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Abstract—This content track project is an effort to solve instructional issues facing my own k12 school situated in rural north India. Currently we lack qualified faculties due to remote location and so it also hampers the classroom instruction. Though we are seeing a rapid advancement in technology (computing and internet resources at cheaper rate) and also the previous research suggests that use of multimedia enhances the learning outcome. This could be a potential differentiator in the coming decade for the rural population. So to approach the mentioned problem in instruction, I am proposing a hybrid classroom where technology will be used for content delivery and to facilitate out of class activities. Student survey report indicates a positive response and curiosity too. Course content will be prepared for Biology Class 10 students aligned with the Indian School Board (CBSE/ICSE/State Board). Contents will consist of video lectures, quizzes, and project based activities where students get the opportunity to work in a team and hence it helps to develop their problem solving and critical thinking skills.

1. INTRODUCTION

This project is about my workplace (inefficient classroom practices in k12 school), being a remote area we still use normal white boards, teachers standing in the

front; writing on board or explaining the chapter content orally. Students must make a note of what the teacher says so overall one way communication from the instructor side and very little opportunity for students to reflect on their learning or to create something by applying the knowledge in new situations. Teachers lack knowledge of adequate teaching strategy (Protiva, 2023; Beena et al., 2023). Sometimes even the teachers are absent (Krishna et al., 2010; Prema et al., 2018) at frequent intervals that hampers learning in a big way.



Traditional Classroom Setting

Objective of this project is to repurposing content through the addition of interactive elements (multimedia) integrated into learning management systems (LMS) to facilitate two way communication and hence derive some value in terms of learning effectiveness, creativity, and critical thinking among students. Doing so efficiently in terms of time and resources, however, presents a considerable challenge. This content track project demonstrates a possible solution.



Hybrid Classroom Setting (Content Delivery Using Canvas)

2. METHODOLOGY

2.1 Cyclical Content Development Process

The course, titled *Introduction to Hip, hip disorder and its Solution*, was developed through a period of eight weeks. Rather than developing and filming at once, the content production occurred in modular cycles to ensure a feasible approach and allow for concrete feedback on lesson presentations and structure during intermediate milestone presentations. Modular content production cycles also allowed the course developer flexibility in the event of technical difficulties: as

full content production occurred earlier and consistently throughout the process, the developer was able to identify and account for any necessary alterations in her planning earlier than if she had filmed everything near the end.

Cyclical content development also enabled the developer to maintain a high level of focus on the specific module's topic. Rather than shifting from creating lecture slides for Introduction Part and Disorders to slides for Treatment and Rehabilitations, the developer fully focused on finalizing all incorporating components (lecture, interactive activity, quiz) for the specific content area, allowing for smoother content transitions within individual modules. The developer also highly recommends future content creation projects take a similar approach if interested, as it may be difficult to constantly switch otherwise.

2.2 Prioritization of Hip Focus Areas

Once the course developer had decided on a cyclical content development process, it was necessary to determine what exactly the course themes and content would consist of and in what order they would be presented. In the early phase of development, thought was given to make the course interdisciplinary using the physiology, kinesiology and Biomechanics of hip joint movement. But since this course is targeted to k12 school students so there was a doubt if content would overwhelm the learners at this stage, they might not have capacity to understand Biomechanics and Kinesiology as it does not align with syllabus. So the developer centered the course areas into three main sections: Introduction to Hip Structure and Function, Disorders associated with Hip Joint, Treatment program in case of any disorder excluding the biomechanics part. In order to align the course content with Bloom's Higher Order thinking and to infuse the learning by doing approach; developer added one PBL activity in the end module. This PBL activity will engage the learners into team-work, critical thinking and problem solving tasks. That is the main objective of this project.

2.2.1 Hip Structure and Function

Research and news articles show that rural populations (of various ages) on a large scale suffer with Hip Joint pain (Deshmukh et al., 2014). It is also an important topic in primary schools, so knowledge on this topic among the younger generation would be essential. They may help someone in their own families by offering primary care at the initial stage.

2.2.2 Hip Joint Disorders

After understanding the complete structure and working of the Hip Joint. Next objective was to understand all the possible causes that may hinder or stop proper functioning of the Hip Joint. Most often people ignore initial pain and it gets worse over time. If they know the causes in detail, they may take appropriate action by modifying lifestyle.

2.2.3 Hip Joint Treatment and Rehabilitation

This would be the most important module of the course content. This would benefit the learners (of any age), it works as a complete manual towards ongoing problems and takes informed decisions.

2.2.4 Applying the Hip Joint knowledge to the Shoulder Joint

Human muscle anatomy suggests that Hip Joint and Shoulder Joint comes under the same category of joint and its function is quite similar. Hence it makes sense that by offering little guidance, students should be able to define the structure and function of the Shoulder joint on the basis of Hip Joint. Objective is that students stretch their problem solving skills by applying learned knowledge to a new scenario.

