

Smart Education Platform to Enhance Student Learning Experience during COVID-19

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Abstract— The community of learners of these days are highly motivated to use the latest trends in education due to the current demand of the education sector. When the Smart education scenario is observed, various advancements in Smart cities play a vital role. Situations like the current pandemic of COVID-19 has forced the entire community of learners to learn through online mode and most of the educational institutions are opting for this mode for a safe learning environment. Several tools are available to support this of which Zoom is one of the most popular online tools and many institutions are using Zoom for online activities related to teaching and learning practice. This paper shows the results of one of such practice implemented during the current situation including the infrastructure of Video Streaming Server utilizing recorded zoom meetings and Moodle. Data is collected by means of a survey conducted among the staff and students. Results have revealed that this practice has shown a good impact on flexibility, accessibility and innovation on learners. The engagement has a scope for improvement to motivate the learners.

Keywords— smart cities, zoom, remote education, video conference, online student interaction.

I. INTRODUCTION

The locus of technology is more than that provided today by the conventional higher education institutions (HEIs) and colleges. In-class delivery are not restricted in using some technology. The use of flipped classrooms with the implementation of ABL, QR codes, remote labs, pre-recorded lectures, online assessments, etc. is restricted to assisting the instructor when incorporating face-to-face student interaction. In order to take full advantage of the different lessons, both the facilitator and the student must regularly communicate in person. Technology will revolutionize teaching as it does not limit itself to traditional teaching.

Many HEIs use recording technology for class lectures, uploading them on student portals to access at their own location, so that learning takes place at their own pace and locations which they are comfortable with. These learning spaces are called online classrooms. Various assessment activities with attendance and grading are mainly used with technology. Interactions with the facilitator as well with peer learners that are lacking when using the technology which is one of the essential aspects of learning [1]. To some extent, in their learning process, this technology has separated

students. The HEI does not have the forum or resources needed to connect and improve learning experiences. Some of the facilitators use Skype for one-to-one contact on a personal level if they are unable to meet or attend face-to-face with any of the students. These communications are usually two-way audio-visual systems, but the educational whiteboard tool have no space for two-way sharing. Peer learning is totally absent.

Technology that can be used in the learning environment to incorporate engagement and peer learning. One such technology is Zoom cloud meeting that allows immersive live audio-visual learning along with whiteboard sharing. With many facilitators and several participants, it also has the benefit of being used.

II. REQUIREMENTS

Mandatorily requiring Wi-Fi connection, zoom cloud meeting app can be used world-wide with any devices ranging from handheld, tablets to laptop computers and pc's. The stylus pen can be used on the tablet for quick writing with ease. With the video's crystal clear transmission and face-to-face recording, Zoom can be used at multiple locations and establish good virtual class room interaction. It features high-definition screen sharing and instant messaging to participants. It is a live classroom in real time where students learn as in a typical classroom from facilitators and peers. Extra reading materials can be shared by posting links in the instant messaging [2] [3].

III. APPLICATION

Zoom can be used for teaching and learning by any institution. The main gain is that education is made available to students who are in rural areas and who do not have access to higher education. Geographical, gender, cultural, social or professional constraints could be the reason for a student's inability to attend traditional classrooms. HEIs can implement teaching and learning technology in every discipline to benefit using technology and enhanced learning experience for the learners [4] [5]. The facilitator who is not in a position to take classes due to geographical, physical or non-availability of time slots may benefit from this. HEIs may also employ other organizations' facilitators and share the costs. They can connect the students to other HEI facilitators and vice versa for best use of resources, which then lowers the costs.

If a facilitator is going on leave, it is possible to arrange an alternative one from a pool of facilitators who are not necessary on site. In addition to balancing the workload of other facilitators who are then expected to take additional load, this in turn does not hamper the learning speed of students. For peers to learn in and outside the session, HEIs may also build an infrastructure.

The necessary supplemental resources can be developed and passed on to the students during these online classes, depending on the nature of the subject. It also enables students and teachers to simplify the procedure in a variety of scenarios and situations. For instance, if a mathematical problem is provided and student learns using an approach, they can be given numerous more ways in additional form for referring to if any original way not easy to follow. [6][7].

Implementation of MOOC have been initiated by many HEIs globally. Due to lower speed in bandwidth or not being able to access such sites in some countries, the participants cannot be streamed the coursework materials [8][9].

