Innovation using Think Pair-Share for Operating System

Overview

It is noticed that a lecture delivered in class based on that questions are asked to check understanding of the students, but not all students are able to respond. To keep all the students actively engaged in the class one of the active teaching-learning strategies that is Think-Pair-Share (TPS) has been implemented. TPS is a classroom-based active learning strategy, in which students work on a problem posed by the tutor, first individually, then in pairs, and finally as a class wide discussion. As the Operating System is core subject of computer science engineering, therefore the activity was conducted for the third year students to improve students' conceptual understanding. In this methodology, one group Pre-Test and Post-Test model is considered. Students feedback related to the activity is evaluated.

Introduction

while conducting the lecture in the class the students are not much responsive, except one or two who are really intelligent and attentive. This happens because tutor is busy with delivering the contents and students either passively listen to the teacher or write notes. Sometimes tutor make effort to keep lecture interactive by asking some questions to the students but still some students did not answer the question as they are not focussed. This becomes very difficult for the tutor to get an idea of how well the class understood the concept. So there is a need of channel between teacher and student.

Operating System is the core subject of computer science engineering and base for other subjects like Unix operating system, **Distributed operating system**, real time systems etc. This subject is also important for GATE exam. So it is required to clear the concepts of this course. Think-Pair Share is a cooperative learning strategy that can promote and support higher-level thinking. TPS has its own benefits like, students are actively engaged in thinking and thinking becomes more focused when it is discussed with others.

Hence, TPS activity is considered to teach Operating System Concepts. So the research questions are:

1) Are the students actively remaining engaged in the class while performing the activity?

2) Does this activity help students to clarify their concepts?

To find the answer to these research questions, one group pre-test post-test along with feedback was carried out. Result showed that this activity is useful for this course. The feedback analysis shows that 100% students were remain engaged in the class and 75 % students say that the activity improves their maximum conceptual understanding.

Strategy

The objectives of this study are: 1) To Prepare the fundamentals of Operating System concepts like **scheduling algorithms**. 2) To make the concepts easy like calculating waiting time and turnaround time for each process, resources allocated based on priorities and other concepts. 3)To improve the performance of students in this course.

Think-Pair- Share (TPS) Activity TPS is a collaborative, active learning strategy, in which students work on a problem posted by tutor, first individually (Think), then in pairs (Pair) or groups, and finally together with the entire class (Share) .The research (Carss and Wendy Diane, 2007) describes the effects of Think-Pair-Share strategies, used during Guided Reading lessons, on reading achievement. So this TPS consist of three phase (Susan) as shown in figure

Fig 1. TPS Activity

The TPS activity is a little modified while conducting in the class. The think phase is divided into read and write seperately , This provides tutors with the opportunity to see whether there are problems in comprehension. tutors can create a Read-Write-Pair-Share strategy in which students:

1. R: Read the assigned material;
2. W: Write down their thoughts about the topic prior to the discussions;
3. P: Pair up with a partner.
   S: Share their ideas with a partner and/or the whole class.

1) **Think (Read-Write)***: tu*tor starts the teaching- learning process by seeking answers to specific question about the topic. Students 'think (read and write)' individually about what they know or have learned about the topic for a given specified time.

2) **Pair***:* Each student is paired with another student. Students share their solution to the given problem in think phase, discuss ideas, and ask questions to each other. Tutor asks complex question related to previously asked problem and students are asked to solve the problem.

