

**Designing learner-centric e-learning in STEM disciplines**  
**Prof. Sahana Murthy**  
**Interdisciplinary Programme in Educational Technology**  
**Indian Institute of Technology, Bombay**

**Lecture – 04**  
**E-Learning in STEM: Overview**

E-learning is ubiquitous today. We hear the news that the advent of information and communication technologies has brought a revolution in teaching and learning. We see E-learning in schools and colleges, in MOOCs and corporate training sessions, in large scale government projects and many other places.

(Refer Slide Time: 00:38)



The slide features a green header with the text "E-learning is ubiquitous". To the right of the text are four circular icons representing different aspects of e-learning: a person at a computer, a group of people, a gear, and a document. Below the header is a list of benefits of e-learning. At the bottom left is the NPTEL logo, and at the bottom right is the text "Learner-centric Design of E-learning".

- E-learning is ubiquitous
- E-learning has reported benefits
  - Efficient use of resources
  - Provides anytime-anywhere access
  - Engages learners via interactivity

NPTEL Learner-centric Design of E-learning

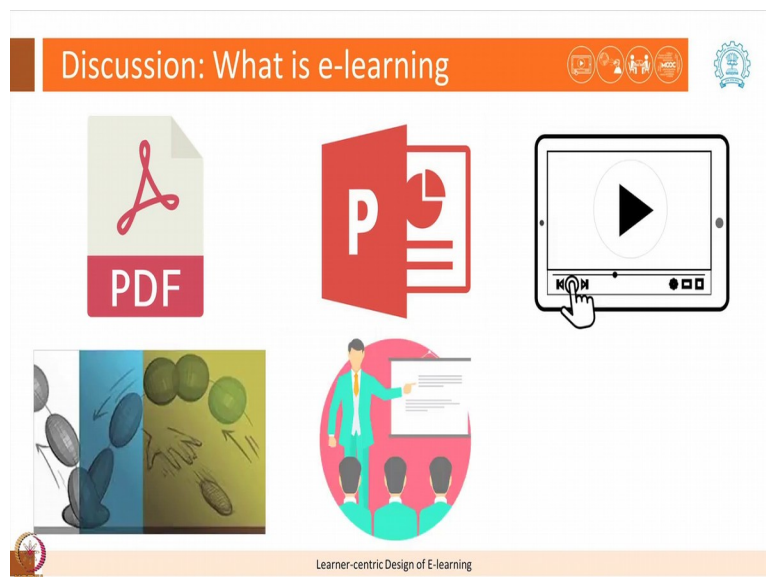
We have reported benefits of e-learning some of it is about saving time and money and resources, but going beyond this efficiency metric E-learning is also said to provide anytime anywhere access in systems that are easy to navigate by students. E-learning is said to engage learners via interactive tools and we hear many other such reported benefits.

(Refer Slide Time: 01:13)



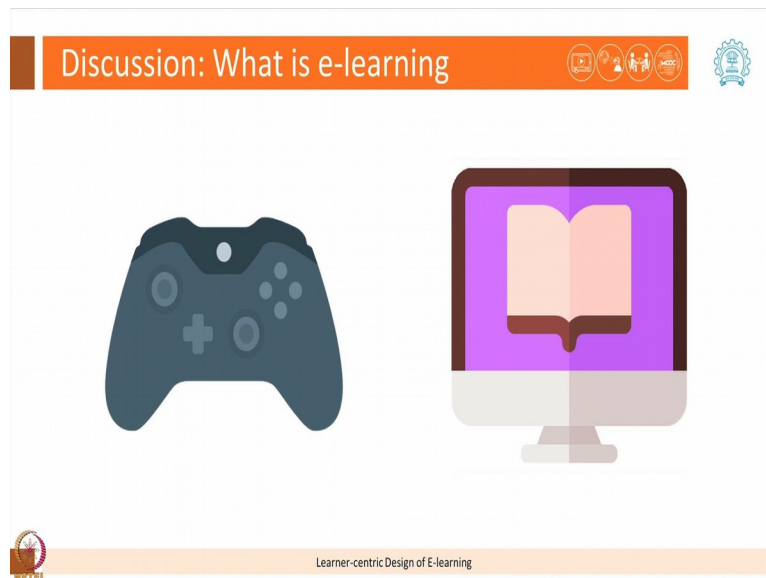
Let us now pause at a reflection spot. What comes to your mind when you hear e learning? Pause this learning dialogue write your response and when you are done please resume.