4. CANVAS AS E-LEARNING PLATFORM FOR CONTENT DELIVERY

While doing research work about E-Learning platforms, developers had to make multiple transitions, it started from Edx then Udemy and finally ended on Canvas. During the developer's research it was found that other two platforms do not have inbuilt support for peer discussion and integration for live one to one session, which is the backbone of effective online classroom (Kennedy et al., 2014; Acosta, 2015; Lockman et al., 2020). Canvas does support most of the key areas (multimedia support, discussion board, teachers presence through announcements, tools for live lectures, social media integration etc) as described in Bosch' framework (Picciano, 2021), required for an effective online/hybrid classroom . In the process it was also found that Canvas has many third party integration tools for various purposes, one of such tools is Canva (graphic design tool) that really helps you design attractive and interactive quizzes and projects. In the recent development, Canvas also offers small sample module suggestions by offering interactive contents on various subjects, which is easily imported into your dashboard, that is a great way to explore while designing course contents. For higher education and adult learning, one may consider Udemy and Edx as well, however developers feel that for school level curriculum Canvas should be considered as top priority.

3. IDENTIFYING MODULE STRUCTURE

Each module (named as sections in this project) of the course had nearly the same structure except the last module that is a PBL activity. While designing the structure, focus has been kept on the subject concept, individual task, and project based collaborative team-work among peers that leads to critical thinking, communication and problem solving skills (Zahrani, 2015; Bereczki et al., 2021; Li et al., 2022). Video lectures are the main learning content, as research suggests that video content remains longer in working memory and it involves more sensory inputs that leads to better learning (Shams et al., 2008; Rudd, 2014).

Website links and text PDFs are also attached incase if someone is not comfortable listening to videos at any point. First, an about 10-15 minute lecture (divided into multiple parts) is given on the essential concepts for that particular focus area. From a Bloom's Taxonomy perspective, this is equivalent to the lower two levels of remembering and understanding. As each module progresses, the course moves to the higher levels of Bloom's Taxonomy (Athenassio et al., 2003; Bereczki, 2021,) through interactive individual quizzes, short answer type quizzes and team-based activities. In the last activity, students apply their knowledge from the lectures to a new similar situation and create a presentation working in a team (Bloom's higher order thinking). Finally, at the end of the module students take an individual Post-test that is to measure their understanding of all concepts learned. This test may help instructors to identify individuals who may still need assistance with the lesson. Complete structure of each module has been designed and sequenced keeping Bosch' Integrated Model of Online Delivery Framework (Picciano, 2021).

4. DESIGNING ASSESSMENT OF STUDENT PERFORMANCE

With any educational endeavor it is essential to ensure students are grasping concepts on an individual basis. In addition to demonstrating their knowledge through team-based activities, student progress in this course will be measured individually through two types of assessments: pre/post-testing of concepts at the beginning/end of the course, and quizzes (multiple choice and short answer) incorporated at the end of each lesson. Before the very first lecture of the course, students complete a pre-assessment. This is essential for allowing instructors to establish a baseline of student knowledge. The pre-assessment begins with an objective of knowing how much a student is ready to start with actual modules, however it will be a non-graded item. Each topic concludes with a mini quiz consisting of 3-4 multiple choice or short answers questions. The Objective of switching between multiple choice and short answers is to test student's recall,

reflect, and comprehending skills (as described in Bloom's taxonomy). After submitting the quizzes, the students receive instant feedback on their progress including explanations of correct answers. Past studies have demonstrated that real-time feedback not only improves students' understanding of course material, but significantly reduces teacher workload as well (Matthews et al., 2012). Additionally, reducing teacher workload through real-time automated feedback is essential for ensuring adoption of the course at scale.

5. FILMING AND CONTENT PRODUCTION

After each lesson and team-based activity was outlined and developed, presentation of the content was recorded with voice overs using Filmora. Although peer feedback has indicated the voiceovers may be slightly hard to hear at times. Filming and voiceover of each lesson was generally completed in an average of 1-2 takes, and the course developer found it beneficial to have a lesson script developed prior to recording. After the lessons were recorded in the local language, English subtitles were added using Dubverse AI enabled software so it could be accepted in a broader audience. Once all the tasks are completed and downloaded into local drive, it is uploaded to YouTube, in order to cover all the contents of the course, about 50 minutes of video content were produced excluding the Quiz and PBL activity. The YouTube videos were then integrated with a content development platform (Canvas) to associate with the quizzes and other parts of each module.

