**Bichronous Online Learning model** (*Blending Asynchronous and Synchronous Online Learning*)

KLE Technological university leveraged the disruption created by the Covid-19 pandemic to transition to online teaching-learning systematically. The overarching goal was to research existing Blended learning models and develop a model of learning that suits undergraduate engineering education.

In order to operationalize the blended learning model, it was necessary to fit the synchronous and asynchronous sessions into the execution of the semester and reach out to students. Thus the harmonization of asynchronous and synchronous modes was achieved by adopting appropriate technology.

- **Asynchronous mode**, a Learning management system (LMS), Moodle was institutionalized, and it served as the face of student engagement with learning. All student-related academic content was hosted here, including video content, lesson plan, study material, task aids, and formative assessment (post-test). Figure 1 shows the KLE tech customized Moodle-based Learning Management system (LMS) ([https://learn.kletech.ac.in/](https://learn.kletech.ac.in/)). All undergraduate programs, courses, students and faculty members, support staff, were registered on the LMS.

- **Seamless synchronous delivery** was enabled using Microsoft Teams (MS Teams), which allows for online and anytime collaboration for student-student and student-teacher engagement. This video conferencing platform also allows for chat, file storage and application integration. All divisions, faculty and students were registered on this platform. Figure 2 shows a snapshot of the teams on MSTeams, which are equivalent to physical divisions.
Figure 1 Enabling asynchronous learning - KLE Tech LMS Login page

Figure 1 Enabling synchronous learning - MS Teams Page containing First Year Divisions
Content Delivery

Two examples of content chunking and identifying resource formats are shown in Figure 3 and Table 1.

![Figure 3](image)

**Table 1 Example of chunking in the Sustainability of the course Engineering Exploration**

<table>
<thead>
<tr>
<th>Chunk No</th>
<th>Chunk description</th>
<th>Content-type</th>
<th>Appropriate instructional method</th>
<th>Appropriate resource format</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Global Challenges</td>
<td>Facts</td>
<td>Presentation</td>
<td>Passive video</td>
</tr>
<tr>
<td>2</td>
<td>Introduction to Sustainable Development</td>
<td>Facts/Concept</td>
<td>Presentation</td>
<td>Interactive video</td>
</tr>
<tr>
<td>3</td>
<td>History and three pillars of SD</td>
<td>Facts/Concept</td>
<td>Presentation</td>
<td>Interactive video</td>
</tr>
<tr>
<td>4</td>
<td>Role of Engineers</td>
<td>Facts</td>
<td>Presentation</td>
<td>Interactive video</td>
</tr>
<tr>
<td>5</td>
<td>Case Study - Woobamboo and Hasbro</td>
<td>Facts</td>
<td>Presentation</td>
<td>Passive video</td>
</tr>
<tr>
<td>6</td>
<td>Sustainable Leadership Matrix</td>
<td>Concept</td>
<td>Presentation</td>
<td>Interactive video</td>
</tr>
<tr>
<td>7</td>
<td>What is Life Cycle Analysis and its Process?</td>
<td>Process</td>
<td>Presentation</td>
<td>Interactive video</td>
</tr>
<tr>
<td>8</td>
<td>What is the Carbon footprint</td>
<td>Concept</td>
<td>Presentation</td>
<td>Interactive video</td>
</tr>
<tr>
<td>9</td>
<td>Example 1: For electricity</td>
<td>Procedure</td>
<td>Demonstration</td>
<td>Passive Video</td>
</tr>
<tr>
<td>10</td>
<td>Example 2: For fuels</td>
<td>Procedure</td>
<td>Demonstration</td>
<td>Passive Video</td>
</tr>
<tr>
<td>11</td>
<td>Example 3: For LPG</td>
<td>Procedure</td>
<td>Demonstration</td>
<td>Passive Video</td>
</tr>
</tbody>
</table>

Figures 4 and 5 show examples for faculty recording content for two different courses.
Figure 4 Faculty recording a topic in the course Engineering Exploration

Figure 5 Faculty recording a topic in the course Mechanics of Materials
Figures 6 and 7 show snapshots of interactive questions embedded in the videos, which were overlaid on the videos at logical points.