(Refer Slide Time: 01:28)



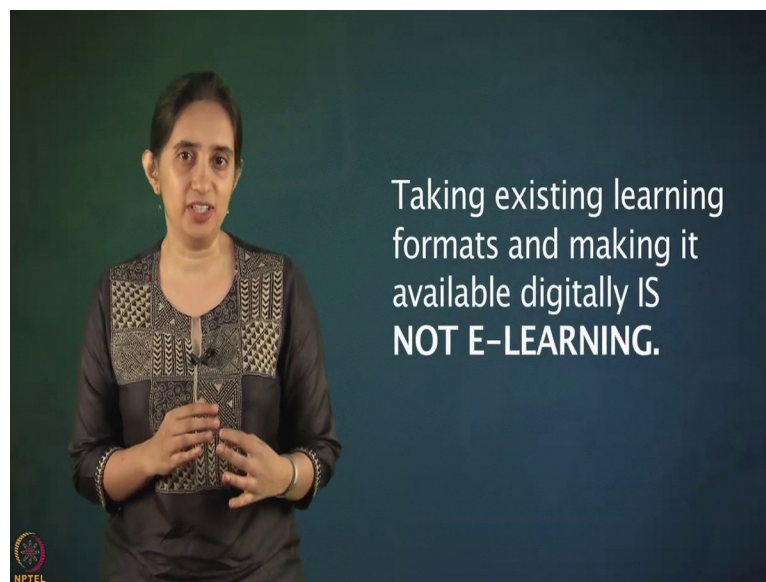
Some of you may have written digitized text such as PDFs or PowerPoint slides with images, others may have thought of videos animations presentations and simulations.

(Refer Slide Time: 01:42)



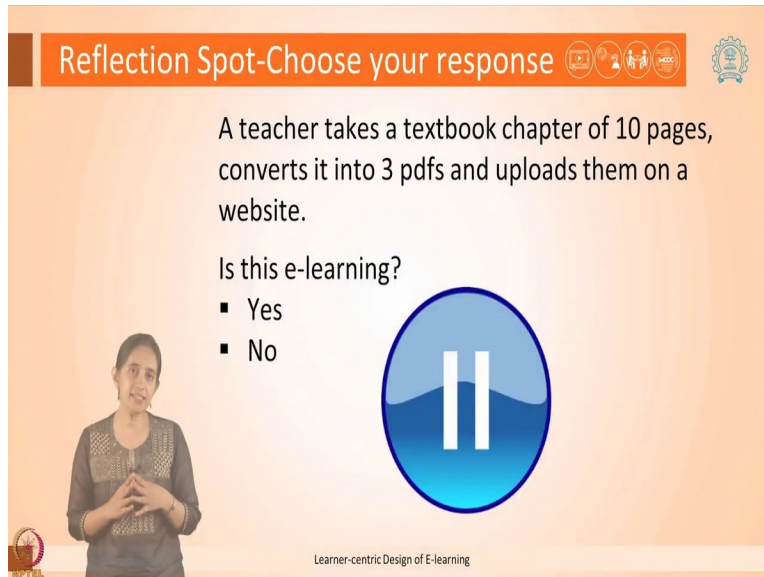
Perhaps you may have encountered games, E books and many more such examples.

(Refer Slide Time: 01:52)



Before we continue any further, let us see what is not E-learning? Merely taking existing learning formats such as information in textbooks and make them available digitally is not E-learning. Let us reflect upon this point a little further for each reflection spot pause choose your answer then resume the learning dialogue.

(Refer Slide Time: 02:21)



Reflection Spot-Choose your response

A teacher takes a textbook chapter of 10 pages, converts it into 3 pdfs and uploads them on a website.

Is this e-learning?