IV. LECTURE SETTING

The facilitator and the participants must download and install Zoom Cloud Meeting application which is cost-free. The facilitator will need to create an user Account ID and issue invitations to the attendees using that ID. After the facilitator logs into Zoom, users will be able to see four options, i.e. meeting, contacts, chat and sharing of content [2]. "Meet now" button has to be clicked and then choose the appropriate screen meeting, shared screen meeting, or showing white-board option. Whiteboard is useful for writing and depicting. Then the viewers may be requested writing on it as well. It can also be hidden or shared accordingly as needed by the facilitator.

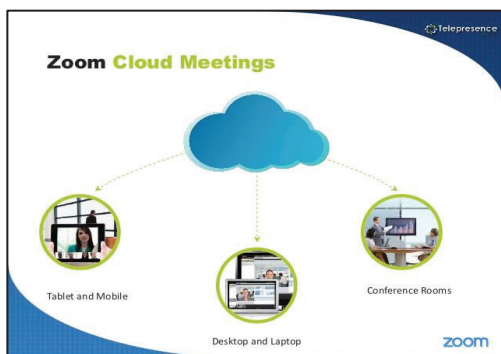


Fig. 1. Zoom cloud meeting

In the above Fig. 1, showing a simple architecture of all devices are connected over the Internet to the Zoom cloud server for the interaction to begin. However, it can be used in wide variety of purposes.

Using the online Whiteboard tool, there is an option of drawing, inserting text, audio-visual materials and many more just like a smart board. These can be shared with the participants who need to access it. It is advisable for the students to take the screenshot for saving their time.

Remote access labs are implemented by many HEIs which can be used in conjunction with Zoom for good interaction with the students and other faculties in remote locations. All their doubts can be solved plus practical aspect can be showcased to get feedback [2]. Emailing and documentation seldom cannot help to solve doubts out of

which Zoom tool can be used. This enables to conducting feedback and feedforward sessions which are utmost beneficial for the students.

In the below Fig. 2, a mathematics facilitator used Zoom cloud for delivering online, for which it has been successful with positive feedback for this approach. In this way the process was used to teach Math with students of various levels at free of cost. Numerous students were taught living in India, UAE and USA.

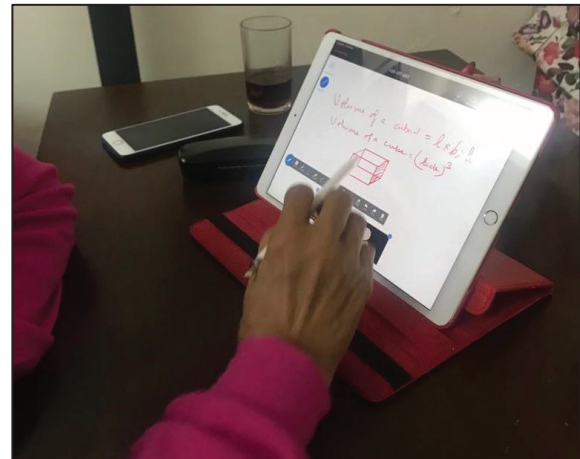


Fig. 2. Usage of Zoom Cloud to teach Maths

As per the feedback students reported shift in their practical understanding and gracefulness for learning on a very good platform.

V. PROPOSED SYSTEM

At Middle East College (MEC) the current infrastructure supporting online video streaming for lectures[10]. This gives lecturers the facility to flip the classrooms and use the streaming server to upload the content on Video Streaming Server (VSS) [11][12][13][14][15]. Using the existing infrastructure, Zoom cloud can be incorporated with VSS giving which can be seen in Fig 3.

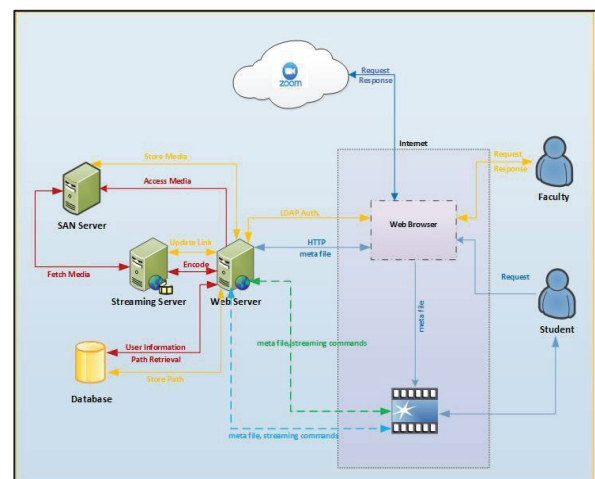


Fig. 3. Video Streaming Server with Zoom [11][16]