The summary of the number of chunks/videos prepared and their duration of all semesters is as shown in Figure 8.
Infrastructure Support

While the model was operationalized, physical infrastructural and digital platforms were set up to aid the rapid development of content. Primarily this included a Studio and Video Management System. The physical part of this system comprises 12 well-equipped recording studios spread across different schools, departments and centres. The technological elements of this system included software and hardware components like a light-board, a Nikon 5600 DSLR with kit lens camera, a Black-magic capture card for capture video, Confidence monitor/TV, OBS-Open Broadcast Software for capture/streaming video, audio and digital assets, among others.

The Light-board is a glass chalkboard impelled full of light. It is for recording video content, as shown in Figure 9. The light board technology provides new opportunities for creative use as presenters can interpret images, animations and videos; here, presenters can position themselves behind the glass and write key points on it, and the writing glows due to fluorescent markers. It also allows for live graphics overlay using a PowerPoint.
Figure 9 Faculty using lightboard technology for recording content. The faculty is seen writing on the light board. In the left image, the computer shows the content being recorded.
Appropriate expectations for quality were marked at different milestones of asynchronous content development. These milestones are module level, course level, pedagogy level and final learning objects like videos, ppts and documents.

The checks were in place at the module level for the following aspects: course structure, module, assignment, post-test, quiz, resource format, task-aids. At the pedagogy level, checks were in place for individual learning activities as well as team-based activities. The last set of checks was for learning objects like studio-recorded videos, presentations used in the videos and screencast videos.

The embedded object shows the expectations of quality.
Update and monitor weekly content on LMS

The module-wise video content was released to students every Monday. Based on this release cycle, week-wise, learning material was hosted to the LMS on or before Saturday of the previous week.

Formative assessment to gauge student learning using post-test

Figure 19 and figure 20 shows the sample post-tests and their results as seen by students, respectively. The results of these post-tests served as feedback to plan content for synchronous sessions.
Figure 2 Post-test After Asynchronous delivery
Figure 3 Conduction of post-test – Sample Questions which students have attempted
Feedback mechanism

In the first implementation of the Blended Learning model, the performance in the post-test served as a feedback mechanism to faculty. Although these statistics of students' performance gave a sense of the attainment of the learning outcomes, it was insufficient as we could not draw any inferences of students conceptual depth.

The post-test questions were based on the content delivered through the pre-recorded videos and were related to the content bits hosted on the LMS. They did not assess student's conceptual clarity, due to which the faculty could not derive any inferences of conceptual depth. Hence in the next version of the post-test questions, it is aspired to craft questions that assess conceptual understanding among students. This enables the quantitative analysis of students performance using a tool called Dipstick which will be integrated with the LMS. Additionally, it is envisioned to use the discussion forum to collect student feedback for each learning activity, which allows for a qualitative analysis of the student's perception of learning effectiveness, challenges and hurdles to learning, which can be used for further improvements in the system. Lastly, FAQs can be created based on the feedback given by the students on the online learning resources.
Asynchronous Delivery | Odd Semester 2020-21
Feedback, Analysis and Actions

Dear Student Friends,
Thank you for your responses — 275 nos. till 12.00 noon on 29th Sept. which is about 35% of the population, to the questionnaire I had shared with you on 26th Sept. 2020. Your inputs help us to take a relook at the online delivery process and the expected outcomes so that we can identify the gaps, if any and effect interventions where appropriate, to make the learning exhilarating for you and the exercise rewarding for teachers.

Many of you have responded by appreciating the lecture videos as part of blended learning approach compared to the synchronous method alone of last time. Some of your comments are critical, that will really help us reflect upon and revise/modify the methodology for creating better learning experiences for you. Some more efforts are needed from our end to meet the expectations of a few of you who have chosen a route of sarcasm to pass on the message though you did not bring out specific issues that will entail further discussion and assist in developing an improvement plan.

Once again, thank you all for your valuable responses. Every response of yours matters to us and contributes to our learning.

I would like to present before you the feedback analysis and propose possible action points.

More than 94% students agree that the videos are in line with the course syllabus. Other 6% who do not agree with the statement, may feel so because it is too early for them to draw a conclusion otherwise.

