Designing learner-centric e-learning in STEM disciplines
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Lecture-13
Learning by doing (LbD)

From our experience as teachers or even as students, we know that in order to tell learn something effectively learners need to go beyond listening to lectures or watching videos or reading text or following procedural instructions. So, how does this apply when we design e-learning content? Let us first examine a learning scenario and pause at a reflection spot.

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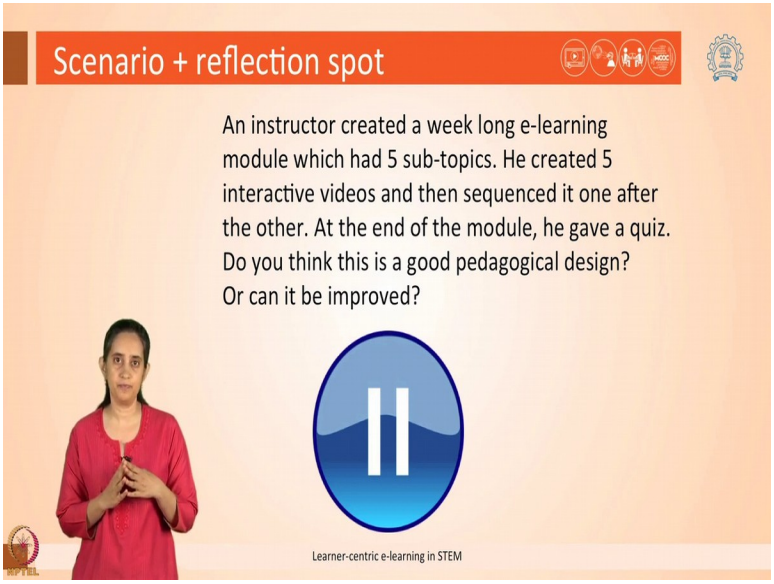

An instructor designed and created material for a week long e-learning module which had 5 sub-topics. So, he created 5 interactive videos for each of the sub-topics and then sequenced it one after the other in some logical sequence. At the end of the module he gave a quiz based on the topics in each of the videos. Do you think this is a good pedagogical design for an e-learning module? Or does it have some limitations and you think it can be improved? Pause at this reflection spot, think about the answer, submit your answer and then we can resume.

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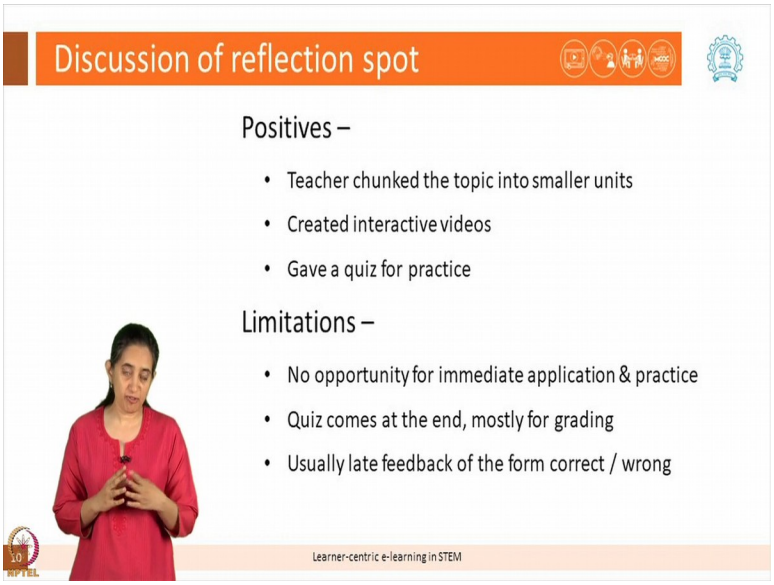

Some of you may have appreciated that this teacher in fact, chunked the topic into small meaningful units and created interactive videos, he even gave a quiz for practice, but this pedagogical design has some limitations. Primarily, students do not get the opportunity for immediate application and practice after they learn the content from each of the interactive videos. The quiz comes at the end and often it is used in a summative manner; that means, it is used for grading and the feedback on the quiz if any, is usually of the type correct or wrong. So, because of these limitations this is not the ideal design.