VSS will enhance collaborative and active learning to increase student engagement for flipped classroom using zoom cloud [17]. Creating opportunity for HEIs to achieve Education 4.0 and achieving smart education in smart cities with the use of ubiquitous devices [18][19][20][21]. In many

aspects of the education field, online video conferencing has a huge impact. Firstly, by improving their research skills, it assists doctoral and dissertation students. This can be provided by the faculty, which has tremendous psychological impact, through coaching and mentoring. From the researcher's guide and moral inspiration, students achieve positive relationships. This will result in increased retention rate of the students [22]. Teachers should also try out various other features on Zoom for advanced options to enhance student engagement, even for the practical tasks for which virtual lab implementation could be added advantage [23][24][25].

Video conferencing may also be used to facilitate hybrid classes in which some students are present physically on college campus and while others are not. This made off-campus students feel more present in the classroom by reducing transactional distance. Zoom is an extremely useful program that allows teachers to share their screen and slides while maintaining complete control. [26].

Cost effectiveness is another advantage of this. HEIs is included it with lesser investment amount in facilities, and even for specific virtual lectures by guests. The only resources needed are lecture room with a wall projector and a Personal Computer or laptop with Zoom program. [26].

VI. IMPLEMENTATION

To implement the proposed system, the zoom meeting links was created in Moodle from which students can login for the interactive sessions as shown in Fig 4.



Fig. 4. Zoom meeting link through Moodle

Fig 5, Fig 6 and Fig. 7 Show the interactive session through zoom meeting with the teacher and the students. Teacher teaches the concepts of mathematics and the session was recorded. The recording was done using free and open source video recorder for screen cast. These recording can be later used to upload on the VSS for the students those who were not present in the session or students wants to do revision on the concepts that has been taught.

