**Making Learning Engaging Through Interactive Games**

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**Interdiscplinary**

**IIT Madras**

**Week – 04**

**Lecture – 1**

Before I start this video, I would like to share that I've had a good fortune of working with Dr. Preeti Aghalayam who is in the Department of Chemical Engineering at IIT Madras for a three year period in doing this course on Let's Play to Learn. It's an elective course offered under the GN category at the IIT Madras. Preeti and I wanted to explore the possibility of play and games and interactivity coming into classrooms. Both of us felt the need that the traditional lecture-based methodologies that have been going on for ages is not resonating with the young learner.

We tried using various different tools, both of us collaborated and we taught this tool and Preeti also not just taught this course but also applied it in her classes. It so happened that the year 2020 was the beginning of the COVID pandemic and the classes had to turn online for a very significant period of time, maybe about one and a half to two years. And all the more, it was more needed because at least in a classroom, one can see the students, gauge their sense of how active they are listening, what is the mood of the class, etc. In the pandemic online environment, it was so difficult.

Many people may not even turn on their videos. There could be network connectivity issues even if they are, if the classroom sizes are large, it is going to be a significant challenge. So, this proved to be a very good ground for doing these experiments. Luckily, we tried out a lot of online tools, which are actually, which you have seen in the course, that have been explained in great detail. So let's have Preeti share her experiences.

She also got to present these in an AICHE conference which is American Institute of Chemical Engineers conference and really it was a joyful learning of three years. So let me play on the video now and I'll share my insights too as she recites. Hi, welcome to my presentation. Just start sharing my slides. I'm Preeti Aghalayam.

I'm a professor at the Department of Chemical Engineering at IIT Madras. And today it's my pleasure to be speaking with you about some experiments we've done in the past couple of years on teaching process calculations. I've worked on this with my colleague,

Kartic Vaidyanathan, who also is an instructor at IIT Madras. We've called this presentation Old Wine in a New Bottle. Hopefully it's evident why we've done so as we go along.

Just a little bit of context setting. We're teaching the undergraduate process calculations class, and the main elements of the context we had with this class was that we were teaching first year undergraduate students. This class was completely online. And one of the things admin told us about these students is that given the pandemic, the fact that this has moved to online, students are in different parts of the country taking classes from homes and so on. They have been really stressed in particular about exams and evaluations, and if it's possible to do something about this without compromising on learning.

Furthermore, because of the pandemic and lockdowns and so on, this semester was going on a very compressed timeline. All the 50-odd classes of the semester were really packed into a smaller period of time as well. So this was a little bit more of a challenge as well. Given this context, we set out to really make sure that we went after an engaged and energized class, despite the fact that it was completely online. Apart from these situations, it was a regular course, you know, as a usual part of the standard and required component of a chemical engineering curriculum.

We use a standard textbook. I'm sure most of you are familiar with this as well. And I've put this big number in the center of my slide to tell you the number of registered students we had in this class, more than 100. Very large class, basically, and that brings its own challenges. The design elements that we went after for this course was one that it should be really interactive, that we need to really hear from the students.

We wanted to make sure that this entire course was sort of split into small bits so that the stress levels of students are better managed and that there's bite-sized learning is what we called it. We also wanted to make sure that there was good peer learning with interactions amongst the students also. Finally, and probably the most important, I would say, or at least the most different, is that we wanted to be really open to feedback and also have students reflect upon their learnings at the end of every class or at least at the end of every week. So this is, I put an old wine bottle carafe over here in the photo, but we thought that these elements sort of make that the design of the class old wine in a new bottle. A quick question for you, audience.

Although this is a recorded lecture, you can participate in this anonymous poll. I'll keep it active. The question that I want you to answer is, what percentage of students do you think are willing to answer questions in online classes, even if you pointedly ask them,

call them out by names and so on? You can participate in this poll by going to slido.com and entering the code. or much more handily by pointing your mobile to this QR code.

I've already seeded some answers when I played this presentation in my network. And you can see that people have put in numbers like 10, 15, 20, maximum 30% or so. My own experience in the online class was also the same. Never more than 50% of the class can be expected to answer questions, particularly chemical engineering questions. Now, not sure whether this Slido poll is still open, but if it is open, please do scan your QR code and answer.

