Making Learning Engaging Through Interactive Games

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IIT Madras

Week – 04

Lecture – 4

Welcome GK, nice to have you here. And it is such a pleasure to be interacting with a person who has had close to three decades of teaching experience in undergraduate, postgraduate, in institutions like IITs. So, thought of having a conversation with you in terms of how the teaching learning has been evolving over the over your career span what changes have you been observing. Okay, first thank you Kartic for having me here it's really a pleasure to talk about some experiences maybe teaching is close to my heart and it's always a pleasure to share. You had asked about the changes over the past three decades, I suppose.

It's 31 years in a few days' time, first at IIT Bombay and then here. There are two aspects to it. One is, things have changed for me. A lot, because I've been learning for the past three decades, and it's a continuous learning process.

There are always things to learn, especially when you're interested in that aspect, in any aspect. So that process, I don't know whether I'd be able to completely differentiate that from how the system has changed over the past 30 years. So probably I won't be able to give a very good idea of how the system changed except based on some conversations that I've had with my colleagues and so on and so forth. A lot of people say that students have changed, their motivations, objectives have changed, and so on and so forth, which I believe is to a certain extent true, but not greatly true. When I started the facilitation of learning process, I don't like to call it teaching.

Teaching is a common term. It's more of facilitation of learning, and once we look at it that way, then things become a lot clearer. When I began at that point in time, 93, students were interested in the core area, chemical engineering, biochemical engineering, as it was called at that time for the elective and so on and so forth. So the interactions were different. And then came the late 90s when pretty much everybody was getting a coding job.

So we went through a difficult period, if I remember, of about maybe six to seven years when the interest level in students was abysmally low. And that used to show up because some of the more vocal ones would actually say outside the class that, why should I learn all this? I'm just going to take up a coding job, you know, whenever the time is done. For me, all this is a waste. So that was a big challenge for all of us to handle. Our colleagues talked about it a lot.

I was in IIT Bombay at that time. But somehow, in the early 2000s, it came back to normalcy. It was indeed a big relief to see the interest level come up back in students again for the domain area at that point in time, chemical engineering, biochemical engineering. Students wanted to pick up principles of chemical engineering. Apart from that, in terms of students first and then probably in terms of facilities and so on, in terms of students, when we were students, there used to be some people who did not have to put in too much effort but were very good in many different things.

I used to call them genuine toppers. I used to look up to them. I used to look up to them to learn their thought processes. I was quite naive in thinking that if I pick up the thought process, I'd be able to do. No, that's a different aspect altogether.

That number has gone down significantly. You don't find, maybe there used to be about 10 in a batch earlier. I don't think we have that many. Here, more of putting in the hard work and picking up things and rarely you come across a genuine topper, so as to say. Apart from that, I don't think much has changed.

There's always a distribution in anything related to students. And once we keep that in mind, everything is within the distribution over the past 30 years at least. My time period is very small. 30 years, I don't think so. In terms of facilities, yes, it has gone through significant changes.

In the 90s, there was not much money that was available in the system. Earlier it was teaching through those OSP slides and a lot of strategies and how to communicate well, show part of the slide at a time and so on and so forth. Although PowerPoint presentations were in vogue for conferences and things like that. And slowly that came into the classes, the PowerPoints, and then along with it came the death by PowerPoint and so on and so forth. All those were arguments around.

And then the facilities improved. They made it easier to communicate better. I think there was a sea change in the facilities that were available. If you look at the classroom of the 90s, a typical classroom of the 90s, versus a typical classroom today, it's much better equipped to do various things of, so you can pick and choose the strategy, you have a lot

of options to implement those strategies and so on and so forth. That I think would be little.

Okay. Yeah, you, thanks for that. And I think you have brought about the, from a facilities perspective, the student learner perspective and probably the domain perspective, the market related changes, while they are certainly important in What I thought I will pick on is things you spoke about, which is about, there is another dimension, late 90s to 2020 is also a tectonic shift in first the internet, then the email, then the mobile and then the smartphone and social media, all of these are playing out in the field and Today, it's an age of, in one sense, we have a plethora of information, readily available information of all kinds, videos, tutorials. Content used to be a challenge. Really good books used to be a challenge in the 90s. Now, it's the reverse problem.

