Effective Engineering "Teaching" in Practice
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Lecture - 11d
Learning Theories - (part - D)

Welcome back. This is the D part of the large chapter, where we are looking at theories and let us finish up with learning theories. Again this is just an exposure, please read your reference book Wankat and Oreovicz for some more information. And then there is a whole wide range of information out there in the literature, you can go and read them and slowly see how you could use them also. For a scholarly reason itself is reason enough and then if you want to use some aspects of it, that is very good.

So, let us look at theories, we earlier saw that students construct their knowledge to overcome disequilibrium between existing structure and new information in the previous lecture, when we discussed Piaget's theory, the cognitive development theory.

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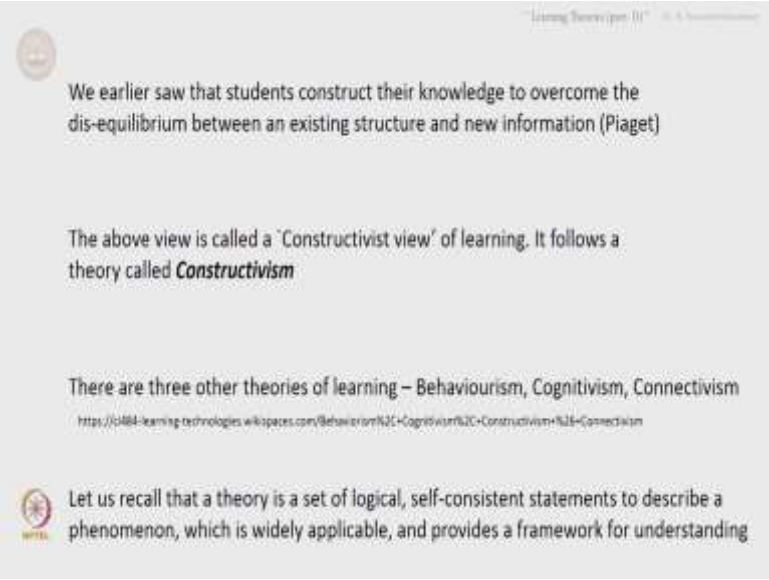

And that is an aspect of learning; the above view is called the constructivist view of learning, it follows a theory called constructivism. There are three other theories of learning behaviorism, cognitivism and connectivism that exist now; the major ones. That is the reference which you can look at to know what these various theories are of learning.

Let us recall that a theory is a set of logical, self consistent statements to describe a phenomenon which is widely applicable and provides a framework for understanding; this we need to keep in mind till we become comfortable with. As you can see I have repeated that quite a few times.

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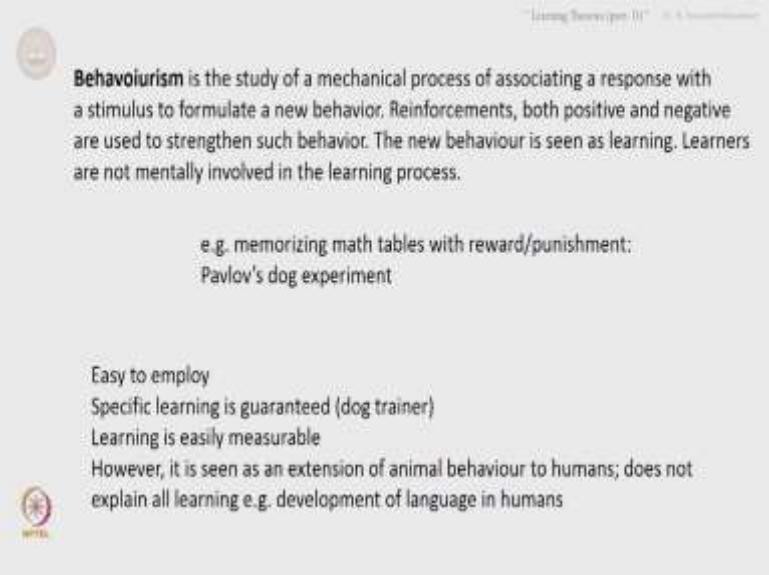

So, let us start looking at these theories just an exposure; behaviorism is the study of a mechanical process of associating a response with a stimulus to formulate a new behavior. Let me repeat that, it is the study of a mechanical process of associating a response with a stimulus to formulate a new behavior. Reinforcements, both positive and negative are used to strengthen such behavior. The new behavior is seen as learning and learners are not mentally involved in the learning process.

