

Increasing students Engagement during Virtual Classroom Teaching through Effective use of Online Tools

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Abstract: Nowadays, the entire world is facing the problem of pandemic i.e. COVID-19. Hence it is a challenging task for educators to engage students during virtual classroom activity. Many online tools are available to take instant feedback from students to measure their involvement levels like Quizzes, Polls, Surveys, etc. Hence, in this paper, the use of two online tools like InterviewBit and Slido is being addressed. These online tools are used to ask the questions during online lecture delivery that may help in measuring the overall involvement of the students. The mentioned tools are described in detail along with its incorporation in teaching Data Structure and Algorithms course for second year B. Tech in Computer Engineering students (around 120 Students). Also, the learning of students before and after the usage of the Tools have been compared and analysed. It has been observed that there is approximately 20% improvement in the overall learning outcomes after the usage of the Tools. Also, the cognitive and affective learning domains are considered to measure the overall impact.

Keywords: InterviewBit, Slido, virtual classroom activity.

INTRODUCTION

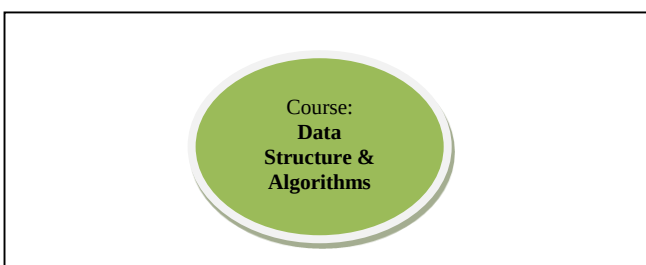
A virtual environment has its own advantages and limitations as compared to the physical classroom environment. To ensure student engagement during online classroom activity is a challenging task. Hence, in this paper total six online Tools have been discussed, namely: InterviewBit[1] and Slido[2]. Here, Data Structure and Algorithms (DSA) course has been considered as a case study to apply above mentioned online tools. This course is for second year B. Tech students in Computer Engineering department. As shown in Figure1, during the course teaching in virtual platform using Microsoft Teams Learning Management System [3] (LMS), various tools have been applied to check the engagement of the students. The details of activity plan for each online tool are explained in the next section. The second section covers the result analysis part and concluding remarks are given in the last section.