Otherwise, you get a sense of the percentage of participation. I am sure there is a universal agreement that not more than 20 to 30, at the max, as Preeti says, it goes up to 50 percent participate in any class. even if you call them out by name and so on, even if you stand on your head and so on. So given this, if students are not willing to answer questions, you ask them, how on earth can we listen to what students have to say? And here are some of the techniques we've used. And I think some of them can be really effective if you want to try.

We used a lot of online polling. When it was anonymous, students just loved it. We asked all kinds of questions. What's your opinion on Gibbs phase rule? Are you a big fan of the psychometric chart? What did you eat for breakfast? Anything like that to you know engage better with the students and I tell you hundreds of responses for any of these polls as long as I kept it anonymous and as long as it was you know felt to be somewhat fun. We also use the breakout rooms feature in our online class platform so that students could try to problem solve problems by talking amongst themselves reasonably I would say it wasn't too well received actually as my emoji over here indicates.

We built a few online games, which we could also integrate with the learning management software that we use at IIT Madras, which is Moodle. And this was, of course, they enjoyed it. We built it specifically for these students, just simple ones I'll show you in, I think, the next couple of slides, some of the apps that we used for this. And it was quite, I would say, popular with students. And we could get a lot of information you know, how the students were attempting these games, how many times and so on.

And so we felt like this was a way in which we could listen to students also. Finally, the most popular thing I would say and also the most useful from a course viewpoint were these text chat based discussion forums. Mostly we used an app called Acadly for this, but this was very, somehow students found it really handy to respond to questions on

these chat-based discussion forums, not anonymous. This was by name, but I had so many responses to questions that I asked in such discussion forums. Of course, in the design of the course, what to do about evaluation.

of course, in the design forums. So, I will probably pause a little bit here. You might have seen This being mentioned by the other faculty also and it is extremely important to focus on the anonymous nature of polling. We will probably be encountering this in at least 3-4 lectures whether we do it with students, whether with other faculty. This anonymity is extremely essential for people to open up.

Because all of us as humans, we tend to feel judged when we answer in a classroom, what will my friends think, what will my faculty think, what if we ask a wrong question, etc. That fear is inherent. It's not only students, even grown-up adults also have this. It's a human problem.

fear that exists. The anonymity takes this away. So, once I am not going to be judged on what I answer, nobody is not going to, nobody is going to know what I answered, then I am a lot more freer to express my opinion. This breakout room feature that Preeti mentioned probably in an online context sometimes it works and other times it doesn't work because and that too she was also mentioning about the large classroom so it's a little bit difficult but if you have shorter smaller classrooms and sometimes if you have a lot more teaching assistants who can monitor those rooms then breakout rooms is a very effective way the reason is learners are comfortable interacting in smaller groups in closer circles with people of similar age groups and backgrounds. So, certainly this is another powerful way to improve interactivity. Again, it has to be tried out and depending on class size and the mode of classrooms, that time the context was COVID and several other stresses might have been going on.

But in general, this works effectively for smaller classrooms and even for larger classrooms provided there are adequate teaching assistants. So, I just thought I will add in that context here. Games, of course, we'll get to see more, but definitely they add to the fun and interactive element. The course, what to do about evaluations, was the most tricky thing, I would say. And our goal was to really balance how we gave marks for effort and how we gave marks for performance.

So we kept the standard features, you know, the final exam, which they wrote individually and they submitted it. and we graded it we had tutorials which the teaching assistants would help the students with and also grade but we also had a number of small online quizzes which were also they were auto graded but they also contributed a big chunk to the final evaluation in addition to these standard things we had marks for class

participation we had marks for when the students would reflect upon what they learned through the course of the week and just fill a simple Google form and let us know what they thought. We had some marks for the games that they played on various games that we created for them and, you know, the way they played it and so on. And we also had marks for these discussion forums, which I said were popular in the previous slide. And of course, very quickly, in case you have a doubt as to why game-based and interactive learning is important.

One is that from the student's viewpoint, it feels safe. It's okay to, you know, fail in a game. Much better that than to fail in an exam. It's a huge deal to fail in an exam. So learning by, you know, Failing a little bit is very easy with games and we believe that's one reason why it's important.

Second, we always allowed the students in games that we built on platforms like Raptivity, for example, we allowed the students to have multiple attempts at the game so they could improve upon their own performance. So they become the judge of, you know, how far they need to go to reach the learning goals. Of course, it's really fun, especially this generation really fast on mobile phones and online and so on. So they had a lot of fun with this type of online games that we did for them. And also our students are very competitive and we believe that this step, what we provided was an environment where they could have healthy competition amongst themselves.

