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

Lecture - 15
Construct your own understanding

As instructors one of our main goals is that we want our students to develop deep understanding, deep conceptual understanding we want them to make meaning.

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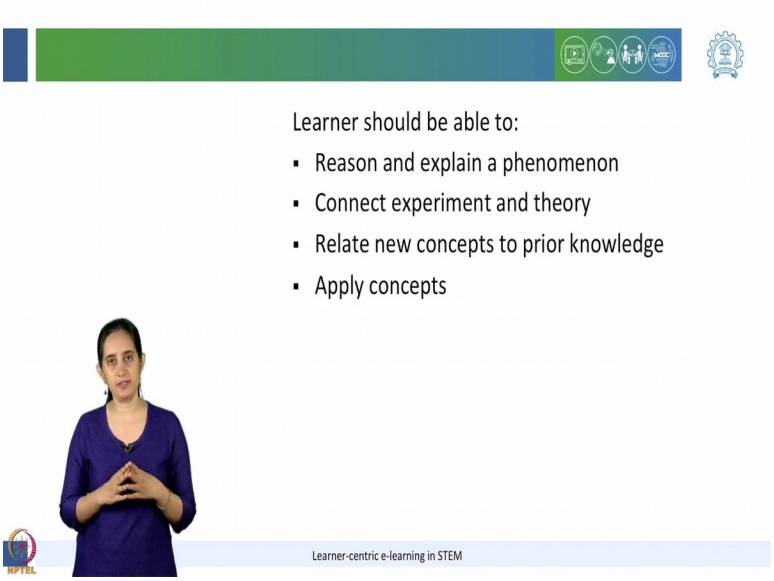

What this means is that learner should be able to reason, they should be able to explain phenomenon, connect experiment and theory. Learner should be able to relate new concepts that they are learning with their prior knowledge and they should be able to apply concepts.

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At this point let us pause at a reflection spot as instructors we want our learners to be able to do all these things. So, before we proceed based on your own experience either as teachers or as learners please list two ways two or three ways by which learners can delve deeper into concepts, they can deepen their understanding, they can make connections between the concepts, the new concepts and prior knowledge and so on, when you are done please resume.

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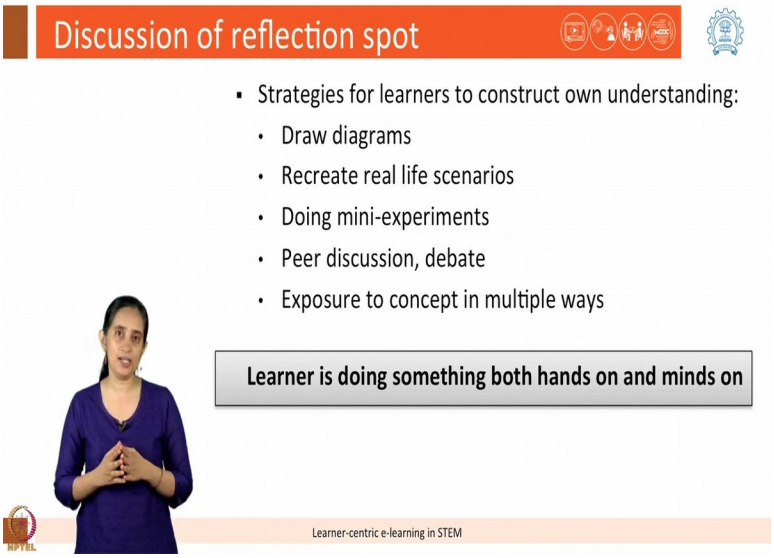

You may have thought of a number of ways to help learners construct their own knowledge and make their own meaning. For example, some of you may have our students to draw diagrams either formal or informal for example, creating concept maps, so just making mind maps.

Other instructors try to create real life create or recreate real life scenarios within the classroom. For example: either by showing movies or animation or by asking students to reason and make predictions in what if scenarios. We can also have learners do a lot of learning activities such as mini experiments or group discussions wherein they debate around issues. Other possible ways are to provide learners in exposure to the same concept in multiple ways.