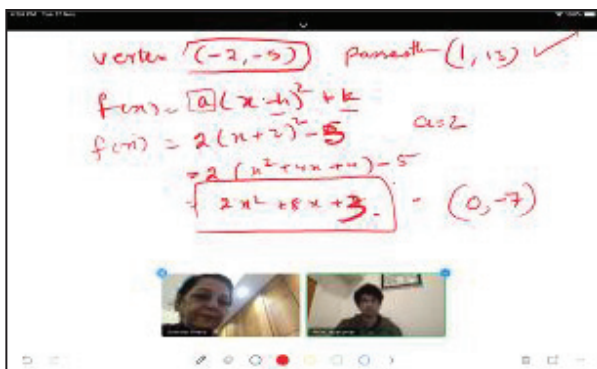


Fig. 5. Zoom meeting using interactive tools

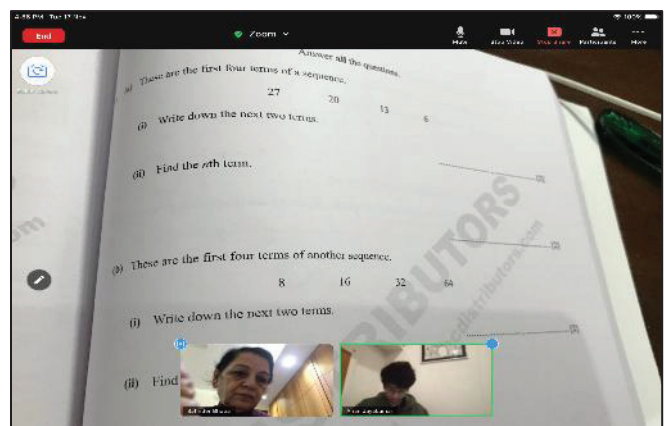


Fig. 6. Zoom Interactive session for learning concepts

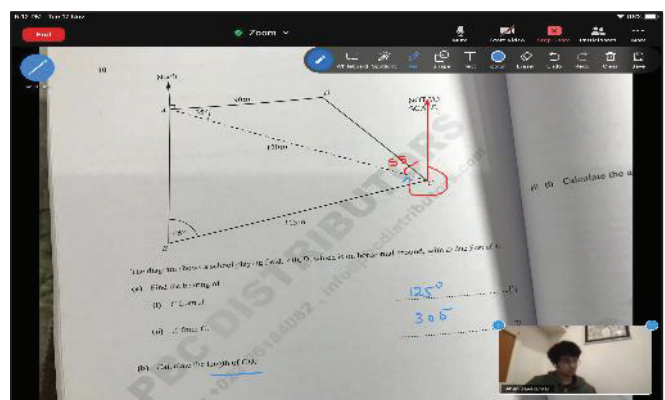


Fig. 7. Zoom Interactive session for learning concepts

Fig. 8 shows the utilization of VSS and uploading of the recorded sessions in streaming server. These links will be shared to students through Moodle. This can help students to view the recorded session at their own pace and at their own time. Due to the shift in the method of teaching in COVID-19 crises these tools and technology plays an important role in disseminating the knowledge and creating an environment where the knowledge is transferred and student learning takes place without the disruption. To evaluate the efficacy and efficiency of this distance mode a survey has been conducted in the online zoom class session and the result are discussed in the next section.

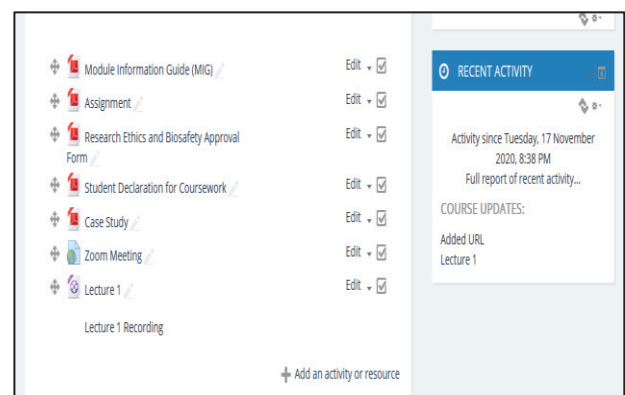


Fig. 8. Moodle link creation

VII. RESULTS AND DISCUSSION

In order to evaluate the effectiveness of the new norm a survey has been conducted after the online zoom session. There were 55 participants that took part in the survey out of 60 students. The survey has 3 questions Fig 10, show the result on teachers experience using the new technologies. Fig 11, shows the result on learning experience. Fig 12, shows the result of the learning environment after the pandemic.

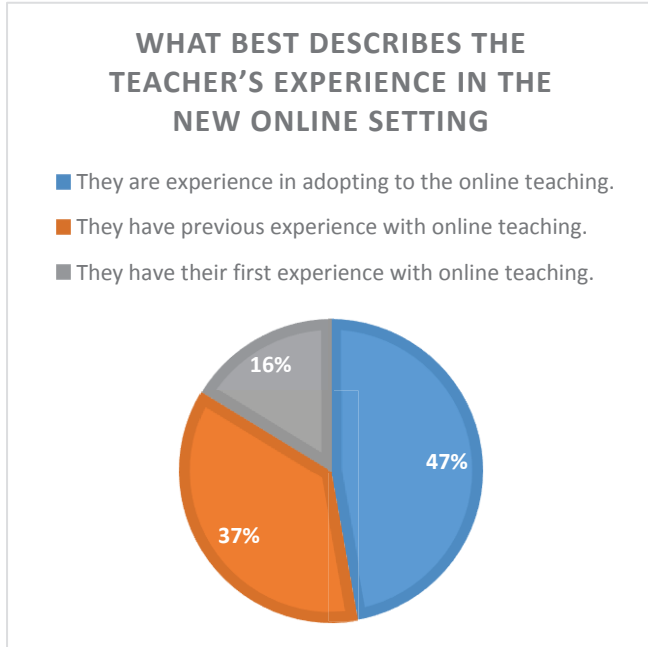


Fig. 9. Question 1

Question 1, 47% respondents have prior knowledge of using the online tools used for teaching and 37% of respondents have little knowledge of the tools used. 16% were using it for the first time.