3) **Share***:* Pair has adequate time to share their thoughts and have a discussion; Tutor expands the 'share' into a whole-class discussion. Allow each group to choose who will present their thoughts, ideas, and questions. After the class 'share', may again ask the pair to talk about how their thinking changed as a result of the 'share' element.
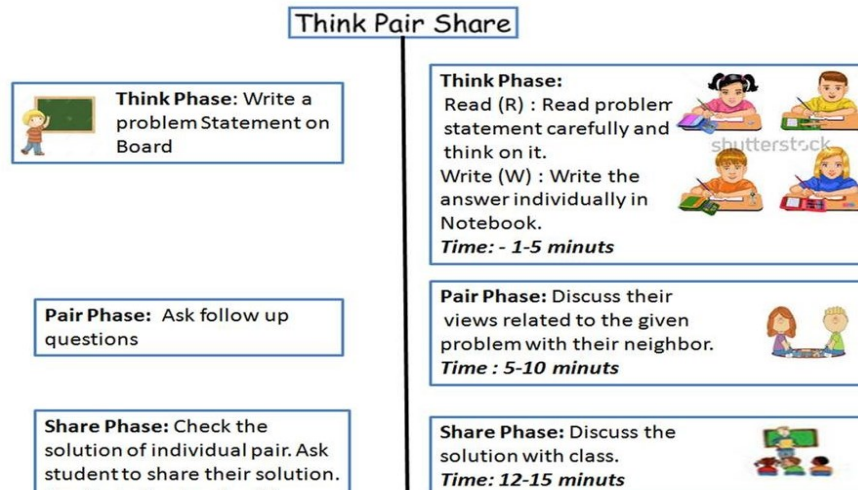
Fig 2. Activity perform by tutor and student

Topic Description

TPS for Scheduling Algorithms concept of Operating System Course

The topic covered for the study is introduction to scheduling algorithm- First Come First Serve (FCFS), Shortest Job First (SJF), pre-emptive and non-pre-emptive SJF. It consists of following steps for given example:

1. how to draw Gantt chart,
2. calculate waiting time for each process,
3. calculate average waiting time,
4. calculate turnaround time for each process
5. And average turnaround time.

For TPS activity the problem statement was given as shown in figure 3

Draw Gantt Chart for Shortest Job First (Preemptive)algorithm for given processes

Processes	Burst Time in mili seconds	Arrival Time in mili seconds
P1	5 ms	0 ms
P2	7 ms	1 ms
P3	4 ms	2 ms

Fig3:problem statement

The three phases in TPS are structured as follows:

1) **Think Phase** - The tutor poses a question to which students read it individually, and write their answers. Tutor ask student to draw Gantt chart for given problem.

2) **Pair Phase** – In this phase, Tutor asked students to discuss their answer with their neighbour and try to convince each other regarding how their answer is correct.

As this example is related to shortest job first scheduling algorithm, 80% students consider only burst time and draw Gantt chart as shown in figure 4.

As shown in figure 3, student thinks that Process P3 is arrived at 2ms and it has burst time less than process P1, so Pre-empt process P1 and schedule process P3 in Gantt chart. This is the misconception faced by the students. But in pair phase they clear their idea with their neighbour.

Figure 5 shows the shortest remaining time first after 1 ms, and after 2 ms for each process. It is observed that most of the student forget about the shortest remaining burst time of the process, and they only check the burst time of process given in the problem statement.
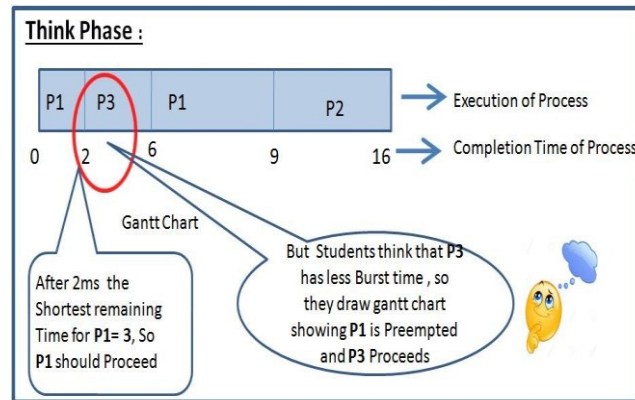

Fig4:Gantt chart

Due to this they drew wrong Gantt chart in think phase. After discussion with their neighbour they get the clear idea about the process shortest remaining burst time and now they can draw the correct Gantt chart.