For example, by doing some explanation as well as by watching a video on it, by helping them, by asking them to solve a problem. In all of these what is key is that the learner is doing something and this doing is both as it sometimes said hands on as well as minds on. That means, the learner is interacting with the environment doing the learning activities and constructing his or own his or her own understanding while doing the activity.

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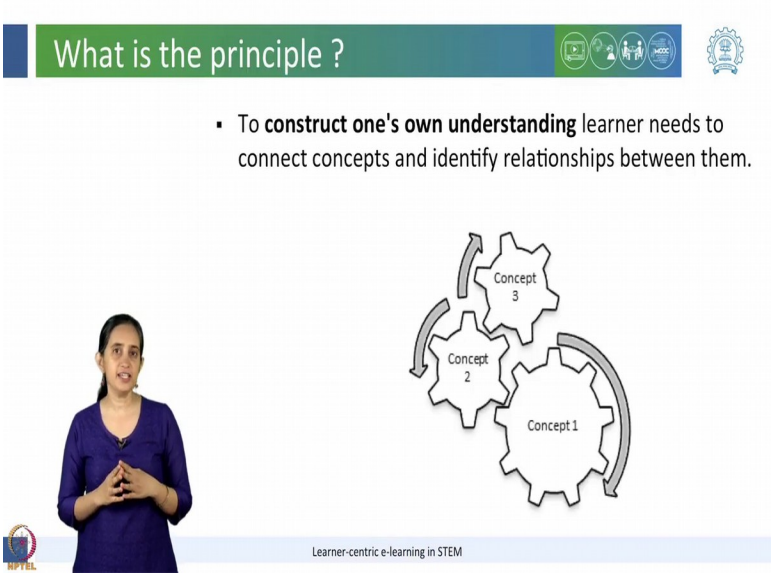

The principle here is that to construct one's own understanding. The learner needs to connect various concepts and identify the relationships between them.

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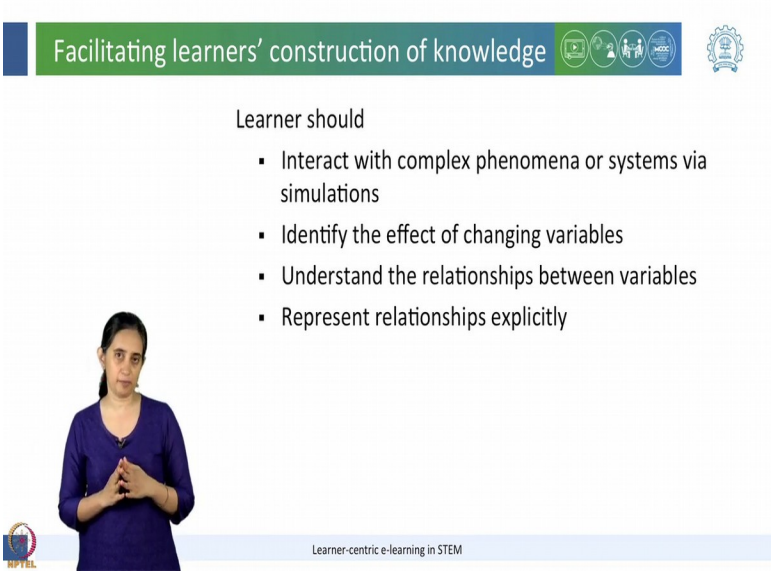

To implement this principle in an e-learning context that is to facilitate learners construction of their own understanding, we should provide them opportunities to interact with complex phenomena or systems or real world scenarios.

For example, via simulations we should make the learner identify the effects of changing variables understand the relationships between the variables as for example, what happens if something increases or something else decreases. We should help learners we should make learners. In fact, represent these relationships explicitly using diagrams, graphs, text and translate between these different representations.