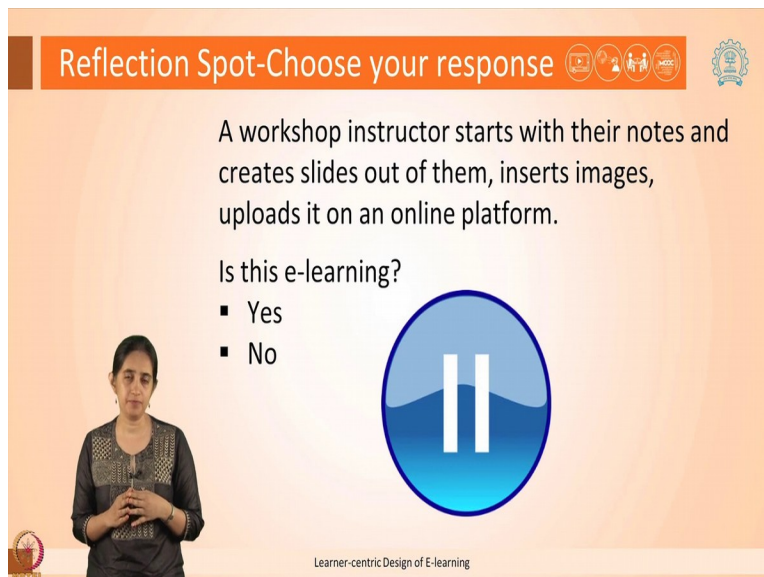
- Yes
- No

Learner-centric Design of E-learning

The slide features a woman on the left and a large blue circular pause button icon on the right. The background is a light orange gradient.

A teacher takes a textbook of 10 pages converts them to PDF and uploads three PDFs on the web is this e-learning; pause choose yes or no and then presume.

(Refer Slide Time: 02:37)



Reflection Spot-Choose your response

A workshop instructor starts with their notes and creates slides out of them, inserts images, uploads it on an online platform.

Is this e-learning?

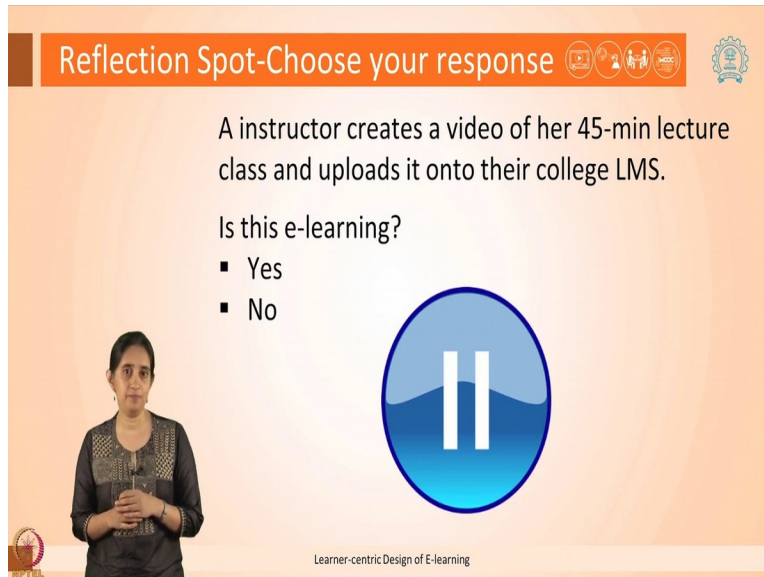
- Yes
- No

Learner-centric Design of E-learning

The slide features a woman on the left and a large blue circular pause button icon on the right. The background is a light orange gradient.

Let us see one more example. A workshop instructor starts with their notes creates PowerPoint slides out of them includes images and puts it up on some online platform is this e-learning?

(Refer Slide Time: 02:53)



Reflection Spot-Choose your response

A instructor creates a video of her 45-min lecture class and uploads it onto their college LMS.

Is this e-learning?