It's the information overload. What information to look for? and there is also an age of distraction. So, is that having an impact from a student perspective, learning perspective? That is what I thought I'll.

.. Certainly, yes. The student perspective, learning perspective, because they are growing up with it. In certain ways, it's natural for them to be, to respond differently to all these distractions and so on, so forth. Maybe they are comfortable with it. We are not comfortable coming from a different generation, things like that. Every time something came up, my thoughts were, how do I use this? For example, there was a time when I used to think, how do I present this in the most suitable form for them to pick it up quickly? Because the attention spans were supposedly becoming short.

I don't know for sure, but supposedly becoming short, going by a lot of articles and so on and so forth. So my thinking was, how do I present this so that they can pick it up this way? Very recently, ChatGPT came up and with that came in a lot of other concerns. Whereas my thought was, how can I use this? And then about a year ago, I think a few months after it became popular, we actually played a game with it. And a huge learning experience for students. The game was find out the error in what ChatGPT is telling you.

Related to the subject area, which was reactive species scores. In that subject, have a conversation. This was probably about two-thirds of the course having completed and so on and so forth. They're getting into their exercises and things like that, semester-long exercises. At that point in time, they had enough knowledge.

So they had to have a conversation with ChatGPT and figure out where it went wrong. And it was a fun class, a game class. So they shared what was going wrong and saying this. And at that point in time, ChatGPT was quite evasive. Now I think it's become a lot

better.

And that was fun. The fun aspect comes in. I also believe that the learning environment has to be fun for it to be the most effective. That's what I very strongly believe. So from that point of view, when I start seeing these things, the thoughts have been, how can I use this? Yes, there are big challenges. How do I pick out whether it has been written by a student or written by this thing? Yes, that was a challenge.

But now I think all that is settled because my students actually said at the end of the course, when I asked them, they said, we cannot use ChatGPT for anything we do in IIT. So then it was a big relief. The students believed that way. They didn't say just for me. It was actually a regular conversation offline conversation.

So I tend to believe that particular thing. So yes, there are challenges and I think that is the way life is. If we can view those challenges in a way to overcome them, look at them as challenges rather than as impediments and look at ways to overcome them, I think that would be a good way to, a positive way to look at them. And after a while, you realize these big tectonic shifts, you cannot do much.

They are there. You can keep complaining, but I don't think that's going to solve it at all if we want to stick to our old ways of doing things. So if we change with them, figure out ways of changing with them, this is a profession where you can be highly creative. And that's in fact the fun in doing this. So that I think is the way I have handled it. But there have been a lot of difficulties by people for a certain time till it became clear that, okay, we can live with this kind of thing.

There are ways to live with this. Good, very nice, great perspective. Embrace the changes and shifts that come along and use it to our advantage. And specifically, I will probably pick on two, three things that you mentioned. Learning environment should be fun and usage of games. Can we go a little deep into that? From two perspectives, one is you as a person who is trying to constantly innovate and improve the teaching learning process.

Secondly, the second dimension is a lot of people view undergraduate, postgraduate education and that too in a premier institute, games somehow have been seen as opposite of seriousness. Are we missing out on serious learning? So, from both these perspectives, I thought I will take your inputs from your experience. First, let me answer the last part of it. I was also a person who thought that things need to be serious until I realized that our avenues of learning here are much more when the environment is fun compared to it being serious. Serious, there's a focus and you're pretty much not willing to deviate from

the focus.

That itself kind of constricts the learning opportunities. And there's a serious feeling that goes along with it. I'm a strong believer that feelings have a lot to play in the learning process. So You know, when you play a game, there's so much you learn without realizing that you're learning.