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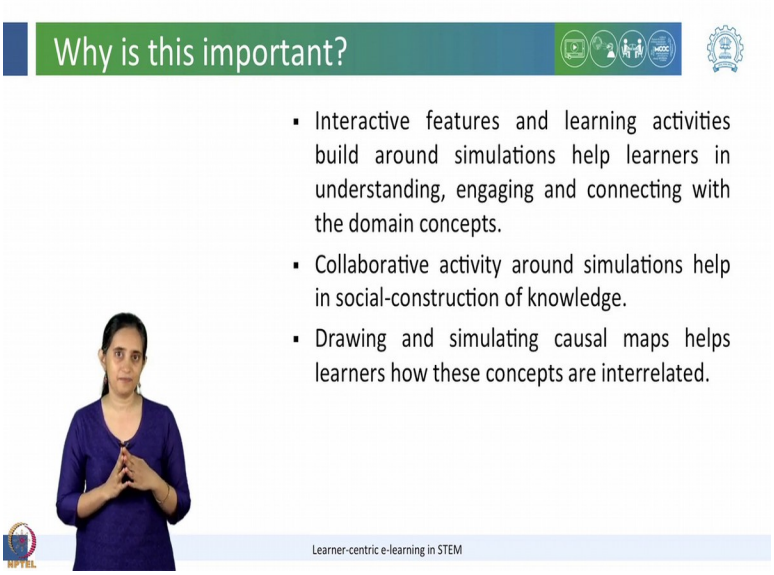

Why are all these important? Interactive features and learning activities built around the simulations help learners in understanding connecting and engaging with the domain concepts this has been reported in various studies. Similarly, collaborative activities around simulations help in social construction of knowledge; that means, learners students are learning from their peers; they are debating, they are convincing each other, they are developing articulation and argumentation skills, they are negotiating broadening their knowledge.

Drawing concept maps or creating multiple representation such as translating between graphs and diagrams are also important as these can help learners identify, how different concepts are interrelated, how they play a role within the entire system. They can help learners make arguments using two different concepts in the concept map.

And, at the end all of these techniques are learner centric because learners are engaging with the content. In the class room if we are doing a face to face classroom or with the e-content if they if that is the scenario and it directly promotes articulation and reflection. Many of these techniques are similar to active learning techniques that we saw in a previous learning dialogue, but in this learning dialogue let us look at two or three specific techniques.

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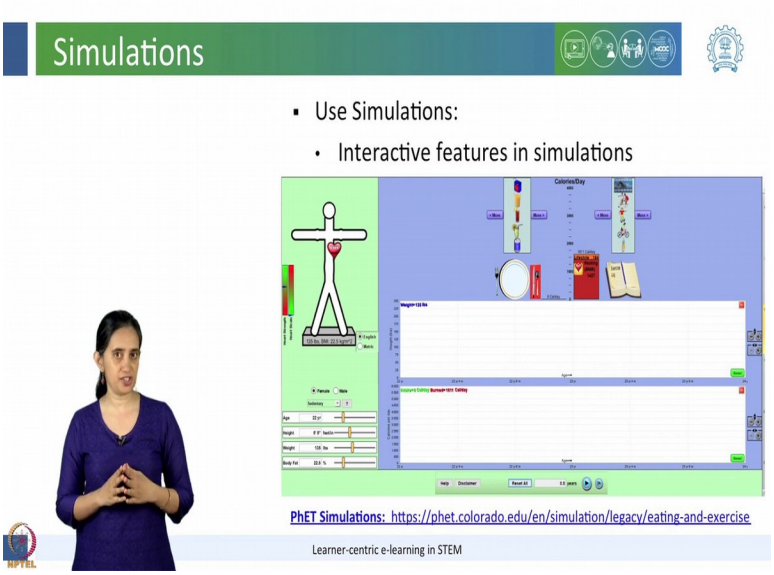

One way to implement this principle and these strategies in an e learning context is to use simulations variable manipulation simulations and in stem disciplines these are fairly common I am sure they are common in other disciplines too, but since in this course we are focusing on examples from stem domains let us look at a couple of such examples.

Variable manipulation simulations have interactive features via slider bars or where learners can input some numbers or they can actually directly interact with the simulation and these interactive features help them manipulate what if scenarios in the e-learning content.