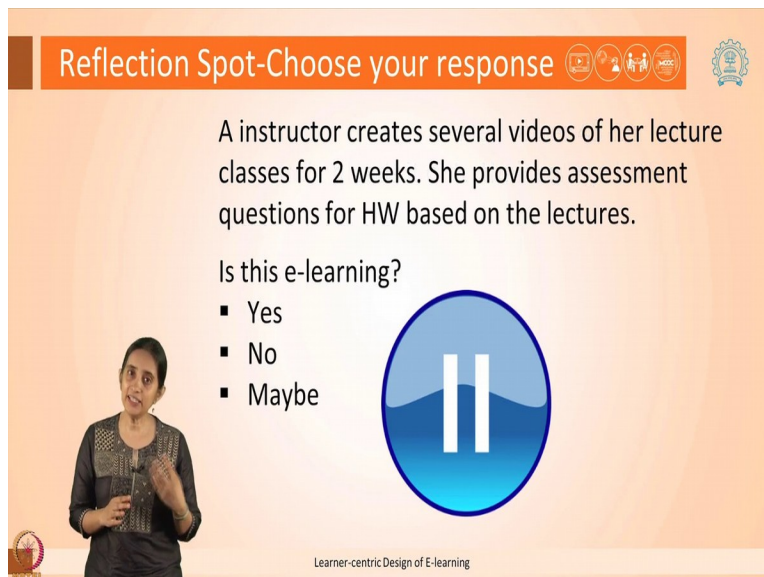
- Yes
- No

Learner-centric Design of E-learning

The slide features a woman on the left and a large blue circular pause button icon on the right. The title bar is orange with white text and icons. The background is a light orange gradient.

Let us see yet another example. An instructor creates a video of her lecture class and uploads it on to their college learning management system is this e-learning?

(Refer Slide Time: 03:06)



Reflection Spot-Choose your response

A instructor creates several videos of her lecture classes for 2 weeks. She provides assessment questions for HW based on the lectures.

Is this e-learning?

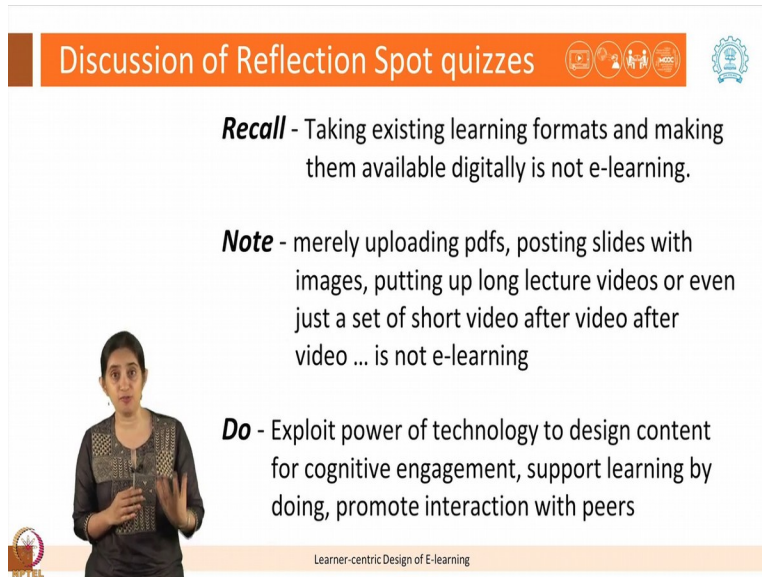
- Yes
- No
- Maybe

Learner-centric Design of E-learning

This slide is similar to the previous one but includes an additional option, 'Maybe', in the list. It features the same woman on the left and the large blue circular pause button icon on the right.

Continuing on the previous example, an instructor creates videos of her lecture class for 2 weeks perhaps 4 5 or 6 lectures. She then provides assessment questions similar to homework based on these 5 lectures is this e-learning?