It is motivating to understand that 91% students are helped by the video content while the rest may learn the content when they interact with the faculty member in synchronous mode.
Students in excess of 82% perceive that the content delivery through video mode has been effective. More needs to be done from the faculty to enhance the quality of content and also the quality of audio/video output.

Two out of every three respondents consider the asynchronous delivery has the potential to replace the traditional classroom teaching/learning method. At the same time, we assure the other 30% that most of their concerns would be addressed in synchronous learning. However, resumption of traditional onsite teaching/learning in near future is still a challenge.

92% students reinforce our belief that the duration of videos should not be very long. Care will be exercised to keep the duration less than 15 minutes. The students can always watch more than one video in quick succession if they are capable of grasping large content in less time or pause in between a video if one finds the duration of the video is more than they are comfortable with.
Interactive quizzes are helpful for self assessment of their learning is the opinion of as many as 92% students. Your teachers are striving hard to introduce such questions at the appropriate intervals to keep your learning tempo intact. Others can always ignore the same as they do not carry any weightage of marks.

Nearly 75% of you enjoy the post-test as a good instrument to evaluate your learning in the course topics for the week. Others can do so with some reading of textbooks and other resources prior to appearing for the test. After all, post-tests contribute a significant 20% to your overall assessment of the course.

Some select written responses:

Most questions from post-test were not from videos as I felt. Since we don't have any materials (notes) to study, it is difficult for us to cope up with post-test.

Please make sure to upload the relevant text books or links to download the text book in learning platform. Because we are unable to utilize library facilities during this unprecedented situation.

Questions on the taught topics are not asked in post-test...or extend the video with some extra stuff so that we may attempt all questions in post-test thank you

Some questions asked in Post-tests are different from what is taught in prerecorded videos.

Even though we give our any suggestions, I know that you people are not going to give a Damn thing about these.
I feel the syllabus covered is just on the surface, it would be great if we get in depth knowledge descriptively. And sometimes I feel because of lack of time, either the syllabus is cut down or the content being delivered is narrowed down. Please look into this, since it is a strong feedback and should be sorted out soon.

It was really a wonderful experience learning through the new platform. I was really amazed by it. Given the limited time duration for every video, it is really very comfortable to understand every topic thoroughly. I believe that I have paid proper attention to the classes and have even made notes. But while I gave the post-test I felt there were certain questions which were not touched during asynchronous delivery. And the time duration was 5 minutes for 10 question, which made me a bit disappointed. Also there were multiple answers for few questions which was not mentioned as any instruction prior to giving the exam that multiple answers are allowed, due to which I lost a mark. Except that the delivery of the lectures is really amazing. I hope my problem will be heard. Thank you!

Some action points:

1. Post-tests are meant to take the best out of you almost immediately a couple of days after you watch the videos and consolidate the important concepts with some additional reading of textbooks, The questions are mostly to test your understanding of the concept alone.

2. The Synchronous classes will help you to have more qualitative interaction with the concerned course instructor and also to clarify your doubts and questions that you have noted down while watching videos and the subsequent study. These interactions will help you strengthen your learning and prepare you well for the In Semester Assessment (ISA) and End Semester Assessment (ESA) later.

3. Some of the shortcomings pointed out by you in conducting post-test (like same question appearing multiple times for a few, no mention of a question while only options being visible, etc) will be addressed.

4. Reading of textbooks and referring to some resources is mandatory after video watching. To make meaning out of something when it is taught first time, demands reflection and more reinforcements on the part of learner. Therefore, make it a habit to refer textbooks, relevant websites and YouTube video regularly. The textbook information is already available with you in the syllabus while the website details and YouTube links will be shared with you by the faculty members time to time. Most of the textbooks are available online - in pdf and many other formats while the hardcopies can always be procured through bookshops as the lockdown is very much relaxed now.

5. We too have noticed quality related issues with the videos (voice, noise, resolution, etc). The technical team is working hard to make sure that such issues are eliminated/minimized and you will get the best quality videos.