That, I think, was the attraction. There were classes when I struggled to keep up student interest. I would feel it. Students probably didn't feel it much, but I would feel it. And I was always figuring out, constantly looking for ways of alleviating it. In my other course, the transport course, there's a lot of math, and I can keep them engaged with the math in terms of asking them to do a few steps, me going around, and then filling in the gaps and so on and so forth.

So it was an engaged class. It was active learning pretty much throughout. Here, that, I mean, information giving, how would I make it interesting enough for the students. I want every class to be a reflection of a slice of life. That's what I believe in overall. And certainly I want every class to be as effective as possible.

And that is where I was coming from for that particular difficulty that I had. At that point in time, you had become a part of IIT. Siva, I think, had sent out a mail to the dean students at that time that there is a lecture on game-based learning. I said, wow, this might work. And that's how I attended the lecture in the dean's conference room.

And then we started discussing. You had started out some programs on developing games for learning purposes. I was going to teach the course. I had a TA who was assigned, the student who just graduated, Krishna Priya. And I told Krishna Priya, you're going to be the TA for the course. Your only job is to develop two or three games for the course.

And I sent her to you. So she went through your program and she developed board games, I think, and then some card-based games, which were what was covered in that particular aspect of the course. And then she brought it. The first time we played the game was a huge success i think we have some videos of that and so on so forth you have some videos there's some pictures videos which is sent every single day I'm gonna make something great. That's my, that's my way It was an eye-opening thing. Everybody's face had lit up when they were playing the game.

And that I hadn't seen ever. That was a big revelation for me. And then, obviously, Krishnaveni had developed the games, the board games. We started improving on the

type of games and so on and so forth. More of online aspects came in the later years with quizzes, with the leaderboards and things like that.

It was a lot of fun. By the way, I'm just coming from a class where we played a game. Today was a game class in the reactive species course. I said I will mention this in the interview. And in the feedback that I received, anonymized feedback by the class rep from others, one of the students wanted more games.

Okay. So it tells you in the kind of response that the games have. And every time I kind of close it with, you realize how much you've learned from this so that that is not lost. I don't emphasize that. I don't push it down. But I kind of make a statement so that that connect is made, the learning and the game and so on and so forth.

In the environment of a game, they've picked up a lot more. They've appreciated the course a lot more. And that's how the equations are designed.

And no marks. That is very important. No marks. You bring in marks. I do some flipped learning. And we are in the process of flipped learning.

I give some papers. They read. They come back. And as a part of flip learning, you know, the incentive, 10-minute incentive is a must to make sure that they learn. And that somehow brings in the competition. And I couldn't submit this. That tension that comes along with it.

And that carries 10% of the grade. That's it. Just to make sure that they read. And every time I tell them. But you bring in marks. That's a good carrot.

At the same time, you must use it appropriately. It can get in the way of learning, is what I believe. So, coming back to this, just to finish up the game part of it. So, probably from 2017 onwards, if I remember, 2017-2018 onwards, games have been a part of my courses, thanks to you. And I took it to my other course also.

Huge appreciation by the students. Simple games. Crosswords. I set up the crossword. And then I realized that there are sites that set up the crossword for you. You just need to give them the words and the clues.

They can go and do it. And then you can make it a game. You can have leaderboards in that for quizzes and things like that. There are various ways. So now most games are online. The card games are a little more difficult to organize in a class. So online, everybody has access to a cell phone and Wi-Fi and so on and so forth.

So this works now. It was difficult for that to work in 2018. Because the Wi-Fi was not that great connectivity. And the cell phone access was not that great. It was okay, but it was not that great. So now we don't even think about it. Earlier we had to ask in class, does everybody have a smartphone? We do not ask that question anymore because that is taken for granted.

So, things have changed and we have kind of changed with that without even realizing that they have changed unless we start talking like this and so on so forth. Got it, got it. So, this is very nice to be open to the idea and actually trying out and seeing results and continuing it. So, you have done all of that.

You mentioned, I will probably pick on one aspect that you mentioned. When we are serious, the learning stops. Or at least it was highly limited. Highly limited. And there is also another aspect you mentioned about assessment.