(Refer Slide Time: 03:24)



The slide features a title bar with the text "Discussion of Reflection Spot quizzes" and several icons. A presenter is visible on the left side of the slide. The main content consists of three bullet points:

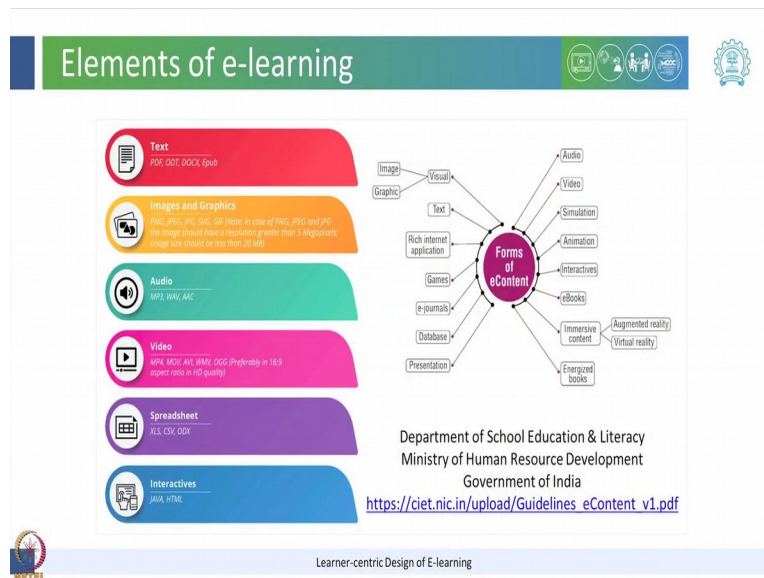
- Recall** - Taking existing learning formats and making them available digitally is not e-learning.
- Note** - merely uploading pdfs, posting slides with images, putting up long lecture videos or even just a set of short video after video after video ... is not e-learning
- Do** - Exploit power of technology to design content for cognitive engagement, support learning by doing, promote interaction with peers

At the bottom of the slide, there is a small logo on the left and the text "Learner-centric Design of E-learning" on the right.

Let us discuss whether these examples are indeed e-learning. Recall that merely taking existing learning formats and making that information available digitally is not e-learning. So, a set of PDFs or PowerPoint slides with images uploaded somewhere is not e-learning, where is the learning in that? Going further, a set of videos plus some assessment questions like in the last example seems like its doing better, but is that enough? Will that ensure that learning actually happens where this e-learning? If we are using the ICT only as a medium to make information available and for content delivery then that is not enough.

If on the other hand we are exploiting the power of technology, we are using its affordances and designing content and the learning environment such that learners are engaged with the content, such that they are figuring things out making meaning perhaps interacting with each other they are motivated to learn, then we are doing our job as designers of e-learning.

(Refer Slide Time: 04:48)



So, the examples we saw in the reflection spots may be included as elements or aspects of e-learning, but they alone may not be enough. Let us now see some examples where technology affordances indeed have been utilized to address learning and engagement.

(Refer Slide Time: 05:11)

**Example: Meaningfully engaging videos**

Providing examples, engaging for children, meaningful visuals

Can water dissolve any amount of a substance?

Learn By Watch: <https://www.youtube.com/watch?v=iPP5Is5Ei8I>

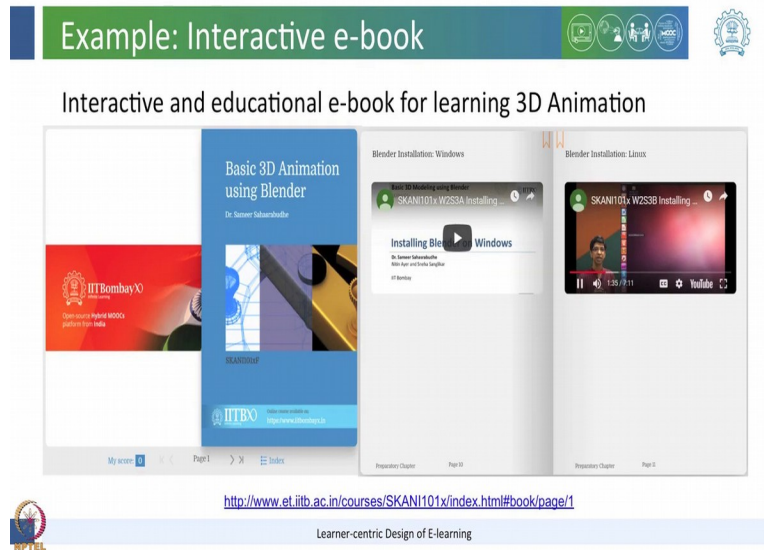
Learner-centric Design of E-learning

Here is an example of a video teaching children about saturated solutions by engaging them with real life examples. There are meaningful visuals in the video, there is a dialogue between two

children. So, it is interactive and even further children identify because its other characters like them who are interacting with each other and with the content. What are we going to do today?