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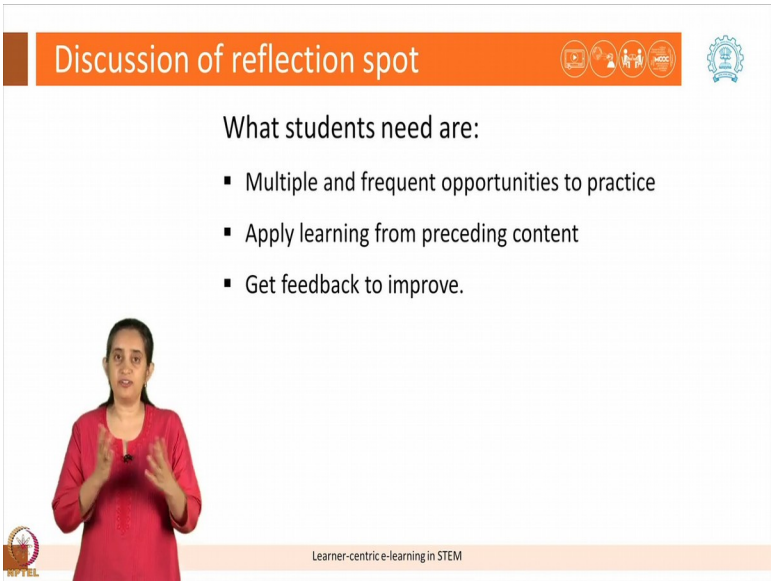

What students need are: multiple and frequent opportunities to practice, apply the learning from the preceding content and feedback to improve. So, as instructors we need to design such activities and also give immediate feedback.

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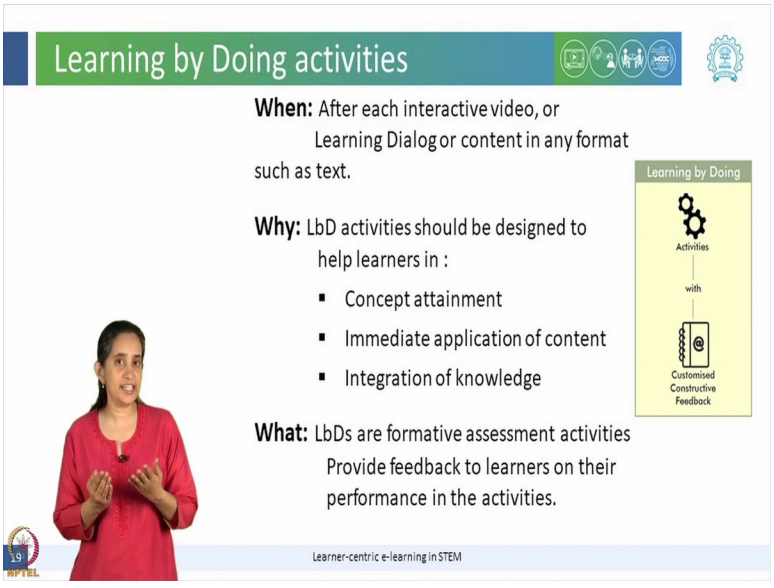

We call such activities learning by doing activities, after each interactive video or learning dialog or content in any format even such as text, we need to provide these LBD activities. Learning by

doing activities should be designed so that they help learners in concept attainment, immediate application of content and integration of knowledge.

Learning by doing activities are formative assessment activities; that means, they help to close the learning loop and learners should get feedback from their performance on their performance in these activities on how they can revise their learning and improve their understanding.