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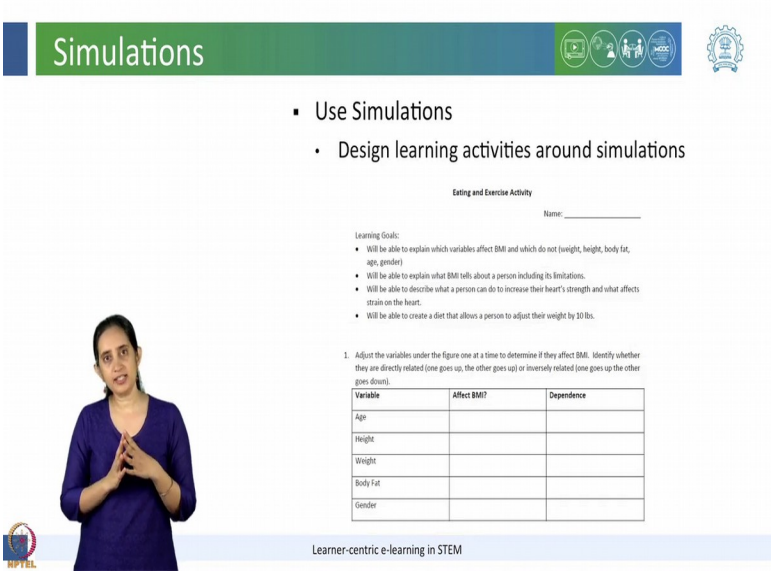

And these simulations are designed along with learning activities built around the simulations where learners have to explain something or enter their observations, they have to create graphs and so on.

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There are several simulation repositories available for stem topics and some of the common one some which have also been tested empirically repeatedly are phet, net logo concord consortium

and you can you can explore these repositories, try to find simulations that work in your own topic and integrate them within your e-learning content. You can ask the learner to go and play with some of these simulations and come back to your content and do some learning activity.

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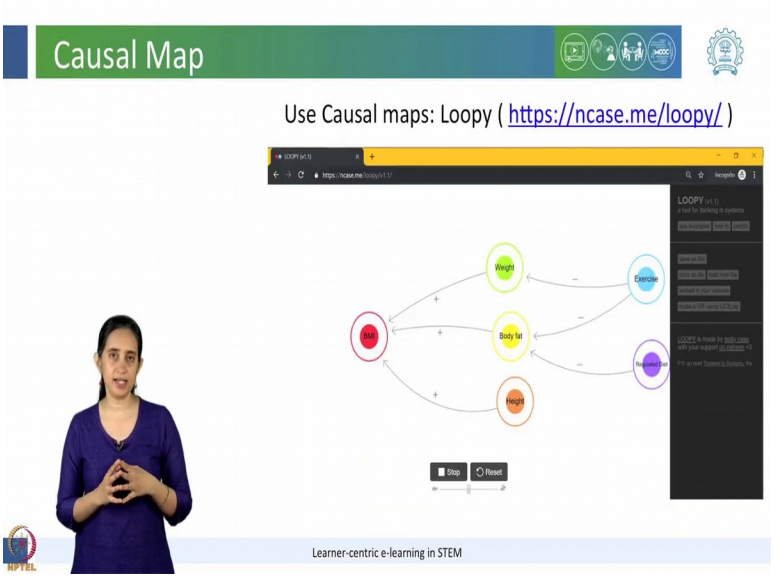

Another strategy that can be used in an e-learning context to help learners construct their own understanding is to have them create concept maps or causal maps, one what happens in when learners do these create such maps such diagrams is that they take a complex phenomena or they given a complex phenomena. And, they are asked to; they are asked to represent in a graphical manner the relationships between the key concepts which explains this phenomenon

So, here is an example you can see where the body mass index is being in and what are the different factors affecting the body mass index are being represented in a causal map.