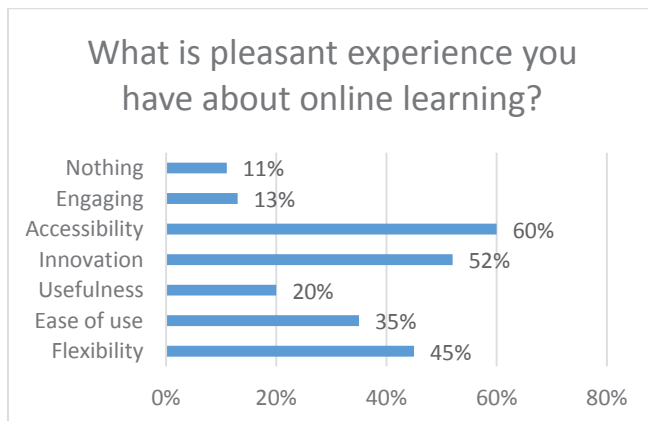


Fig. 10. Question 2

Question 2, 60% respondents have preferred accessibility as the most pleasant experience while having online teaching. Students preferred new and innovative ways of learning more appropriate and the response was 52%. Flexibility plays a vital role in online learning as it showed 45% response. The concern in the online learning environment is the engagement as students find it less engaging and the response is only 13%.

AFTER THE PANDEMIC WILL ONLINE TEACHING REMAIN THE PART OF SCHOOL PRACTICE?

- Online teaching will become integral part of teaching.
- More online learning and contact hours than usual in class setting.
- The teaching will return to its original practice.
- The teaching will return to its original practice with minor changes.

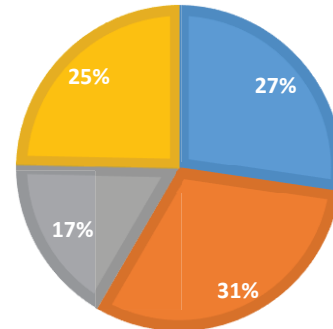


Fig. 11. Question 3

Question 3, 17% respondents agreed that teaching will be back to normal as it is previously before the pandemic. Respondents showed 31% that it will have an increased time on learning with having online and in campus classes. 27% agreed that online will be the integral part of teaching and learning for the future.

From the survey results it is evident that online learning will be the new norm in teaching and learning. Flexibility and prior knowledge of the tools used for both the learners and educators help in achieving the learning objectives.

VIII. CHALLENGES

Latest tools and technologies can help in the COVID-19 era where teachers can interact with the students live such as Zoom or MS Teams. These technologies can be effectively used for educational purposes, tackling interruption by participant's voice and the view it provides can be confusing for the participants and the teacher as it loses the concentration. Telepresence technologies can be used to provide the feel as they were being present in actual via telerobotics [26].

These tools provide asynchronous mode of communication where the chat and presentation cannot happen in synchronous mode. Infrastructure and bandwidth issue is always a challenge in video based online learning where it requires more bandwidth utilization. To avoid this voice enabled lectures can be streamed instead of video enabled lectures but this can cause lack of interests among the participants [27][28].

Availability of the streaming content, concurrent connections can also disrupt the off campus availability as compared to MS Teams and MS stream can be used if the subscription is available to the institutions.

IX. CONCLUSION

Technologies can be used to disseminate knowledge to students in an efficient and effective manner. The role of technology is heavily dependent on the infrastructure and the tools used. In this COVID-19 era teachers and students were moved to online lecturing settings where these tools play a significant role to transfer the knowledge. Zoom, Google Meet and MS Teams are the commonly used tools for video conferencing. In this paper we proposed a framework where we can have our own infrastructure supporting video streaming which can be added to the learning management system and off campus learning. This tool can be used not only for teachers, students but can be used for managing people to monitor the process of learning.

In this research paper, we implemented the framework with a video lecture and a survey to recognize the teaching and learning processes. This research found that this is the new norm for teaching and learning that will be further used after the COVID-19. Prior knowledge of the tools can be helpful in better running of the online lectures. This system provides the students with the flexibility as student learns at their own pace. Accessibility with flexibility provides students with better environment where they can learn easily and at their own time of availability. From the study it was found that though online learning is a good way to communicate and providing teaching and learning but engagement and concentration span of the student's needs to be improved as it can be deceiving in the virtual environment.

With these tools it can also help in predicting the student's performance and implementing different free and open source tools for providing engaging activities such as H5P, Kaizala, Kahoot, Edpuzzle etc. Different datamining or big data techniques can be adopted by HEIs for better learning analytics about their learners.

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