After this, Tutor asks the students to find out waiting time and turnaround time for each process.

As shown in figure 5 waiting time, turnaround time is completely depends on Gantt chart. If students draw wrong Gantt chart they get wrong waiting time and turnaround time for each process. In pair phase students were able to draw correct Gantt chart and they get correct answer for waiting time and turn around time.
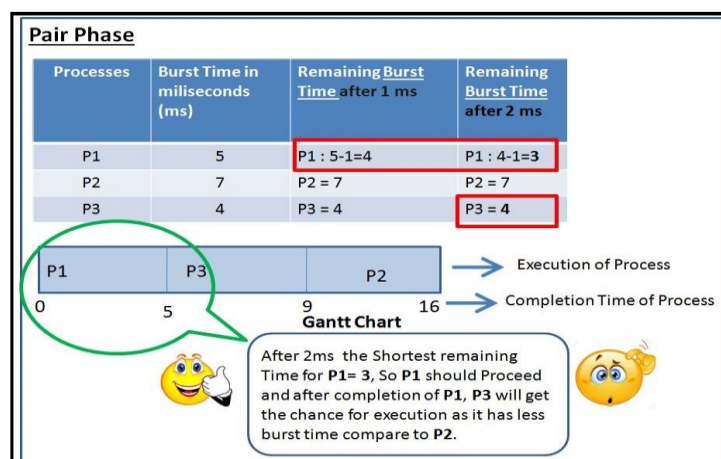

Fig5:Gantt chart in pair view

3)Share Phase - Students engage in a class-wide discussion, sharing their answers and reasoning.

Pair phase gives enough time to share their thoughts and have a discussion with each other; Tutor allows each group to choose who will present their thoughts, ideas, and questions. This includes class-wide discussion, after that tutor expand the "share" into a whole-class discussion.

After discussion in pair phase students were able to calculate correct average waiting time and average turnaround time. After this activity Post Test was conducted in the class and feedback form was designed to collect immediate feedback from the students.

Sample analysis

Since Operating System Concepts is the course of third year Computer Science and Engineering, a group of 40 students was selected for this experiment.
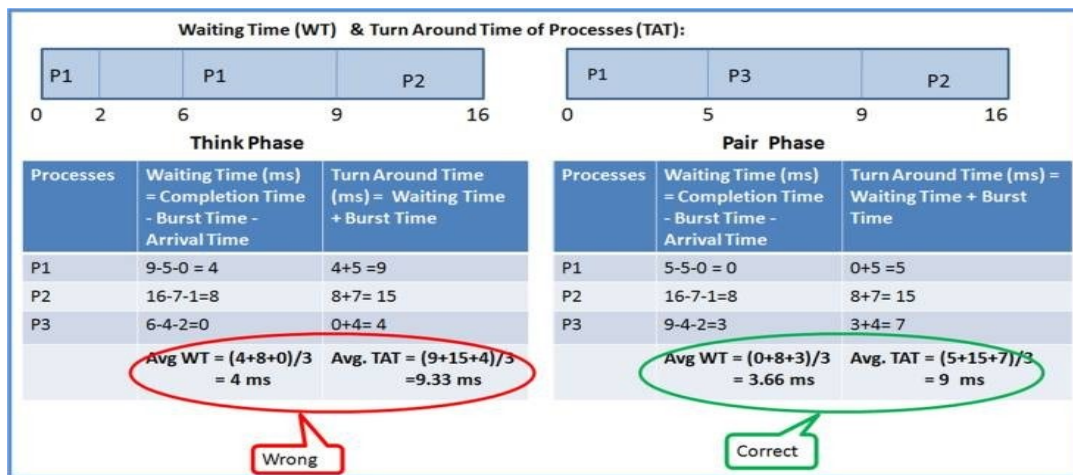

