

Facilitating Distributed Systems Course for Under Graduate Students using Case Studies: Impact Analysis

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Abstract:

Measuring effectiveness of the teaching method has become a challenge for teacher. Teacher depends on the reflections of the students instantly in the classroom. Background of adopting certain teaching strategies is considering one's own experience and researching the literature on experiments done by other teachers in similar field. Theory suggests or recommends certain methodologies as proven to produce success. Teachers adopt little pedagogy to facilitate their academic course and reflections of the learners might look very positive. Immediate measure of success is only the student feedback and instant assessment in term of asking quick questions or conducting a small quiz. Learning of students must translate into applying thoughts in action and perform in building tools for society. But there are several examples where retention of knowledge which need to be applied in relevant context disappears and results in confusion. Teachers interested in involving their students more fully in classroom discussion have found that case studies can provide a rich basis for developing students' problem solving and decision making skill (Goodenough, 1994). This paper attempts to present experience of choosing case studies as teaching pedagogy, implementing and evaluating the effectiveness of pedagogy.

Keywords: teaching strategy, assessment, case study, pedagogy

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1. Introduction

Distributed Systems is a course offered to computer science engineering under graduate students as an elective. It is part of Jawaharlal Nehru Technological University, Hyderabad constituent colleges' curriculum. The course carries four credits and expects 50 lectures to facilitate which are spread a semester of 16 weeks length. The course has been introduced with an objective of creating awareness on significance of distributed systems and understanding of distributed computing with its limitations. There is no laboratory component included as part of course offering. It becomes complicated to facilitate such a wide concept without involving any practical exercise in the curriculum. Learners are at a level of having completed their five semesters in computer science engineering and expected to have basic knowledge of computers, programming language, databases, operating systems, networks and World Wide Web. This motivates the facilitator to take the advantage of existing student knowledge and skills to get into the learning of distributed systems. It is found that physical presence of students in the class is a challenge in the context of teachers struggling to attract them into classroom with effective teaching pedagogies and participative activities. This demands the need of coming up with a teaching strategy which can address the learning needs of the students. Other challenge is learning styles of the students. Mere results of the prerequisite courses can't be considered as base for categorizing the students into a particular type of learner. Being a constituent college, curriculum is governed by Parent University and 85% of assessment happens summative. Learners are generally puzzled by the assessment questions and results. These kinds of results may be used in analysis but with a less

weight. Assessment influences the degree of learning but other factors contribute significantly (Carlo Perrotta, 2017).

A survey on the prerequisite knowledge may be conducted to understand the level of confidence of students to arrive at a conclusion on incorporating new teaching techniques. If the survey finds confidence of learners in prerequisite knowledge, course may be planned right away. If it is other way round, recap of concepts should also be included in the current course. Pedagogies have to be chosen based on various factors like learners background, current concept, teachers competency, available resources to implement, time and expected outcome.

Distributed systems course covers majority of generic concepts. Nature of the course is understood in its definition. A distributed system is a model in which components located on networked computers communicate and coordinate their actions by passing messages. Concepts have to be visualized by accessing remotely. Current learners are well equipped with accessing computers remotely and relate the concept of distributed environment. Role of teacher is to facilitate learning by provoking various contexts. Apart from regular lecture, think pair share, demonstration and discussions, case studies are chosen as the most important teaching strategy to facilitate this course.

2. Method

An analysis of student background and available teaching pedagogies within the scope is done. There are 82 students in the course. Around 50% of the students are confident of prerequisite knowledge and skills. Three hours of refresher sessions are planned for the rest to be on par with the others. All teaching pedagogies used by teachers for the same batch of students are analyzed. Students are shown with a list of pedagogies and asked to rate their preferences. All the pedagogies session wise are frozen considering all parameters discussed in the introduction.

There are seven topics Java RMI, Sun Network File System, Andrew File System, Global Name Service, Consistency & IVY and Munin in the course found suitable to be learnt using case studies. Descriptions of respective case studies are shared with all students over online portal. Questionnaires on each case are given in the classroom and discussion follows. As the new cases are introduced, comparison of current case with the previous is done for clarity.

Feedback is collected individually on the final case study from the learners. Questions used for collecting feedback are

1. Did you access the case study in the portal? [Yes/No]
2. Were you able to spend time to read the case study thoroughly? [Yes/No]
3. How many questions did you answer? [5 4 3 2 1 0]
4. How confident are you to brief the answers instantly? [5 4 3 2 1 0]
5. Did the case study help in understanding concepts? [5 4 3 2 1 0]

3. Results

56 students out of 82 have responded to the survey conducted to analyze the impact of pedagogy used.

A question to know if the students have accessed the case study is asked and the results are captured on Yes/No scale, which is represented in a pie diagram.

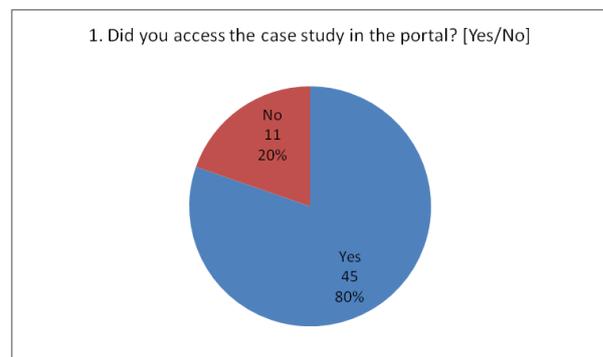


Figure 1: Case study access percentage

It is a common tendency to open the content and postponement of spending sufficient time to go through. Pedagogy chosen is considered to be accepted by the students only if they cooperate in all aspects. One among the aspects is to spend sufficient time on the case. A question is asked to know if students have spent sufficient time to go through case in detail. The following pie chart shows percentage of students spent time on the case.