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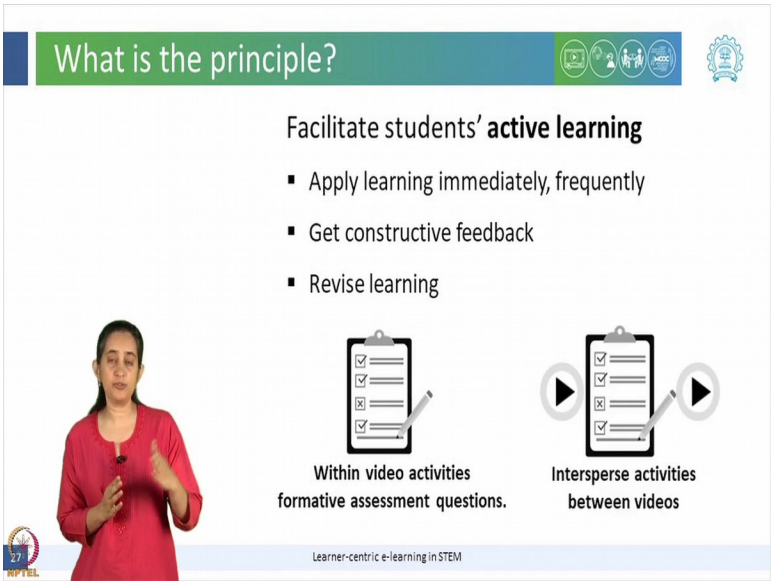

The principal here is that we need to facilitate students active learning; that means, we need to help them apply learning immediately and frequently, we need to help them get constructive feedback and that helps them revise their learning, in designing e-learning content, we need to do the above both by providing in video activities which we saw in a previous learning dialogue and providing activities between videos which we are calling as learning by doing activities.

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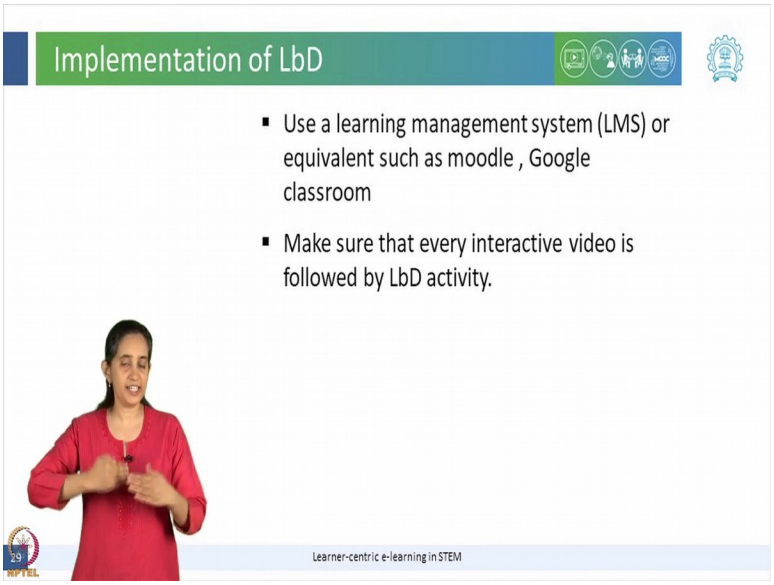

To implement learning by doing activities in an e-learning module, it would be preferable to use a learning management system or equivalent such as moodle or Google classroom or your own LMS that you may be using in the in your organization and this LMScan be used to sequence the interactive videos and activities in between for each module. Even if you are using something minimal like an html page, the same idea can be used that you sequence some content either video or text content followed by an learning by doing activity followed by the next piece of content and so on.