Fig6: Calculation of Average Waiting Time and Turnaround time

Research Design - Figure 7 shows the architecture. Before conducting the activity, simple black-board teaching was done, after that one group post test of 25 marks was conducted in the class. While checking the papers tutor found that there was confusion while drawing Gantt chart for shortest job first scheduling algorithm.If Gantt chart was wrong then automatically it results in wrong waiting time and turnaround time so tutor decided to conduct Think-Pair-Share activity in the class and it was conducted. After that immediate feedback and post test of 25 marks was conducted. After evaluating the post test paper tutor found the desired result.
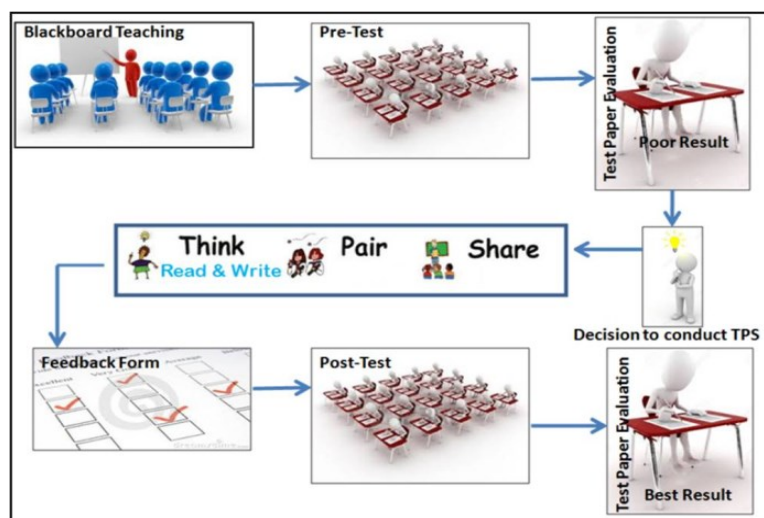

Fig7:architectural view

Table shows the course, sample, method, instruments used and learning domain used in

experimental setup.

Course	Operating System Concepts
Sample	A group of 25 students from Second Year Computer Science and Engineering of Solapur University
Method	One group and a pre-test post test model
Instruments Used	Pre-test Post-test 1. Survey questionnaire and 2. feedback from open ended questions
Learning Domain Used	Bloom's Taxonomy- Analysis Level of Cognitive domain

Benefits of Think-Pair-Share

- Students are actively engaged in thinking which leads them to analyse the concept from different perspectives.
- For students it is easier to pair with a student partner and get into discussion
- Effectively critical thinking is retained after a lecture in which students have had an opportunity to discuss and review on the topic.
- No specific materials are needed for this strategy, so it canbe easily incorporated into discussions.
- Teacher has an opportunity to get through from all students.
- It engages the entire class and allows quiet students to answer questions without having to stand out from their classmates.
- This activity helps the students to clarify the concepts more clearly
- It is beneficial for the entire group of students of class to be engaged actively in the topic discussion
- This innovation of think pair share allows more students to actively participate through the work sheets and activity based learning involving active discussion shared among the students .
- Result responses of all students are good.

Feedback
To get the student's perception regarding this activity, the feedback was conducted after the