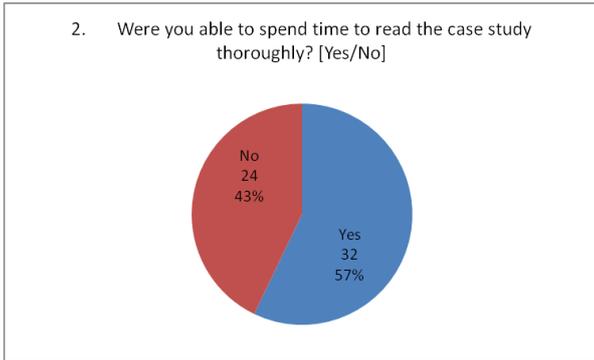


Figure 2: Time spent on case studies

Three questions have been asked to see the impact of pedagogy used on a scale of 5 to 0, 5 being the highest and 0 being the least. Consolidated data responses have been shown combindly in the follwong bar chart.

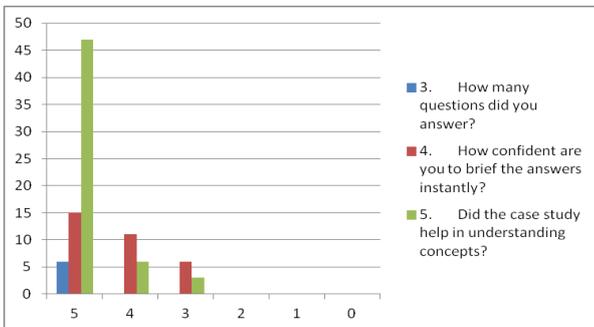


Figure 3: Impact of case studies as felt by the students

Correlation coefficient between scores of internal assement and external assessments is 0.57. For more clarity, deviation between internal and external assessment is analysed and represented in the following bar chart.

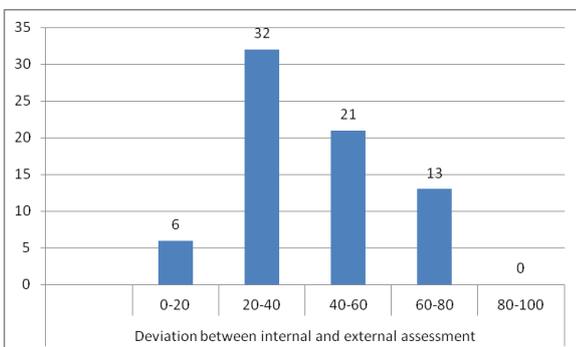


Figure 4: Deviation in assessment

4. Discussion

Response rate to reflections on effectiveness of the pedagogy is 68% (56 out of 82). All the students who have taken course did not respond to the survey. Analysis is done considering it as a sample. 20% of the sample did not access the case study Figure 1 shows that 11 out of 56 respondents have accessed the case which was made available for interpretation. Which means some of the learners did not feel the importance of the case studies posted. 57% students of the sample have mentioned that they had spent sufficient time to go through entire case in detail. Only six students were able to answer five questions posed against the case given.

However the idea of facilitator is to help students understand concepts when they actually discuss case in the classroom. Diversity of learning capabilities is used to complement slow learners. There is positive confidence in the learners to answer questions instantly as they got gist of cases on the spot. Almost all the respondents of sample felt that case studies help understanding concepts better.

Out of 82 candidates who have taken the course, 72 have attempted both internal and external assessments. 45 students have met the requirement of pass grade fulfilling both internal and external assessment requirements specified. There is a huge gap between the scores of internal and external assessment.

For both planning of teaching and designing of assessments, diversity in terms of students' level of understanding, complexity of content and need of skills have to be considered. (Martin-Kniep, 2011). Though results captured in the context do not have any scope to generalize the issue with ideal demography of stakeholders, there are significant number of institutions in India which operate under affiliating university curriculum.

An issue of concern in this experience is assessment. Out of the stages of understanding learners, exploring the concepts to be taught, choosing appropriate pedagogy and evaluating learning, former three are within the influence of facilitator and later is actually out of influence which needs a standard process to justify learning experience. Correlation between percentage of internal and external assessment is suppose to be close to 1 but the real value is 0.57. For easier understanding, difference between percentage of internal and external assessment is compared and found that the gap is huge. Learners are puzzled with the external assessment questions and evaluation as well. Ultimate measure of success of pedagogy of teaching and learning is final

outcome in terms of consolidated grade of the particular course. Results prove that the pedagogy used is not a great success where as students confidence of understanding and comfort is very high.

Conclusion

The paper leaves a question of concern on measuring effectiveness of pedagogy. Relationship between actual learning and formally accepted measure of learning is slightly exaggerated intentionally to make readers think the importance of systematic synchronization among content, pedagogy and assessment. On the other hand, "Case studies" being alternative pedagogy to the regular classroom delivery, proved better in comparison. There could be many more parameters which could have improved performance of learners in external assessment, which the author has not considered. Research on the same can be continued by incorporating other possible dimensions to increase learning experience both qualitatively and quantitatively.

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