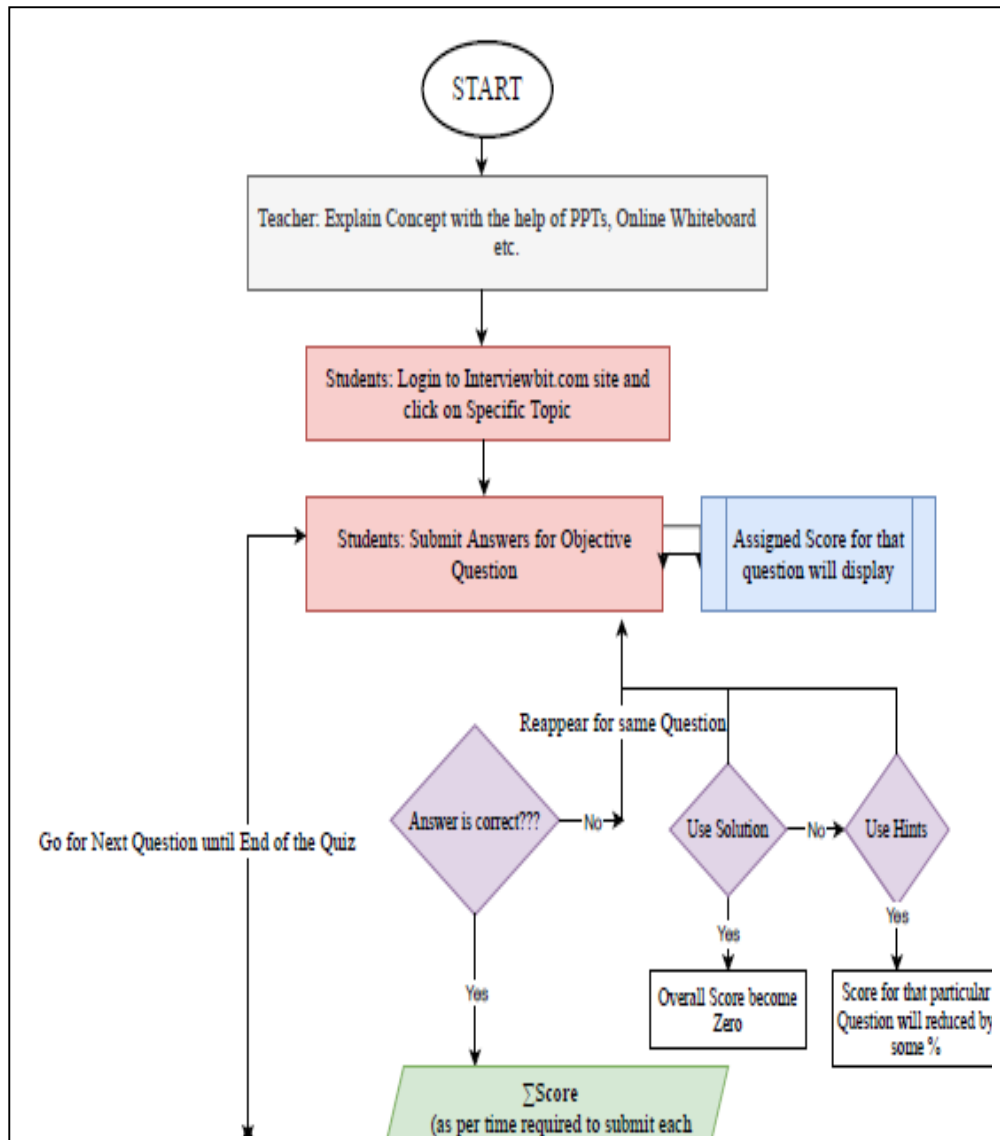


Fig.1 Online Tools to ensure students engagement

ONLINE TOOLS

There are many online tools available to assess students on the distance education platform. Many researchers [4-7] had contributed their work for the tool-based learning approach. On the physical classroom environment as face to face conversation is possible, it is easy for instructors to get live feedback from students. Hence, the instructor may change his/her teaching strategy as per the responses received. But in online mode, there are many limitations like it is difficult for an instructor to predict the percentage of concept understood by the students. The below list of online tools may help instructor to measure the student involvement during the online classroom teaching activity. Here, the details of the tool used along with its application to teach DSA course is being explained.





Tool 1: InterviewBit

The Interview Bit tool is available on below mentioned link:
<https://www.interviewbit.com/courses/>

This is helpful for the students to practice objective questions along with programming, problem solving questions that are mostly asked in placement drives of many multinational companies.

Activity Plan

Teachers Role	Students Role	Duration
Explain the Concept on virtual environment		10min
Ask students to go for Slido tab on MsTeams	Open the Slido Tab in MsTeams	2min
Post Question in Q/A section		1min
	Solve and Type Answer	5 min

As shown in Fig.2, InterviewBit Tool activity is carried out. The Instructor need to discuss a particular topic and then ask students to appear for multiple choice questionnaire and provide time as per complexity and total number of questions in a particular section. This particular tool is helpful in which first attempt does not provide any hint and as per time taken to answer, score will be given. All the questions asked to practice as well as for the contest, are totally based on the previous questions asked in placement drives of well known companies. Hence, this tool not only helps in better understanding of the concept bit also prepare students for placement activities. The screenshot of sample questionnaires is as shown in Figure4.

Tool 2: Slido

In a virtual environment, instructor can able to take live polls along with quizzes. Students also can ask questions in Q/A section, present in Slido tool. In MsTeams Learning management system, Slido tool is available or one can explicitly go to www.slido.com website, do registration and Create live interaction in Q/A section. As shown in Figure3 and Figure5, live responses are collected during the session. It is observed that this tool is very useful to analyse the understanding of the students quickly in the virtual classroom teaching environment. Also, students can able to ask their doubts in Q/A section. The Live polling facility is also helpful in checking the learning and overall involvement of the students.

Activity Plan

Teachers Role	Students Role	Duration
Explain the Concept on virtual environment		10min
Ask students to go for InterviewBit	Open below link: https://www.interviewbit.com/courses/	2min
	Solve Questions	15 min
Ask students to share score	Share score in a sheet	5min
Announce first three Toppers		5min

To use this activity in specific courses, the instructor must have to register first at slido.com while no registration is required for participants. Multiple options are available like Quiz, live polls, Q/A etc.

