstacles associated with active learning included the following: limited class time, the density of the curriculum, the potential difficulty of using active learning in large classes, the lack of materials, equipment or resources, and the conservative attitudes of fellow students who did not like taking part in active learning methods.

Perhaps the single utmost barrier of all, however, is the fact that instructors’ efforts to employ active learning involve risk-the risks that students will not participate, use higher-order thinking, or learn sufficient content, that instructor will feel a loss of control, lack necessary skills, or be criticized for teaching in unconventional ways. Each obstacle or barrier and type of risk, however, can be successfully overcome through careful, thoughtful planning.

The next sections describe the purpose of each technique and implementation details. The teaching/learning techniques will create a learning environment in which the students pay an active role. To achieve this, students will be encouraged to adopt an active knowledge-seeking attitude and to build up confidence in their own ability to communicate and work with them.

1. Student projects

The student project requires students to work in teams both inside and outside the classroom and for the entire duration of the semester on almost 70% of the course content.

2. Student presentation

In-class presentations give students the opportunity to tie the concepts learned in class. During the class period, there will be time set aside for these presentations. The students take

ten to twenty minutes to present chosen examples.

3. Formative Quizzes

For each chapter, students are provided with an in-class quiz with several questions covering the lessons. This quiz helps the students and students are unclear about the answer, they could discuss them with the instructor.

4. Instant Feedback

For each chapter, students are answered a few multiple choices and true or false questions. Moreover, they answered the assessment such as what you know, what you want to know and what you learned. This active learning technique enables to receive instant feedback on their understanding.

5. Out-of-class exercises

Out-of-class exercises are homework assignments that require students to draw the diagrams. The exercises are provided on course website and students download exercises, read the instructions, complete the exercises and upload them to the course website.

6. In-class exercises

In-class exercises means students to draw the diagrams during the class time. The exercises are provided on course website and students download exercises and complete the exercises and discuss them.

7. Case study

Case studies used in the UML course require students to read assign case complete a written case report and come prepared to participate in class discussion. The following topics covered in class, learning outcomes and active learning techniques used for each topic are described in Table1.

Table 1.Course contents, Learning Outcomes and Active Learning Techniques

No .	Topic/Goal (broad, generalized statements about what is to be learned)	Learning Outcomes (narrow, specific statements about concrete, measurable skills or content to be gained in the course)	Active Learning Techniques Used (teaching strategies aimed at building desired knowledge or skills)
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1.	Introduction to UML	Understand the importance of UML using diagrams	Formative quiz, Instant feedback, In-class exercise
2.	Modelling with Objects	Understand the use of object-oriented model	Formative quiz, Instant feedback, In-class exercise
3.	Class diagram and Object diagram	Understand and apply the use of class and object diagrams	Formative quiz, Instant feedback, In-class exercises, Presentation, Project deliverable-1
4.	Interaction diagram	Understand and apply the use of interaction diagrams	Formative quiz, Instant feedback, In-class exercises, Presentation, Project deliverable-2
5.	Business Modelling: Restaurant System	Understand and apply the use of use case diagram	Formative quiz, Instant feedback, In-class exercises, Presentation, Case study, Project deliverable-3
6.	Analysis: Restaurant System	Understand the use of analysis	Formative quiz, Case study, Instant feedback, Case study
7.	Design: Restaurant	Understand the use of design	Formative quiz, Instant feedback, Case study
8.	Implementation: Restaurant System	Understand the use of implementation	Formative quiz, Instant feedback, Case study
9.	Statecharts	Understand and apply the use of statecharts	Formative quiz, Instant feedback, In-class exercises, Presentation, Project deliverable-4
10.	Component diagrams	Understand and apply the use of component diagrams	Formative quiz, Instant feedback, In-class exercises, Presentation, Project deliverable-5

4. Students' Evaluation

This section describes a summary of feedback received from students. Sample comments are as followed.

4.1. Qualitative Evaluation

Student feedback has been positive and encouraging. When asked about their experiences with the course and with the multiple active learning techniques used during the course, students had only positive things to say such as:

“I realize, it is the very effective learning techniques.”

“It is provided our communication skills and very effective for us.”

“It is very effective learning techniques and increase dramatically my critical thinking and confidence for this subject.”

“In my opinion, I've never seen this kind of learning techniques in classes and it is very useful for our thought. It is also giving opportunity to reveal our thought.”

In summary, these sample comments represent student excitement about learning the subject matter and participating in classroom activities. The next section provides quantitative evaluations of techniques based on active learning techniques.

4.2. Quantitative Evaluation

Students were asked to rate the effectiveness of the use of active learning techniques in their learning. A total of 22 students responded to this survey. The responses were provided on a scale of 1 to 5 (5-Extremely effective and 1-Not effective). The averages are provided in Fig.1.