activity using moodle. Below graph shows the feedback analysis. The feedback form contains the questions related to the engagement of the students while conducting the activity and how the activity helped students to clarify their concepts. Analysis shows that maximum students actively participated in the activity and this activity helped them to clear concept of scheduling algorithm in depth.
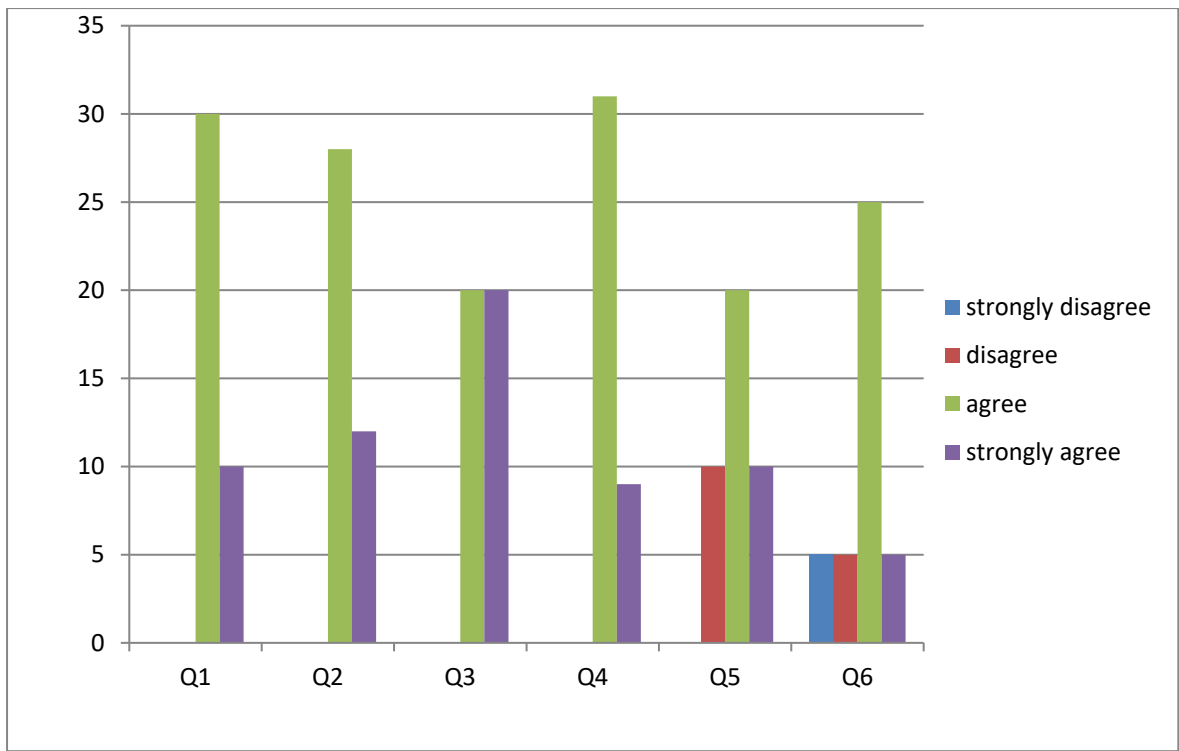

Fig8:graph of feedback analysis

Feedback questions

Q1   Students actively participated in the activity?

Q2   participated in the pairing with other student?

Q3   activity helped your group to keep on task?

Q4   we finish task on time and it was good job?

Q5   this ideology should be followed for all concepts?

Q6   the activity was good to learn the content?

Conclusion

This strategy allows students for thinking on a given topic, enable them to formulate individual ideas and share these ideas with a peer. This learning strategy promotes classroom participation by encouraging a high degree of student response. The feedback analysis shows that 94% students actively participated in the TPS activity, 92% students participated in group discussion with their neighbour, 92 % students felt that the activity help their group to keep on task, activity helped 75% students to clarify their concepts about scheduling algorithm. 100% students say that the activity is a good way to learn the content. TPS activity can be applicable for any subject. Creating an interactive classroom environment is very important to the success of students. Think-Pair-Share activity proved useful in clearing the doubts of the course. This TPS activity makes class interactive and involves all the students in the teaching-learning process.

References

Komal R. Pardeshi, Kanchan A. Khedikar (2015) "Peer Instruction: An Active Teaching Learning Strategy To Improve Programming Skills" , Golden Research Thoughts, ISSN 2231-5063 , Volume-4 Issue-9 March, Available online at www.aygrt.isrj.org

Susan Ledlow, (2015) "Using Think-Pair-Share in theCollege   Classroom" http://www.hydroville.org/system/files/team_thinkpairsha re.pdf . 24/9/2015

http://serc.carleton.edu/introgeo/interactive/tpshare.html,16/9/2015