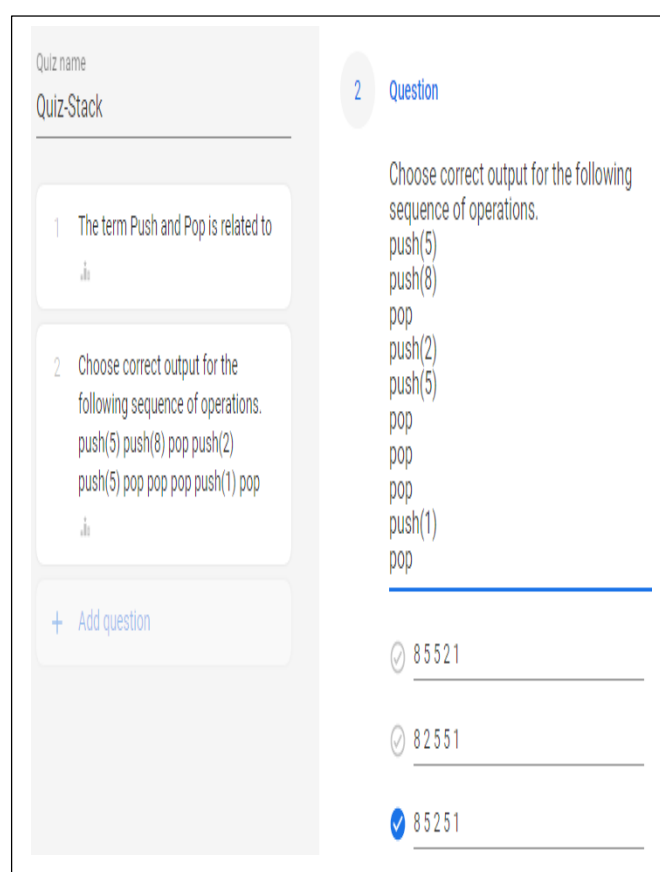


Fig.3 Screenshot of live poll created on Slido

What is the time, space complexity of following code :

```
int a = 0, b = 0;
for (i = 0; i < N; i++) {
    a = a + rand();
}
for (j = 0; j < M; j++) {
    b = b + rand();
}
```

Assume that rand() is O(1) time, O(1) space function.

Hints

[Solution Approach](#)

[Complete Solution](#)

☐ O(N * M) time, O(1) space

☐ O(N + M) time, O(N + M) space

☒ O(N + M) time, O(1) space

☐ O(N * M) time, O(N + M) space

☐ O(N * M) time, O(N * M) space

Submit

Access Hint

Notice that the 2 loops are independent and not nested. So, we can look at them separately and then add the result. Assume that you do not know the relation between N and M. So, try to **suggest your answer as a function of N and M** (max or addition maybe).

Remember that space complexity is measured in terms of the largest amount of memory used during runtime.

Suggest Edit **Close**

Time to Solve: 1 min. / Average Solving Time: 2 min. Your Score: 7 Max Score: 20

Fig.4: Screenshot of Sample Questions asked in InterviewBit

M Manasi Pawar 1903058
Aug 24, 2020
abcde*+/-

S sakshi chougule
Aug 24, 2020
abcde*+/-

S Sheetal Khavare
Aug 24, 2020
abcde*+/-

1903032
Aug 24, 2020
abcde*+/-

A linear list of elements in which deletion can be done from one end (front) and insertion can take place only at the other end (rear) is known as a ?

Stack (9.8%)

✓ Queue (90.2%)

Tree (0%)

Linked List (0%)

Fig.5 Screenshot of live Responses collected using Slido

RESULT ANALYSIS

Affective learning is relating to the student's responsiveness approach, i.e. listening carefully and responding actively. To measure the students understanding in the online platform, affective and cognitive [8] approach need to be considered. For example, cognitive learning analysis can be done with the help of marks scored in examinations. Affective learning analysis may relate with how students listening and responding to the questions. As shown in Figure 6, as a case study Linked List data structure is being considered. Total numbers of responses received along with its accuracy are the parameters considered here for measuring affective learning of the students. Also, for cognitive learning analysis, questions based on various Blooms Taxonomy levels were asked.