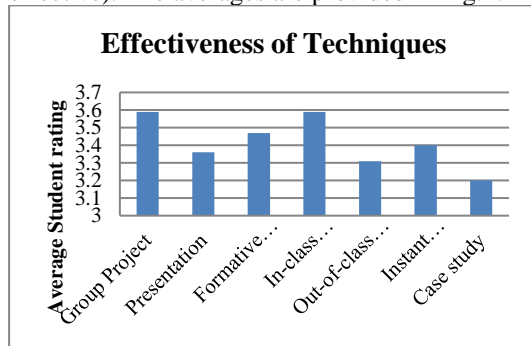


Figure.1 Students ratings of effectiveness of some active learning techniques

In general, all the active learning techniques are rated highly. There was not much difference in the way all over the techniques. However, project and in-class exercises were rated slightly higher than other techniques. This analysis suggests that the students evaluate the use of active learning techniques favorably. The implementation was provided with active learning techniques, a sample course, active learning techniques evaluation and answer. A sample assessment instrument [11] is shown in Table 2.

Table 2. Assessment Instrument

Student Name (Optional).....		Activity: To teach UML subject using Active learning Techniques	
		Yes	No
1.	I understood the purpose of the activity.		
2.	I could complete the activity with the directions that were provided.		
3.	At least one member of my team was uncertain of how to carry out the steps of the activity.		
4.	I was uncertain of how to carry out the steps of the activity.		
5.	The activity used a real-world application.		
6.	I could imagine carrying out this activity as part of my job.		
7.	I/we communicated verbally in a small group while completing this activity.		
8.	I/we communicated verbally in a large group while completing this activity.		
9.	I/we made a formal presentation as part of this activity.		
10.	I thought critically about content while completing this assignment.		
Provided your overall thoughts about this activity.			

As can be seen from the results, the student survey data for the set of questions shown in Table 3 showed that across the activities, students understood the activity, used the directions, communicated about the content in a small group. Moreover, most students believed the activity as a real world application and could imagine carrying out the activities as part of their jobs. A small number of students were uncertain how to carry out the activity. It also appears that instructor did not utilize large group. In

summary, traditional lecture-based teaching alone is not effective in teaching the UML course. Use of active learning-based activities which enable students to do more than listening inside and outside of the classroom and to get effectiveness student learning outcomes.

Table 3. Student evaluations of individual instructional activities from University of Computer Studies, Taunggyi for case: UML Course

Survey Item	Question	n	%
1.	I understood the purpose of the activity.	22	100
2	I could complete the activity with the directions that were provided.	18	81
3.	At least one member of my team was uncertain of how to carry out the steps of the activity.	17	77
4.	I was uncertain of how to carry out the steps of the activity.	5	22
5.	The activity used a real-world application.	20	90
6.	I could imagine carrying out this activity as part of my job.	20	90
7.	I/we communicated verbally in a small group while completing this activity.	20	90
8.	I/we communicated verbally in a large group while completing this activity.	15	77
9.	I/we made a formal presentation as part of this activity.	21	96
10.	I thought critically about content while completing this subject.	21	96

As shown in Figure 2, results showed that student are satisfied using active learning techniques. The main finding suggests that students found these active learning techniques useful and effective. The assessment results show that most of the students who were in class when this exercise was conducted understood the exercise and were able to complete it. They also had to work in smaller groups and then participate in the class discussion. Students who provided their thoughts were supportive of the exercise. Most students had a feeling of being involved and many felt that they improved their UML skills over the semester of the course.

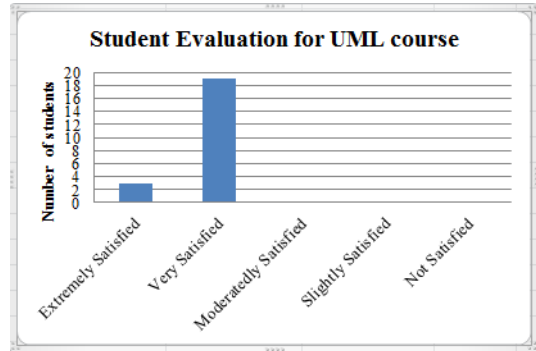


Figure2. Students' Evaluation for Learning UML course

5. Conclusion

In conclusion, this paper describes that the use of active learning techniques to be integrated with traditional lectures. Instructors planning to use this approach must consider the size of their classes (larger classes may require different active learning techniques), the ability to task risks in the classroom to pause lectures regularly to include student activities and specific active learning that suit class and personal teaching style. However, use of active learning techniques, if not carefully planned, may impact instructor's ability to cover all intended topics. Successful execution of active learning techniques requires a lot of effort on the part of the instructor to prepare and deliver the material.

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