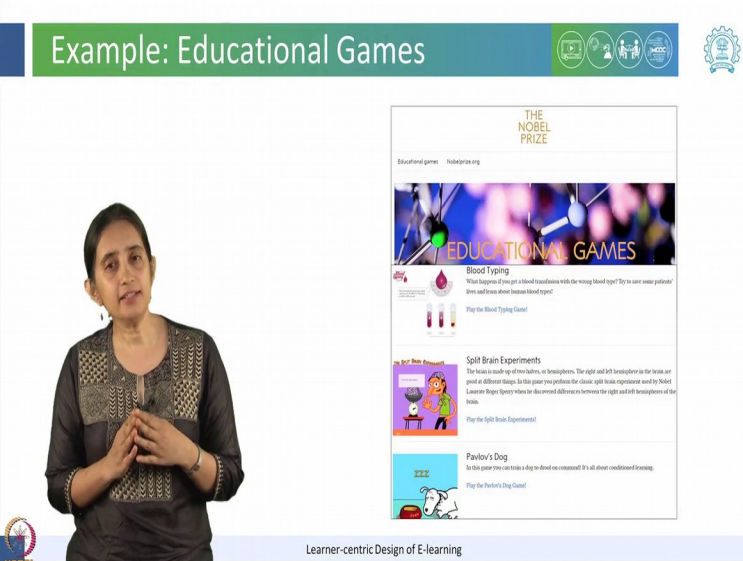
I want to test whether a glass of water can resolve any amount of sugar what is there to check.

(Refer Slide Time: 05:45)



The next example is that of an interactive e book for learning blender 3D animations for animators and other working professionals. See in this example that immediately after learning a concept or technique through the video within the e book, the learner is asked to check his or her understanding and apply it.

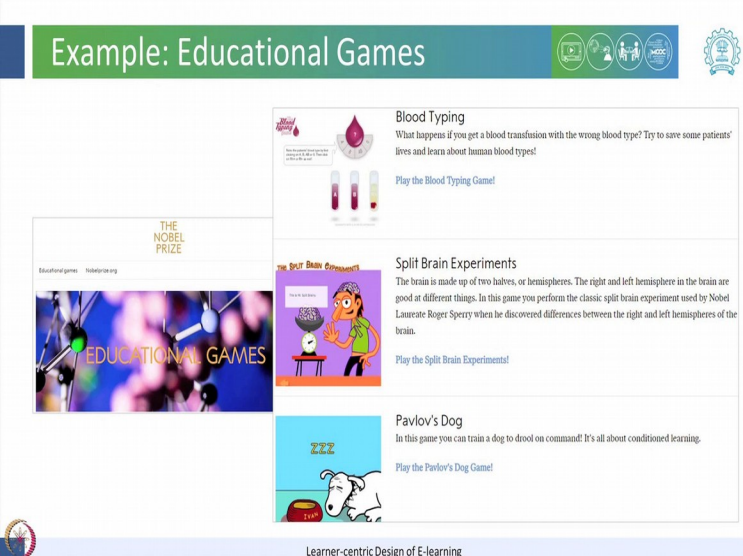
(Refer Slide Time: 06:10)



The screenshot shows a website titled 'THE NOBEL PRIZE EDUCATIONAL GAMES'. It features three game cards: 'Blood Typing' with a blood drop icon, 'Split Brain Experiments' with a brain icon, and 'Pavlov's Dog' with a dog icon. Each card includes a brief description and a 'Play the [Game Name] Game!' link. The website header includes 'Educational games' and 'nobelprize.org'. The footer has the NPTEL logo and the text 'Learner-centric Design of E-learning'.

Another example is that of educational games which again many of you may have heard off.