Assessment, again, is correlated with seriousness. Assessment is a learning blocker rather than a learning enhancer, which is what it was supposed to be meant to. Traditionally, it has been meant as a checkpoint on how much a student has understood or learned.

But it is having an opposite effect. Yes. Because people are too much stuck to it. So, I thought I will probably request you to elaborate on that seriousness. It is also quite a recent piece of work of mine on these thoughts. These thoughts are a little radical and therefore, I did not want to write a formal paper on it. But I wanted to put it out because I have been thinking about it for the past almost 30 years.

That is what I realized. All these kind of tie up with that. Then an opportunity came in terms of an article for the Times Higher Education newsletter, their magazine, I think, where I wrote about, at an appropriate time, wrote about formative assessment. There are tools available. Education is a very old field, many centuries old.

So people have done a lot of research. People know what works. There is evidence-based aspects of many different strategies, which is the basis for many different strategies. So in formative learning. Traditionally, people think it is for checking whether people have understood and so on. But finally, bring it down to all summative learning, whether it's a three-hour exam, two-hour exam, whatever it is.

Where people answer a set of questions and they are graded. I very strongly believe that summative assessment, especially in the IITs, are tests of competition rather than tests of

learning. I very strongly believe that. So that has been bothering me ever since I started teaching. But there is a system in place, a system which believes in summative assessment. Luckily, one of the positive outcomes of the pandemic has been that you could try out various things which were not acceptable earlier, but which, you know, you couldn't do anything else during the pandemic.

So I brought in a lot of formative learning. My entire course didn't have any exams. Okay. So, but they have, their grades are based on semester-long exercises. A couple of them, not only one. And some small credit is given to these tests and things like that.

Works very well. Students liked it a lot. There was one, I'll tell you this story. There was one M.Tech student of mine who had taken the course online because of the pandemic. And then she came to, she asked me for a reference letter for DAAD Fellowship.

Shakuntala is her name. And she had done well in the course. I was happy to give. She went to Germany, came back and a rare kind of a gesture. She came in with a bag of sweets. Very nice gesture, coming back. And then I had an hour before class on that particular day.

So I asked her to sit down, talk and so on and so forth. She said, I liked your course a lot. Good, thank you.

But do you know why? She said, because I didn't have any exams. She was a topper. Wow. Okay. That was a big surprise for me. I said, Shakuntala, you've done well. You know, in the course, which didn't have exams, which had exercises and projects and so on, so forth, creative projects.

And then she said, yeah, I can do well, but it puts me under a lot of pressure. I don't like that. In your course, I could learn and I could do well without feeling that pressure. And that kind of opened up and that was also one of the main drivers for this particular article. And this where I make a case for the grade to be given on the basis of formative assessments rather than summative assessments.

That's what I do now for my elective course. I have only semester long assignments. I kind of say that this is equivalent to your end semester exam to be as a part of the system. But they're all, they're not three hour closed book kind of courses. Even during the regular times, right from the beginning, my exams are always open notes. Open notes, open book, whatever, so that they don't have to memorize. But still, even with that, and also you can take them to a higher level of learning with open notes kind of exam.

That is the motivation there. But even with that, students were going through quite a bit of challenge. But this from a topper, that too was eye-opening. That is what formative assessments can do. So, in fact, I remember having seen in the new education policy also that the recommendation is more towards formative assessments and you can have more of those and on a continuous basis rather than expecting them to remember it all in one sense and do it in a three-hour period. And this can be a combination of both fun filled game based learning as well as where it's purely as you said, take away the marks, take away the marks.

We need to have such moments to enjoy the class. And even if you are assessing, it is not going to be heavy on your mind and heavy in terms of the weightage. You are just going to be assessing one part. In fact, one of the things they say in game-based learning is feedback is instantaneous.

When you play a game, you quickly get to know in a non-judgmental environment. Exactly, yeah. Non-judgmental environment. And these are things that correlate your, make studies fun and less serious. I mean, the seriousness should be translated into curiosity.