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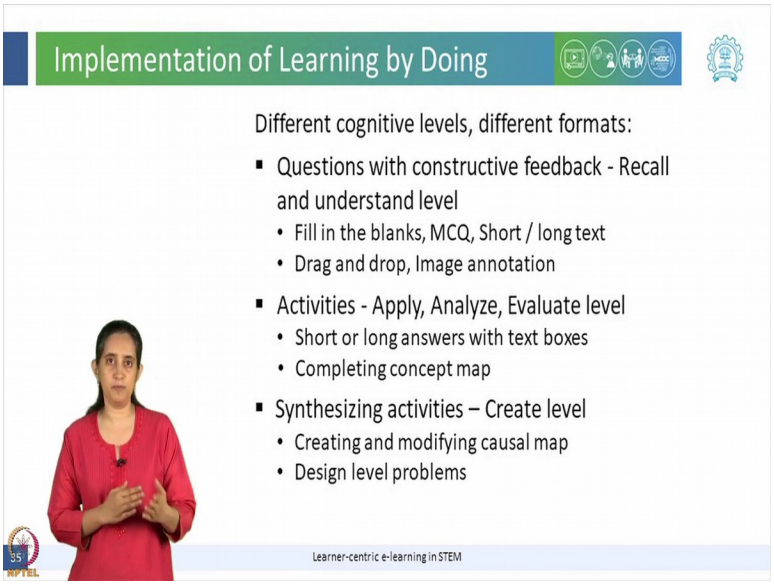

Learning by doing activities can be at different cognitive levels and can use a variety of formats. For example; a large number of LbD activities should be at recall and understand levels so that learners can get a lot of practice in just applying the concepts in testing their understanding of the concept. These recall and understand level questions can be in the form of multiple choice questions with one or more correct answer, simple drag and drop activities perhaps annotating images with labels and so on.

Another level a slightly higher level of LbD activities require the learner to apply the content. So, these could be in the form of solving problems and in terms of the format, we can give short or longer answer questions with text boxes, we can provide them concept maps that they can modify and so on, we will see a few examples in a moment. And if we go at a higher level which is also required for integration of knowledge, we need to provide synthesis or create level activities, longer problems perhaps design problems and we don't need to do this too often because that will the this comes after a set of concepts are learnt, but these do need to be included in the e-learning module.

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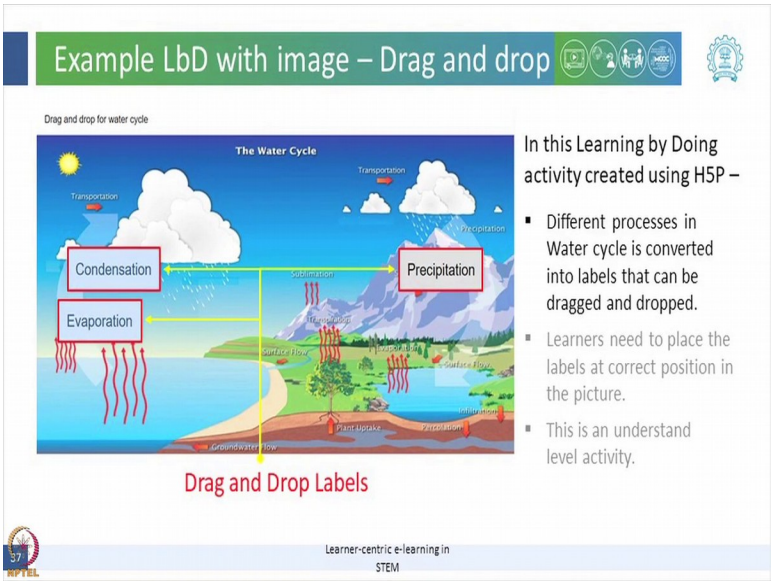

Let us see some examples of these different types of LbD activities; here is an example LbD at an understand level where there is an image. So, what do you see is an image of different processes in the water cycle and this is converted into labels that can be dragged or dropped dragged and dropped by the learner onto the image. So, learners need to place the labels at the correct picture in order to finish the activity and this is an understand level activity.