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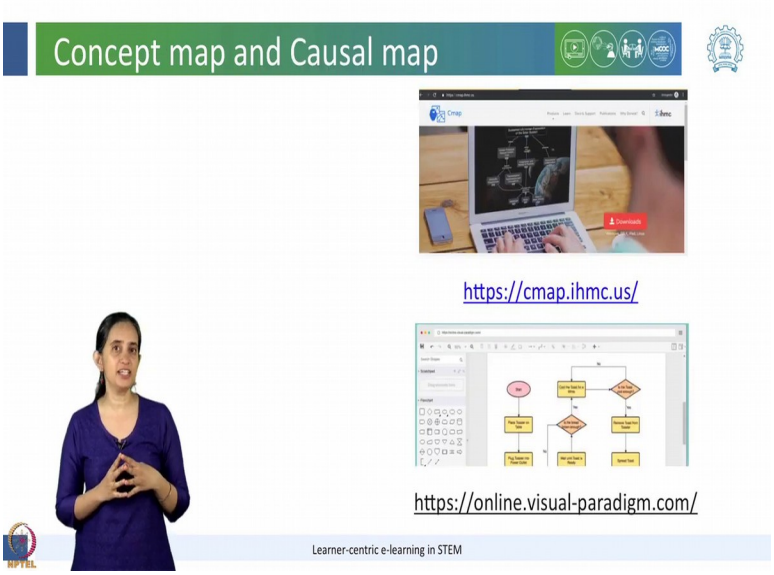

Again there are several tools available to incorporate such maps within your own e-learning content. For example, the C map tool, visual paradigm tool, loopy is the example we saw earlier and you can create activities around these tools where learners actually go and build some diagrams and maps using these tools. As designers of e-learning content when we want to in incorporate learner centric approaches into our learning designs. Some of the things we can do we should do to help learners construct their own understanding are the following.

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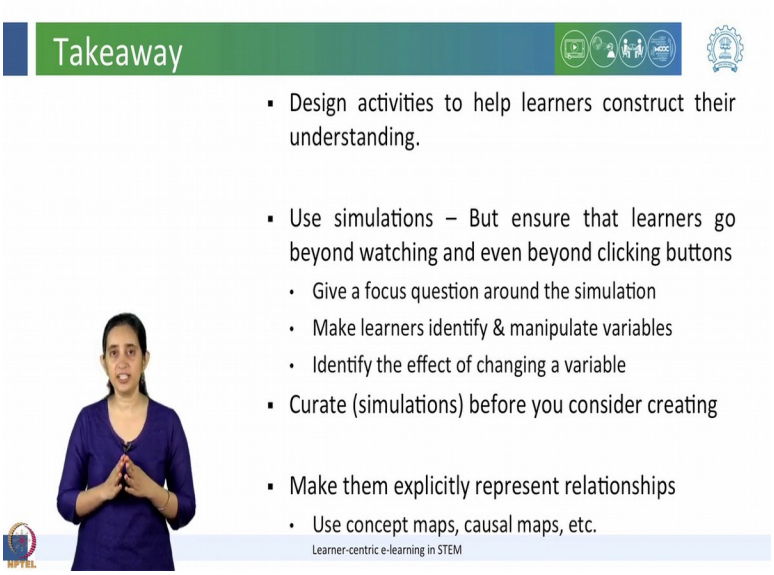

We should design learning activities that explicitly make learners construct their own understanding and help them connect various concepts. We saw few strategies in this learning dialogue for example, this can be done by helping learners identify various variables, manipulate relationships between variables reflecting on what variables affect a particular phenomena this can be done using simulations.

And important guideline while using simulations is that we should not simply ask the learner to go and do or play with the simulation. What we need is a focus question and a set of learning activities around the simulation. So, that the learners are guided into what they should be looking for we should ensure that learners go beyond watching and viewing again this guideline we seen earlier and it holds even in a case of a simulation, we should make sure that they go beyond pressing buttons in the simulation and that is why these learning activities and focus questions are important

Another guideline for us as curriculum designers is that creating especially coding these simulations is rather difficult. So, instead of just going ahead and creating our own simulation let us first try to be curators. So, we can look at various repositories that we discussed a few minutes ago and try to find something that closely fits our needs. Finally, once learners interact with these simulations and manipulate the different variables we should make them explicitly represent

these relationships and for that we can use concept maps, causal maps, mind maps and other such diagrammatic representation tools.

Thank you.