On the right side of the slide are some of the apps and platforms that we've used. Slido, which you saw an example of. Quizzes, which helps us build these really nice quizzes, mostly multiple choice based. And, you know, it has some superhero themes and so on, which kind of appeal to young audiences. So in the previous slide, I said, you know, I used, so it heavily used an app called Just to reiterate the points that Preeti made, the fail-safe factor once again is extremely important.

Now, we earlier saw that for answering in the classrooms, but in the context of even attempting in an assessment, assessment always there is a sense of judgment, have I understood enough? Instead of giving us a feedback on where we need to improve a lot of time, it could be interpreted as Why am I going wrong? Why am I not faring well enough? And mostly compared to peers. And usually in formal assessments, there is not much scope for attempting the same thing yet again. See, for example, if you take a quiz or an exam, There are several factors that influence the performance of a student apart from the preparation. It could be just a bad day or it could be a rushed up day, etc. Now, they can only improve themselves in this next exam or next quiz.

They are not going to be able to repeat the same quiz in a different environment. Now,

the games make it a fail-safe environment if it is just focused on learning. You can play it multiple times. Almost all platforms, any game can be played multiple times. And along with this fail-safe nature, allows the student to try multiple times and in a fun-filled and a competition which is healthy.

When we say healthy competition, it's like people like to play it again and again. They are not going to worry if they are going to lose this learning game. But there is a heavy, what do you say, weightage associated with not doing an exam well. However, lightweight or less weightage the exam has in the overall grading.

So, subtly all these play a very, very big role. And among the platforms listed here, just a few samples, you might have seen a few more as a part of this entire courseware. In this, I would say, Raptivity and Quizzes are interactive game platforms. Slido is more about classroom interactivity, although it offers a quiz component to it. And Acadly largely is a discussion forum and a place where you can store the courseware. Also, it offers a light kind of a quizzing environment.

So, I can't believe we are not discussing in detail in this program, but we are going to be discussing for sure. We would have discussed raptivity and quizzes and Slido is very similar to Mentimeter. Mentimeter something that we have elaborated in the program as a tool. Slido is a very very similar tool, only thing is their user interface slightly varies. So, essentially you can read Slido and to be very similar to Mentimeter.

very handy to keep all the course material organized and so on. Very popular among students also. So in the previous slide, I said, you know, I use the word fun. So people have asked me, Preeti, come on, chemical engineering, can it really be fun? I just wanted, I know this audience won't ask me that question, but I really just wanted to bring these inputs from the students which they gave in the final evaluation for the course and just highlight a few things. I got a lot more responses than this, but I just wanted to highlight a handful of them.

Interesting course, relaxing, you see the first cloud over there says. They commented on the marking scheme and said it was good. Never happened before in my life. Students said it was interactive.

One said that helped them concentrate better. One said they thoroughly enjoyed this first ever chemical engineering course. People talk about engagement and one said it was awesome. And the way the professor made this course interactive, made learning easy, which I thought was great. And also students commented on how Acadly helped them keep really on top and the short quizzes that we gave in Acadly helped them keep on top

of the material to be learned. I'll just pause here and to reiterate one more point, which comes as a part of the first feedback that Preeti read out.

The course was interesting and very relaxing. And if you see another interview with Professor G. K. Suresh Kumar, he also mentioned that one of the key components of learning is doing it in a relaxed environment. The relaxation and fun is extremely essential to learning. And the other point that is being highlighted is he also talked about formative and summative assessments.

Typically, we have most traditional courses load all their weightage towards the end. The end semester probably carries 50% weightage and there's a lot of theory to be written in a three-hour paper and things like that. And Preeti, as she has highlighted in the previous part of the talk, she's beautifully distributed by making different components of the evaluation like quizzes games classroom discussions reflection feedback and apart from the regular written exams of course because of they being in online nature it might have been simpler but essentially it's important to distribute so that overall the courses are not felt as a burdensome one and small incremental bits of information keep getting accrued to the students. Remember, she also talked about bite size learning earlier, which is one of the goals of slowly conducting and imparting the information rather than like one single big chunk of information. The pleasure of enjoying the first ever core course, teaching methods were nice, all these highlight a combination of all these factors in addition to the usage of games and making the space a fail-safe one really make it very, very effective.