This is one of the theories of learning. For example; memorizing math tables with reward and punishment could be one of the examples here. The best example is the Pavlov's dog experiment; remember whenever a person rings the bell and treat was given to the dog after a while whenever the bell rang, the dog started salivating.

So, there was a learning without probably mental involvement, a mechanical process; there was a response associated with the stimulus. Response was salivating; stimulus was the ringing of the bell. So, this pretty much applies to many animals and some aspects of humans. This is easy to employ, specific learning is guaranteed such as a dog trainer, learning is easily measurable; the response is measurable. However, it is seen as an

extension of animal behavior to humans, does not explain all learning for example, development of language in humans is not explained by this theory.

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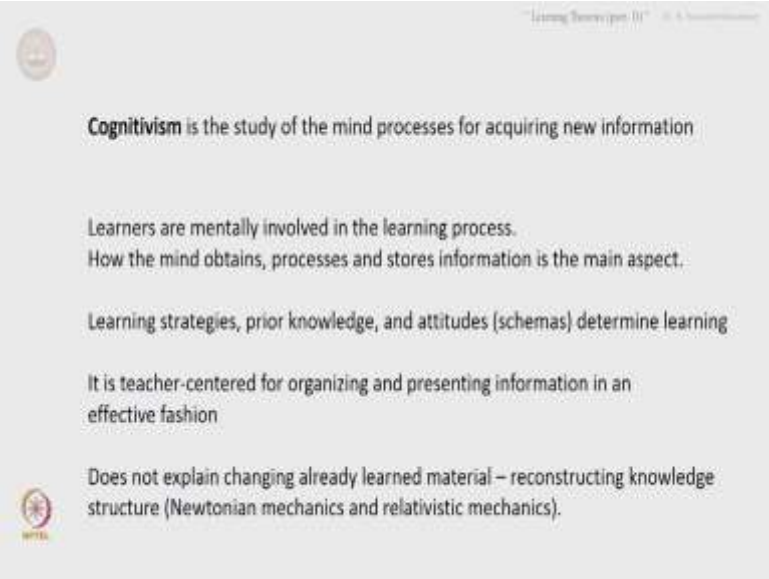

So, cognitivism comes into the picture, is the study of mind processes for acquiring new information. Learners are mentally involved in the learning process; that is the big difference between behaviorism and cognitivism. How the mind obtains, processes and stores information is the main aspect. Learning strategies, prior knowledge, and attitudes which are also called schemas, determine the learning. And it is teacher-centered for organizing and presenting information in an effective fashion.

It does not explain changing already learned material; reconstructing knowledge structure is not explained by this. For example, initially we started out with Newtonian mechanics, then we go to relativistic mechanics, the process that is needed to do this is not really explained by cognitivism.

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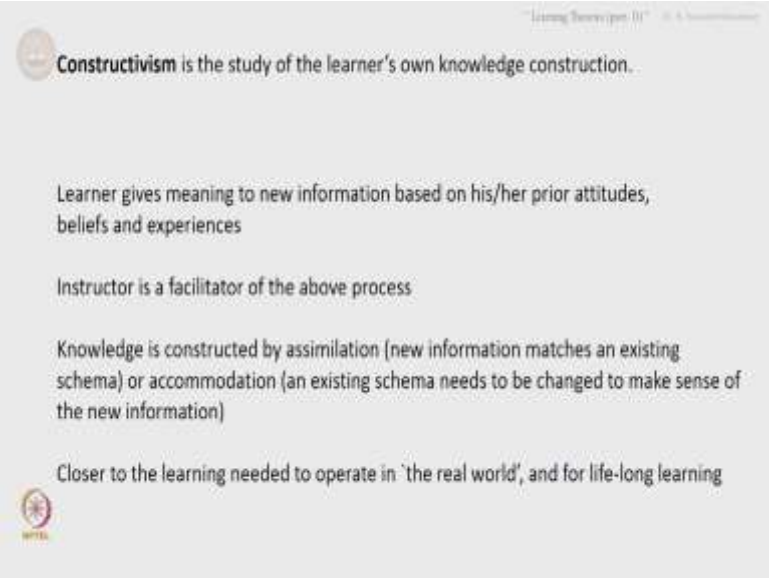

The next is constructivism which we have already seen is the study of the learners own knowledge creation. Learner gives meaning to new information based on his or her prior attitudes, beliefs and experiences. Instructor is the facilitator of the above process, knowledge is constructed by assimilation; new information matches an existing schema or accommodation; an existing schema needs to be changed to make sense of the new information.