(Refer Slide Time: 06:18)



This is a zoomed-in view of the same website shown in the previous slide. It clearly displays the 'Blood Typing', 'Split Brain Experiments', and 'Pavlov's Dog' game cards. The text on the cards is more legible, showing details like 'What happens if you get a blood transfusion with the wrong blood type?' for the Blood Typing game. The NPTEL logo and 'Learner-centric Design of E-learning' text are visible at the bottom.

The example shown is that of animated and interactive educational games based on the work of Nobel Prize winners. So, this is cutting edge science which is being learned along with an element of fun and competitiveness.

(Refer Slide Time: 06:43)

### Example: Educational Games

Situational games: Learners solve a relevant problem by interacting with the game. Simulate real world conditions, and see results.

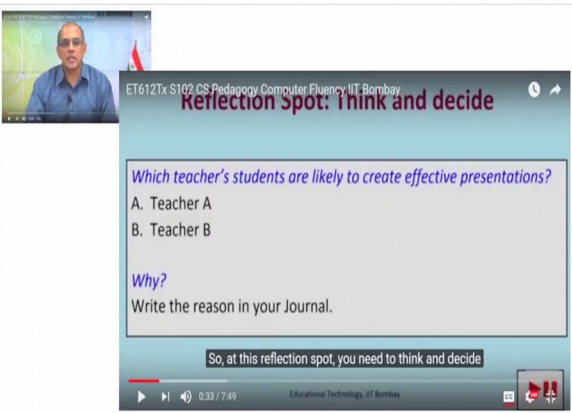


Learner-centric Design of E-learning

Another example of an educational game is situational games, where learners have to solve a relevant problem by interacting with various characters or various parts of the game and simulate real world scenarios and see the results.

(Refer Slide Time: 06:59)

### Example: MOOCs



Learner-centric Design of E-learning

A popular example of e-learning is an online course such as a MOOC. A MOOC again is not merely a collection of lecture videos uploaded on a platform.

(Refer Slide Time: 07:17)

## Example: MOOCs

### Learning by Doing (LbD): Practice questions with immediate feedback

1) What are the goals of Learning by Doing activity?  
Check all that apply.

- ☒ To introduce learners to new concepts
- ☒ To allow students to immediately apply concepts learnt in LeD
- ☒ For students to get feedback on their understanding
- ☒ For students to integrate knowledge from various parts of the course

**No, the answer is incorrect.**  
Score: 0

**Targeted Feedback:**

- Incorrect: The goal of an LbD activity is not to introduce learners to new concepts; that is in fact the main goal of an LeD.
- Correct: One goal of the LbD is to allow students to apply concepts that they learnt in the LeD in a new context. There are other goals as well.
- Correct: An LbD is a formative assessment activity, that is, students get feedback to improve their learning. There are other goals as well.
- Correct: One goal of the LbD is for students to integrate the knowledge that they gained from different parts of the course by solving a problem or answering an open-ended question. There are other goals as well.

**Accepted Answers:**


- To allow students to immediately apply concepts learnt in LeD
- For students to get feedback on their understanding
- For students to integrate knowledge from various parts of the course

You may submit any number of times before the due date. The final submission will be considered for grading.

**Check Answers**

Your score is: 0/1

**Submit Answers**



Learner-centric Design of E-learning

(Refer Slide Time: 07:20)

## Example: MOOCs

### Learner Experience Interaction 1 (LxI - Week 1)

**Focus Question**

**Description of the focus question for the peer discussion**

**Instructions for posting:**

- Click on the button "Ask a Question"
- Then click on "New Question" and ensure that the category "LxI - Week 1" is selected (see fig below)

Categories: Pre-Course Discussions, General, **LxIs**  
Choose a category, Choose a category, LxI - Week 1

Some more instructions on posting the answer to the focus question


**Instructions for discussion:**

- Identify a peer from this course who has identified a similar aspect as yours and another peer who has identified a different aspect.
- Note down the similarities and differences in the explanations provided by the peer