6. RESULTS (CONTENT PRODUCED)

6.1 Section 1: Introduction to Hip Joint & Its Movement

The developer has presented this topic in a single module keeping the most important elements in mind; namely muscles, ligaments, nerves and arteries helpful in hip movement. Materials have been presented in both forms (text and video). Looking at the visuals, students' should be able to understand how these

elements help in overall working of the hip joint and interdependence to each other. After covering the basic structural component, students are exposed to a short quiz that is intended to reinforce the lecture contents.

6.2 Section 2: Hip Joint Disorders

Similar to the first section, one study guide has been provided for text readers that details all the disorders. Then disorders have been categorized in two broad categories namely; Accident or Sports Injury and Arthritis. Both categories are discussed in detail in the following videos. In this section, two quizzes have been placed which are targeted to help students in deeper understanding (learn, remember and reflect) of lecture content.

6.3 Section 3: Hip Joint Treatment & Rehabilitation

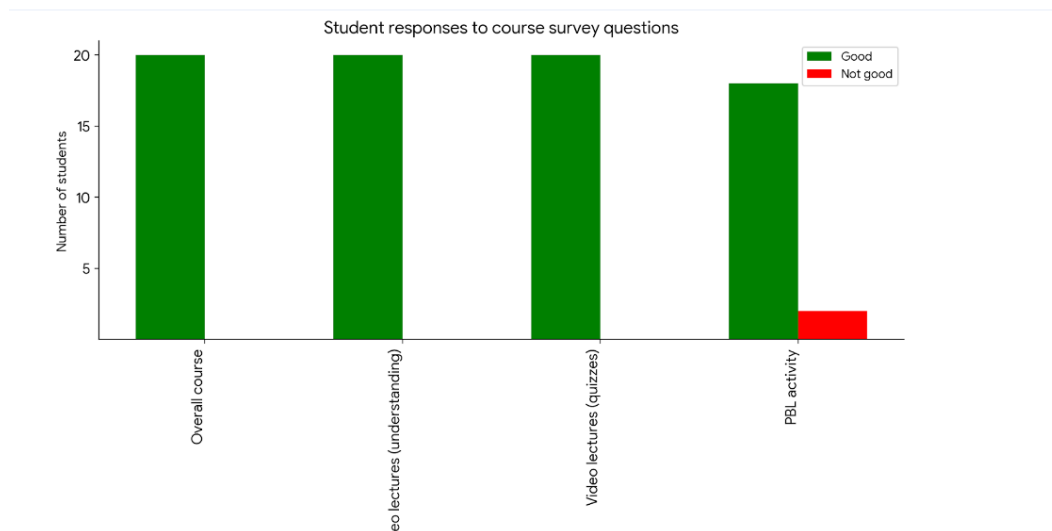
Treatment options have been divided into two categories; Surgical Treatment and Non-surgical Treatment. Within the categories, arthritis and sports injuries will be discussed with the help of animated video lectures. Non-surgical treatment is targeted to the mass population where they can heal their problems only by changing lifestyles (diet and exercise). Non-surgical treatment follows a standardized synchronous course sequence that would help a common person to follow.

6.4 Section 4: Shoulder Joint VS Hip Joint

This section is solely devoted to learning by doing (as suggested by constructivist framework) (Hein, 1991). Students will complete two activities (can be done individually or in a team) where they will be challenged to think creatively and come up with a complete solution and then present it to the teacher and parents. This section will be followed by a post-test, which is intended to understand the final learning outcome of each student.

7. SURVEY REPORT ON COURSE CONTENT (WITH ACTUAL STUDENT IN CLASSROOM)

As shown in Appendix , five questions were put before the actual students after running the demo of the course. Questions were mainly targeted to know the student's interest level towards the content and what benefit it may have on their learning.



8. DISCUSSION ON SURVEY RESPONSE

This survey took place among 40 students inside the class so it is quite limited in terms of broader application of the course content. However, in the context of this project, it is solely developed for a given school and by going through survey responses it seems they are interested in such a hybrid approach. The first four questions were specific to their feelings and understanding about course content and effect of video and multimedia use, all of them agreed that it is a great approach. Last question was targeted to PBL activity where we got mixed responses. It is assumed that either they did not fully understand the use of it or they don't have good vocabulary to describe their feelings. Discussing with the

physical teacher in the classroom, it came out that they were very excited to do such project work.

9. FUTURE WORK

There are two main domains where more work is needed in future; a) Modify the course contents by applying the concept of Mastery Learning (as discussed by Khan Academy) and Adaptive Algorithm. b) Verify the course content by applying more rigorous statistical methods (for example; T-square test etc) with a broad audience.

In this course, the developer presents the same content to all the students (fulfills the objective of this project) but looking at recent advancement in education technology, it would be more appropriate if presented content is adaptive to individual student's capacity and gets them to mastery level. So each student follow a particular track based on his/her cognitive ability.

Survey data collection must be real-time and should come from the system itself (through student interaction), that way it will be less prone to human biases and misinterpretations.

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