Of course, that's what the students said. But in case you were wondering what my colleagues had to say, you know, many things. I don't have time to be messing around with games and polls and so on, Preeti. My students are shy. I don't know about you. By the way, Preeti, all you've shown me are multiple choice questions and really all multiple choice questions are equal questions.

And some of the topics in my course are too tough, so I don't think I can play around like you can. So to this, we had a lot of responses for the I don't have time. The tools that we recommend really make it very quick and easy. As an instructor prepares for the class, it's very easy to incorporate these interactive elements, as many as possible.

It doesn't have to be the entire 50 minutes. That's the time that we have for each lecture. In this mode, but definitely possible to do more than we normally would with just writing a bunch of words on a blackboard or showing a bunch of and so on. And I'll just comment on one more thing that not all MCQs are equal. Seriously, the gamified versions are much more fun for us and for the students as well. And there's really no good reason

to be using the same old type of multiple choice questions.

One quick comment here, like what Preeti has highlighted, the digital tools that have been taught in the course are extremely simple to set up. And yes, faculty do have a shortage of time. And that is why this entire course has not been about game building from scratch, where you will have to spend a lot of time thinking creatively, iterating, improvising, etc. Most of them are template based. Be it the digital ones or even the board and card games, very, very lightweight and it is more a plug and play.

The mechanics are already available, they have to be fitted in with the content, that is how in most cases they are. But still, if there is a challenge with time, it is best done in conjunction with TAs or for that matter, even with past students of the course who are passionate about it. Students take up to game building like fish takes to water. They really love it. And once the student knows the content, they are passionate about it, they can very well assist the faculty in building these for the next semester or the next year students.

So, that will be the faculty-student combination will be super win-win is what I would like to highlight. Among the rest, yes, as Preeti said, MCQ in an exam paper versus an MCQ in a game is completely different experience. And as I said, a game, even if it has the same content, gives a lightweight and stress-free experience to the student, which is extremely essential for learning purposes. Lastly, Preeti also highlighted that it is not necessary that everything has to be packed in, games have to completely comprise the class. Even here and there, little bits of it, 5 minutes, 10 minutes can completely transform the classroom experience.

Some additional thoughts over here. My colleagues have commented that all these fun game fair things and all that, I have heavy math in my course. I really can't put down any questions and so on. I've given you an example from my course where I used quizzes and you can quickly see some integrals and so on over there. Not a problem, quite easy to do that. On the left side, I'm showing you a snip of some of the activities we did in Acadly, a large number of quizzes.

I called them Jaldi 5. Jaldi means quick. And that's the word that I generally use for these quizzes. Five questions, really quick, you know, you sort of refresh the material that you learned in the previous week or the previous class and so on. On the bottom is the Acadly discussion forum, which can be a very heavy one. It can actually span the entire one hour class, especially in a flipped mode.

It's very easy to do these chat based discussion forums. Every question I've asked over

here and I live updated through the course of the class. So I ask Q1, wait for the responses for this Q1 and then type in Q2 into this box over here. Every question, at least 100 responses have come. And as we saw at the beginning of the presentation, 10, 20 percent of the class may be willing to answer this question if we call upon them.

But here it's almost 100 percent. So with this, I come to pretty much the end of my presentation, but I do want to leave you with one question. I want to know if you will adopt some of these techniques. Of course, I've seeded it very heavily with the yes from a few of my colleagues here. It's the same poll, actually, if you played the previous one, if you open this QR code, it would have now shifted to the next question.

So you can answer this question for me. I'll be very happy to receive your responses. It is anonymous and I have no way of tracking who said what.

So feel free to be honest. That's all from me. Thank you very much. I'm Preeti. Here's my email address and my Twitter as well. So that kind of summarizes Preeti's experience in using these tools very very effectively and she found a significant improvement in engagement. She has obviously used a combination of tools and techniques and adapted them beautifully to the class. But even if a few of them are used, it definitely transforms the classroom experience. As you would have also be hearing from other practitioners, it's not necessary that we do too many things to begin with.

Preeti, of course, has been an experienced teacher and she is open to trying out a lot more things. But for the new person out there who wants to try out, like what other faculty have said, start slow, start with one or two, even that will drastically improve the classroom experience. So, wishing you all good luck. Thank you.