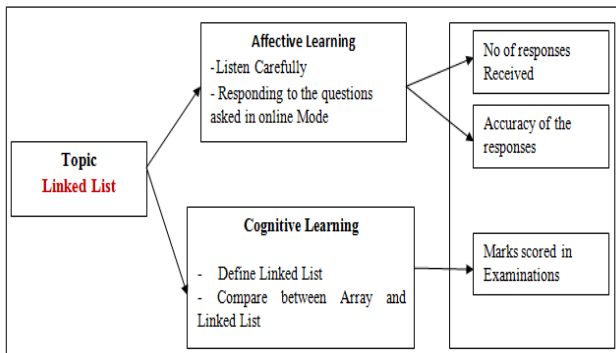


Fig. 6 Affective and Cognitive learning

Observations & Result Analysis:

To engage students in an online environment, total two tools were used namely InterviewBit and Slido. The responses of the students before applying this tool and after application of these tools have been recorded as shown in Table 1. Also, to measure the cognitive learning, total two tests had conducted before and after the application of tools. On an average response are considered and mapping with average marks is done before and after the usage of the online Tools. I.e. Initially, Chat Box was used for taking live responses from the students at virtual classroom activity. It is observed that only 18% students had responded. After that to measure the cognitive learning of the students, Objective Test has been conducted.

Participants: 120 Students

Class: Second Year B. Tech (Div.: A and B)

Course: Data Structure & Algorithms

To calculate the cognitive learning average marks before and after the usage of online tools is considered here. Following formulae is used to measure the overall improvement in the marks:

$$\text{Improvement} = \frac{\text{AvgM_ObjT2}}{\text{Total Marks}} \times 100 - \frac{\text{AvgM_ObjT1}}{\text{Total Marks}} \times 100 \quad \text{-----}(1)$$

Where,

AvgM_ObjT1 : Average of marks scored by 120 students in Objective Test1

AvgM_ObjT2 : Average of marks scored by 120 students in Objective Test2

Total Marks: 20

Improvement in result is $90\% - 70\% = 20\%$.

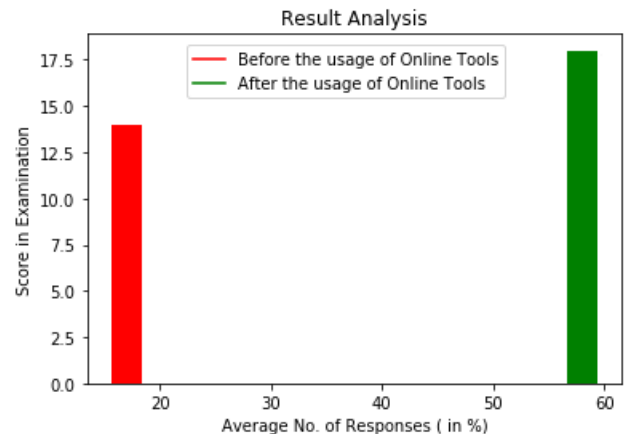


Fig. 7 Result Analysis

Hence, from Figure 7 it is observed that there is a relation between the responsiveness of the students in a virtual classroom and marks scored in the examinations. As number of responses increases, the student engagement also proportionally increased. That in turn results in improvement in the marks in the examination.

Table 1. Result Analysis

CONCLUSION

Affective Learning		Cognitive Learning	
Average No. of Students responded (in %)		Examination	Average Marks (out of 20)
Using Chat Box in MsTeams	18	Objective Test1	14
After the usage of Online Tools			
InterviewBit	52	Objective Test2	18
Slido	80		

To ensure students engagement in a virtual classroom, many online tools are available. In this paper, InterviewBit and Slido these two free online tools application has been demonstrated. Along with that, Chat Box in MsTeams has also used to collect online responses from the students. Here, Data Structure & Algorithms course along with total 120 students is being considered for study purpose. It is observed that the average number of responses received from the students have increased by applying online tools. Also, the average marks secured by the students are increased around 20%. This work can be extended by applying other online tools like Poll Everywhere, Answer Garden etc.

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