**Week 1:**

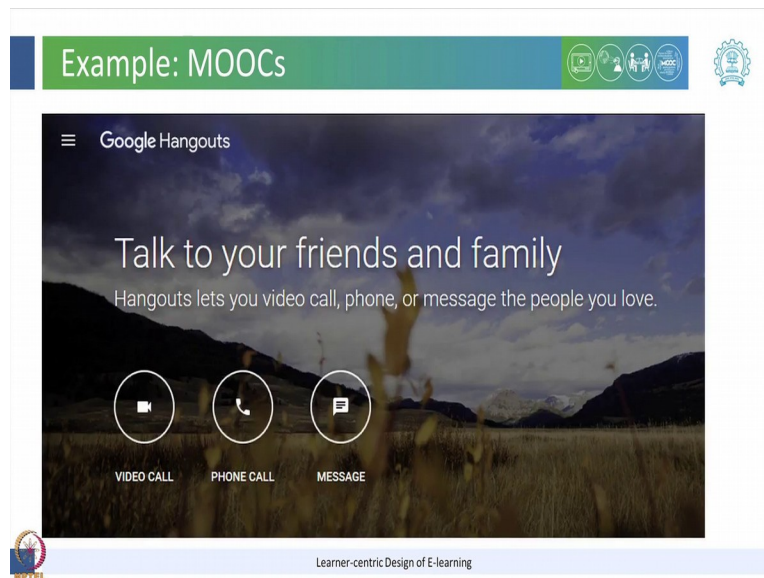
- ☐ Instructions for LxTs and AQs
- ☐ LxT 1.1:
- ☐ Quiz: AQ based on LxT 1.1
- ☐ LxT 1.2: MO
- ☐ Quiz: AQ based on LxT 1.2
- ☐ LxT 1.3
- ☐ Quiz: AQ based on LxT 1.3
- ☐ Learner Experience Interaction 1 (LxI - Week 1)
- ☐ Quiz: RQ based on LxI
- ☐ Quiz: KQ based on Week 1
- ☐ Weekly Feedback
- ☐ Download Videos

**Previous Page** **Next Page**

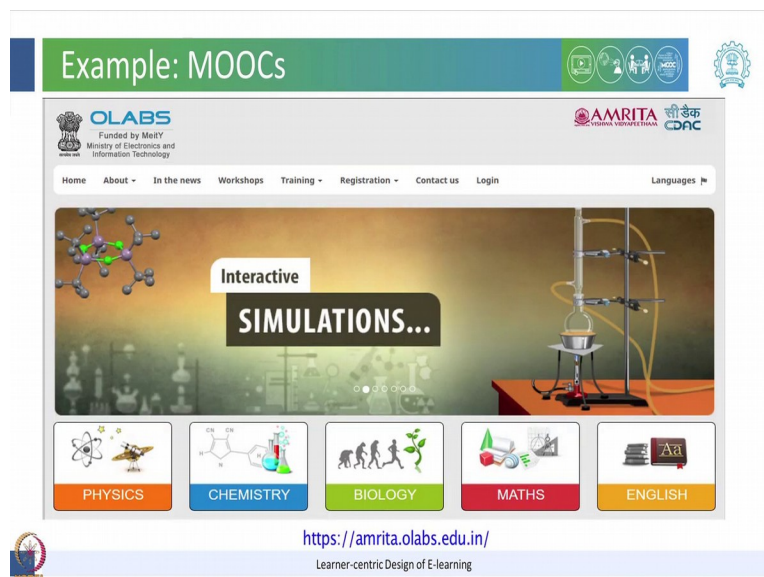


Learner-centric Design of E-learning

(Refer Slide Time: 07:27)



(Refer Slide Time: 07:28)



But a MOOC contains videos with in video embedded activities questions followed by immediate feedback, discussion forums and peer review, interactive sessions such as on hangouts, virtual labs, personalized communication with learners and several other such elements. In this course we will focus on e-learning in stem disciplines science technology engineering and mathematics; e-learning has been reported to be a systematic and effective

intervention to support enhancement of teaching and learning in stem. While the concepts and principles that we discuss in this course may be applicable to other topics and other contexts our examples will be from stem disciplines.

To summarize the key takeaway of this learning dialogue is what is not e-learning. We did see some examples of e-learning where the technology affordances were utilized to address some aspect of what learners need such as engagement or interactivity or meaningful learning. In the next learning dialogue we will look at some challenges of e-learning especially those that arise due to the format and the medium itself.

Thank you.