Head, SME

Hubli
29th Sept. 2020
Blended Learning | Odd Semester 2020-21

Summative Feedback, Analysis and Actions

No. of responses: 275 (35% population)

Asynchronous Delivery

The formative feedback on Asynchronous delivery was gathered in the second week of the first cycle. A number of pain points experienced by students were attended to in the following weeks. The faculty members were curious to know the student responses after fine-tuning some of the gaps that needed immediate attention as this whole exercise of Asynchronous delivery was a new challenge that was to be confronted in a very short time. Thanks to our students who responded to our requests for feedbacks on both the occasions. I am sharing with you the analysis and possible action points to consider for Cycle II delivery.

5% shift from ‘Agree’ to ‘Strongly Agree’
No change in the overall perception
Change from last time:
Actions: More care to be exercised while dividing the chapter into chunks
• The logical flow from one chunk to the next needs to be well thought-out

Overall increase in agreement is about 2% while 7.5% improvement in ‘Strongly Agree’ category.
Change from last time:
Actions: The beginning and the end of videos are critical
• Begin the delivery stitching the threads from previous chunk with the chunk to be delivered
• Communicate the objectives of current chunk
• Consolidate the content delivered and brief introduction to next chunk

A definitive improvement in the quality of delivery i.e. 8% increase in ‘Strongly Agree’ contributes to 7% overall jump.
Change from last time:
Actions: Efforts are to be made to reach-out to the struggling 12% students, such as
• Connection of concepts with real-life scenarios
• Systematic board work
• Repeat the key concepts multiple times
The students' adaptability to Asynchronous method is a good development in just two months' time. 16% increase in 'Strongly Agree' and 6% increase in overall agreement.

Change from last time:
Actions: It is time to introduce several features to enhance the delivery quality
- Zoom-in, zoom-out select portion of board work for better understanding, etc.
- Introducing small experimental demonstrations, where necessary

Students are critical on the increase in duration of videos. 4.5% increase in disagreement among students clearly shows that the attention span matters a lot.

Change from last time:
Actions: Ensure the duration of each chunk does not exceed 12-15 minutes
- Conscious organization of content
- Split the chunks in case time exceeds

A section of students, 10%, about 2% increase from last time see no value in the interactive quiz.

Change from last time:
Actions: Deeper involvement of faculty team is warranted to not only identifying the quiz questions but also the positioning of the same in the chunk.

The faculty efforts in streamlining the post-test is appreciated by students with an increase of 8% from last time. However, concerns of nearly 10% need to be addressed.

Change from last time:
Actions: Concerned faculty members to study and address the issues. A majority among those who are on the disagreement side seem to have problems with the test pattern such as
- question(s) not visible, but options visible
- mark awarded for a single correct answer even when multiple correct answers, etc
Synchronous Delivery

The synchronous approach to delivery was relatively an accustomed realm. However, the blend of Synchronous with Asynchronous was an uncharted territory. Thus, a small attempt has been made to sense the student perception when two are delivered in combination, though it has been a well-accepted phenomena at many places. I am presenting herewith the students’ take and also our preparedness required when we deliver next time i.e. in Cycle II.

Students in excess of 86% agree that the synchronous delivery followed by the video watching helps to enhance their learning. The timing and frequency of delivery of these classes need more attention from the faculty members to improve the overall effectiveness further.

Almost 75% students feel that synchronous classes mimic the onsite classes as far as delivery is concerned. A lot needs to be done in usage of suitable technology and delivery pattern to make the classes more engaging and involved.

What changed in Asynchronous approach from formative feedback?

- Organization of content — the team of course instructors deliberated on the asynchronous content well before the videos were recorded to make them crisp and easy to learn for students
- The usage of light board — the direction of movement of the teacher, text size used, emphasis on explanation, the delivery speed, etc. where worked out for individual faculty-course combination and adjustments were effected into the presentation
- Some quality issues related to videos — noise, volume, etc. were addressed
- The post-test was modified — no. of questions, type of questions, timing, etc. to make it more competitive and learning focused
- The learning material was shared periodically with students on the LMS platform
- Student login issues were attended to swiftly, thanks to the coordinator, info cell
- Synchronous method — ensured that every course instructor limits the use of power point presentation slides and relies on tabs to deliver the content — a near natural approach to teaching

Head, SME

Hubli
24th Nov. 2020