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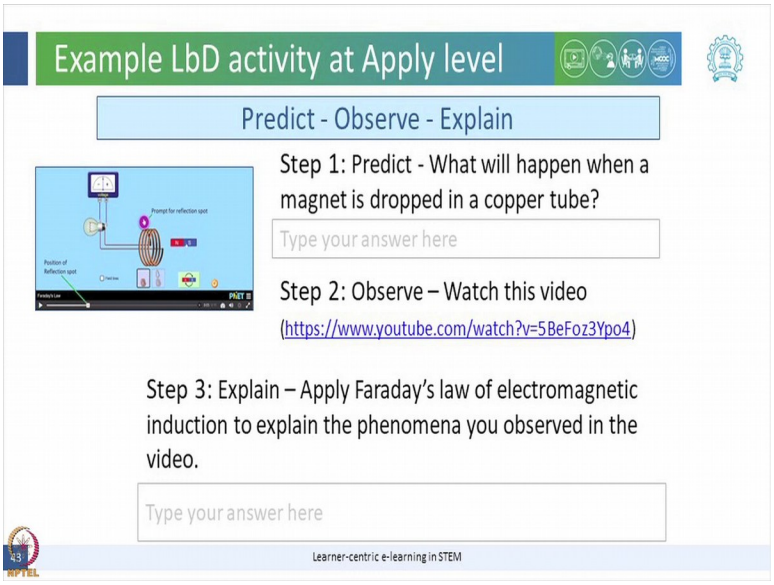

The next example is that at an apply cognitive level and the technique used here is called predict, observe and explain. So, you may recall the learning dialog example that we saw in a previous LeD about a magnet and movement of a magnet in a circuit and so on. So, after that interactive video, learners can be asked to predict what will happen when a magnet is dropped into a copper tube and they can type their answer, then they can be asked to observe a different video to test their answer and finally, they can be given another text box wherein they apply the corresponding laws to explain the phenomena observed in the video.

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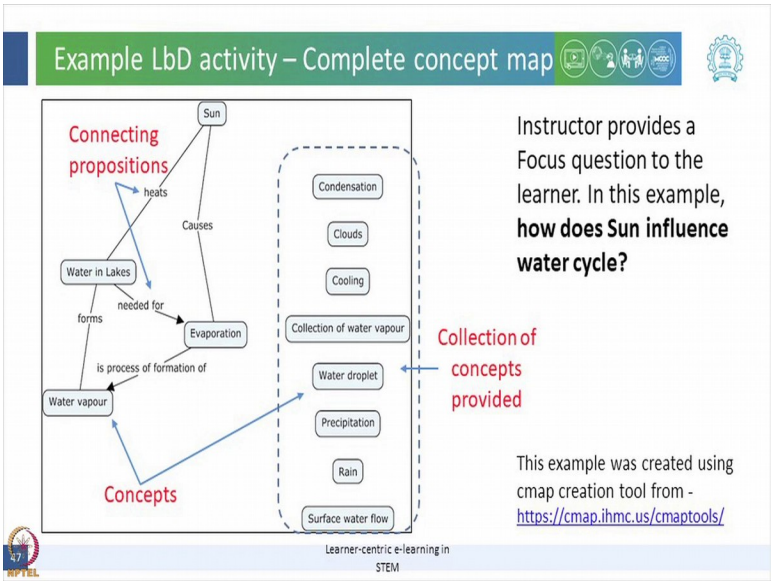

The next example is could be perhaps even at a higher level or apply or even at an analysis level and this involves completing of a concept map. Here the instructor provides a focus question to the learner, in this example the focus question is how does the sun influence the water cycle and a group collection of concepts involves a involved are provided. What the learner has to do is to connect the concepts with meaningful propositions, so that together the concept map can answer the focus question.

Alternately a partial concept map or perhaps a slightly incorrect concept map could be provided and the learner can evaluate and correct the map. So, again this activity can be at an analyze or even at an evaluate level.