Serious is not as in pressure kind of a seriousness. Curiosity builds that intensity and thirst for learning. That is what all these in some way. I agree. And this approach of promoting curiosity and so on and so forth, even at the school level, would bring into the fold a larger number of students who kind of tune out because they are curious, but the system wants them to be a certain way and kind of they miss out. And again, there's reinforcement that they don't do well and therefore, teachers don't pay too much attention to them and so on.

Even teaching, it's a skill-based thing. It's a talent-based thing. There is a distribution. You cannot expect everybody to perform the same way. There is a distribution which is natural. You cannot do anything about it.

So, if the people can be told these things, probably they can keep this in mind and bring them in and so on. Sure. And this is a very, very relevant point that you mentioned. It is a graded thing. Everybody is of a different nature and curiosity has to be brought in earlier in life rather than being assessment based. One of the things that people who look up to this field, some people are averse to it or probably still getting adapted to this mode of fun-filled learning.

Some others expect a real high sophistication in terms of games, etc., simulations. In your experience, you mentioned crossword, simple quizzes, board games. I think you

have seen tremendous results even with these. One does not have to be necessarily sophisticated. What is your view on that perspective? I think it has to be some sort of a mix. If you need to take the effectiveness of game-based learning to a much higher level or to much higher levels of the learning taxonomy, much deeper levels of the taxonomy.

I've been thinking about it a lot. These, see, if you use games for reinforcement of material learned, that's also learning. That's important learning. People don't realize that. People think only if I am able to solve problems and things like that, it's learning.

No, the information is also learning. So for all those, in a fun thing, you can set things up. I think a lot more effort and creativity is needed to set up things to impart the deeper learning skills. I think they can be done. I don't know how as yet. I am thinking about it as we speak.

In fact, yesterday, today also, this morning also, I was thinking about the same thing. But I haven't done that as yet. To a certain extent, yes, but not very deep as yet, directly from game-based learning. If I get to do that, I will certainly let you know. Sure. No, the context, I mean, I know definitely you are experimenting and trying out new things. The angle with which I asked was, even reinforcement, even revision, creating that fun-filled environment, making the people try it out again and again, all those can be enabled by very simple infrastructural investments.

Yes. Of course, there is definitely benefit in higher order sophisticated simulations. The one challenge that might happen and probably with time even that may become cost effective and effortless, maybe 5 years, 10 years down the line, more advanced technologies AR, VR might evolve. But even in today's context with whatever is available, can bring in those other dimensions with whatever is available. That is what I was trying to come to. Even this kind of shifts the classroom environment to a higher level of interactivity, even with the simple methods.

And the contrast makes it very nice for the students. Whenever they experience this, they do not experience it in many other classes and therefore this So, it shows up much better, the learning is much better and slowly if it goes on to many courses, then the learning environment itself becomes much better, I think. Was there a question there? No, I was just trying to come to the, I mean with available infrastructure, it is helpful to get started and as technologies and other things evolve, we can leverage them.

Definitely. If you are able to see how they evolve and so on and so forth, probably you can have some thoughts. I don't. I go by what is available. Available. Yeah. No, I think the most important thing I wanted to emphasize and highlight is it's important to leverage

what is available.

Even that is probably going to shift the level of classroom interactivity by a significant notch. Certainly. Definitely. That is what I was trying to say. Even a simple crossword, people are very happy. Students are very happy. And that video, I think if you include, it'll show that they were playing a dice game, right? That, you know, the level of engagement, the level of happiness in students' faces, playing that, the first game that you recorded, that I think shows that it's being very effective.

Bring in the needed ethos into the environment. Yeah. So, yeah, definitely. And another question I had was, are the students more participative when we create such an environment? As in, do they open up? Do the people who usually do not speak up much, do they open up a lot more? Is there a lot more participation in the class? Have you seen that, any trends around that? There is certainly a lot of participation because everybody is asked to just play. There are no marks.