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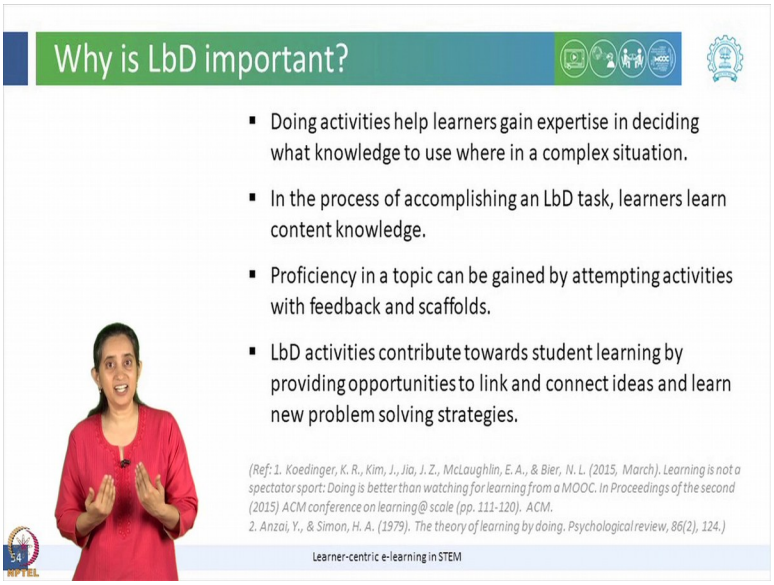

So, why are these learning by doing activities important? Doing LbD activities help learners decide which knowledge, which content which concepts are to be used in which situations and this becomes very important when there is a complex situation, a complex scenario fairly common in various STEM disciplines and even in other disciplines. In the process of attempting a learning by doing task, a learners conceptual understanding their application of the concept becomes stronger.

Proficiency in a topic can be gained by attempting activities with feedback and scaffolds and learning by doing activities contribute towards student learning by providing them opportunities to link and connect ideas and learn new problem solving strategies.

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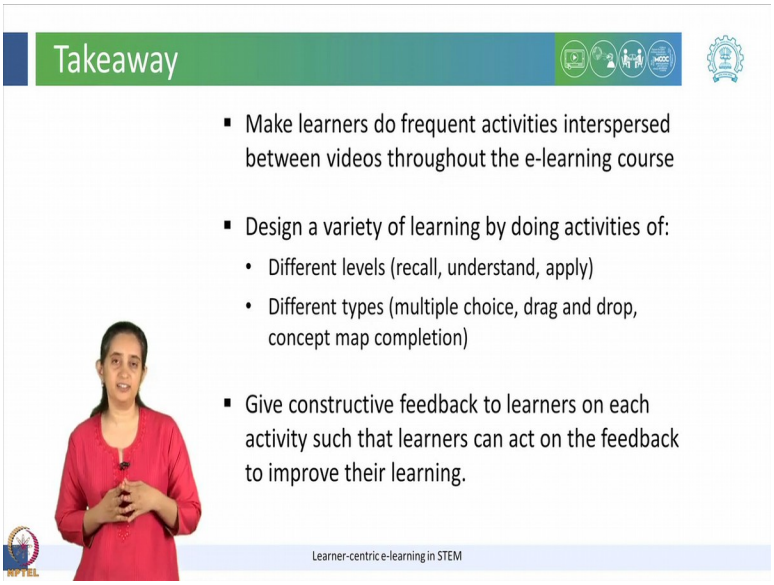

Finally let us come to some takeaways for us instructional designers and teachers as we use a learning learner-centric approach to design e-learning content. We need to make learners do frequent activities which are interspersed between videos throughout the course, we need to design a variety of learning by doing activities at different cognitive levels and in a variety of formats and we need to give constructive feedback to learners, so that they can revise their understanding and improve their learning.

Thank you.