This will help you learn when to try. And I've not had an instance where people didn't participate. They participated. And in terms of people who are reticent, yeah, their reticence level went down, I would say, in terms of the interaction. Noticeably, certainly.

But whether they came up to levels of effusive communication, that I don't know. I don't think so. I haven't seen that. But yeah, it certainly improved. The participation was 100% all the time. There's not been a case when people decided not to participate. Okay. Yeah, that is what I mean, small nudges because the classroom space is made what they call as fail safe, right? I mean, it is non-judgmental, fail safe, unfilled and naturally there will be a positive shift across the board.

Of course, the extent to which is not something we are interested in. We are trying to Enable that environment for the students. That is the main thing. It will have varying extents of impact. But previously, when a teacher were asked to, were asking that same question in front of the class, very few people will speak up.

That strategy, I think it didn't benefit many people. Fine, it kind of got the teacher going because there was a response. I used to say this. Most of us, when we go to teach, we talk to people, then we get feedback in terms of nodding heads, whether they understood it or not. Some people would just nod their heads, whether they understood it or not, and so on and so forth.

That would keep us going. And then we give exams. We are very happy with the people who did well and we completely forget people who didn't do well.

And that would have been the majority of the class. We are kind of stuck in... Because we were good students and most faculty would have been good students. That's why they probably came to this profession. If we expect our students to be our own way without realizing our classes themselves were a distribution of interests, abilities and so on and so forth, that is the problem. I think, what is it? I lost my train of thought here. What is the question again? No, the idea is how do you make more people open up and be a part of the class? I mean, that is exactly what you were highlighting.

A teacher should make the space conducive in whatever form, games or other interactive Just create a judgment-free fail-safe space. That's the key for creating a conducive learning environment. And today we realized that the, what shall I say, not so good aspects of competition things and so on so forth is brought into the game. They play it with competition because they need to win. And that's a nice environment to let out all those or to even develop all those skills which are needed in the real world, in the competitive real world scenario, if you want to say that.

So, it has that aspect. I said, take out all your competitiveness in this because in the course, you're not going to face this. So, that is what. So, it brings in that also. Nice environment of games. So, thank you.

Thank you very much. Before any, before we close, I thought I will ask you, if someone were to want to get started in this approach, just try it out. What would be your, some pieces of advice based on your experience, just to get them started? Let me at least split the group of teachers learning facilitators into two, one who have an orientation, one who don't have an orientation.

That's reality. That's reality. The ones who have an orientation will anyway try it. So, let me not even go there. The ones who don't have an orientation, I would say, Please be exposed to these. I have a course on NPTEL Effective Engineering Teaching and Practice along with our Teaching Learning Center, Prasad and Richav, providing some input and so on and so forth. There we talk about a lot of evidence-based techniques that are known to improve learning. We have presented many and we make it clear that you don't have to try everything. Pick out one that vibes with you that is important okay whatever comes easily to to you whatever you think would help all of them will help because they're all evidence-based so pick out one try it out pick out another try it out and not for the entire course but a small part of the course see how see how it works for you if it matches your personality try it out a few more times And then pick out another one.

Try it out. Similarly, games start out simple. A lot of conditioning is needed in terms of

waiting for responses and so on and so forth, in terms of not expecting to talk continuously, which is a problem for many people. They want to talk continuously and so on and so forth.

Here, you're silent most of the time. You're observing, you're getting input, you're making them work. So that calls for a lot of silence from the teacher. So try to develop those and keep trying these. See what works. And anything that you choose will certainly work.

Will be better than what it was without it. So that way you start out slow and once you are convinced, you pick up whatever you want. If you are convinced. That's what I would suggest. The ones who are oriented will anyway try it out. And the only suggestion is don't make the entire course a certain way.

have a good variety of techniques for improving learning and try out a few at a time. Great. So, thank you so much for sharing all your experiences and thoughts. It will be very helpful for the teachers out there.

Thank you very much for having me here. It has been a pleasure talking to you. To talk about these things is always a pleasure for me. Thank you very much. Thank you.