Closer to the learning needed to operate in the real world and for lifelong learning.

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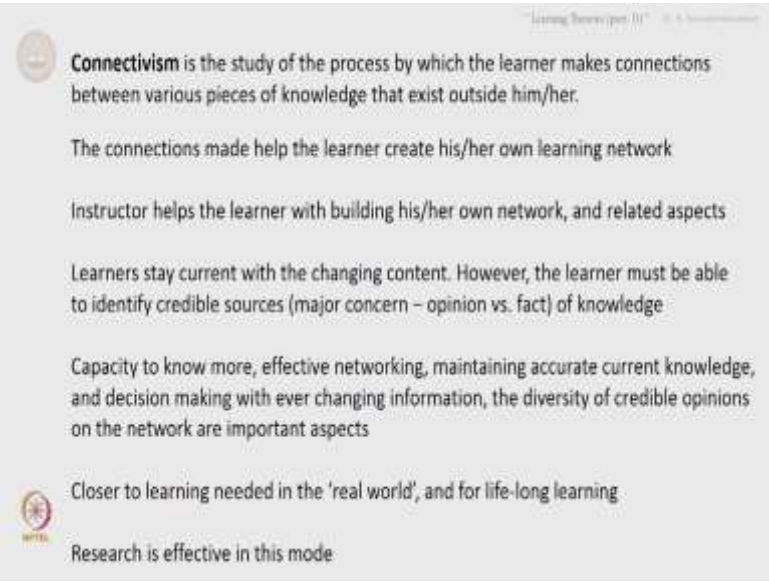

And finally, connectivism is the study of the process by which the learner makes connections between various pieces of knowledge that exist outside him or her. The connections made help the learner create his or her own learning network. Instructor helps the learner with building his or her own network, and related aspects; not the actual points, but how to build this network.

Learners stay current with the changing content; however, the learner must be able to identify reliable sources, this is a major concern. For example, on the net, on the world-wide web, it is very difficult to make out for a new person to what is opinion and what is fact, so this is where guidance may be needed. Therefore, the ability to identify credible sources of knowledge needs to be built in.

Capacity to know more, effective networking, maintaining accurate current knowledge, and decision making with ever changing information, the diversity of credible opinions on the network are important aspects. Closer to learning needed again in the real world, and for lifelong learning. Research is effective in this mode usually; all research is effective in this mode.

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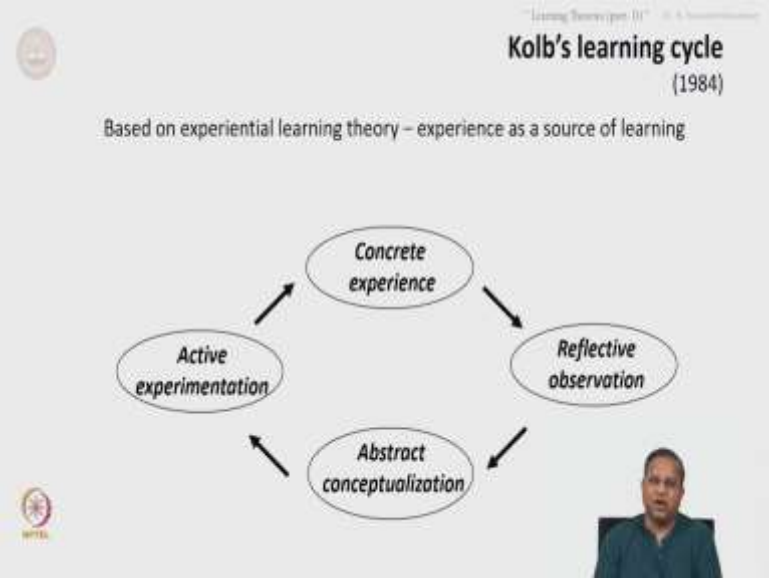

So, these are the learning theories and then let us also look at something called Kolb's learning cycle. This is based on experiential learning theory, experience as a source of learning; you have concrete experience that leads to reflective observation, that leads to abstract conceptualization and active experimentation which further leads back to

concrete experience; this is the Kolb's cycle of learning people; this is what Kolb says about how people learn. This can be a good understanding framework for us, to try out new strategies and so on so forth.

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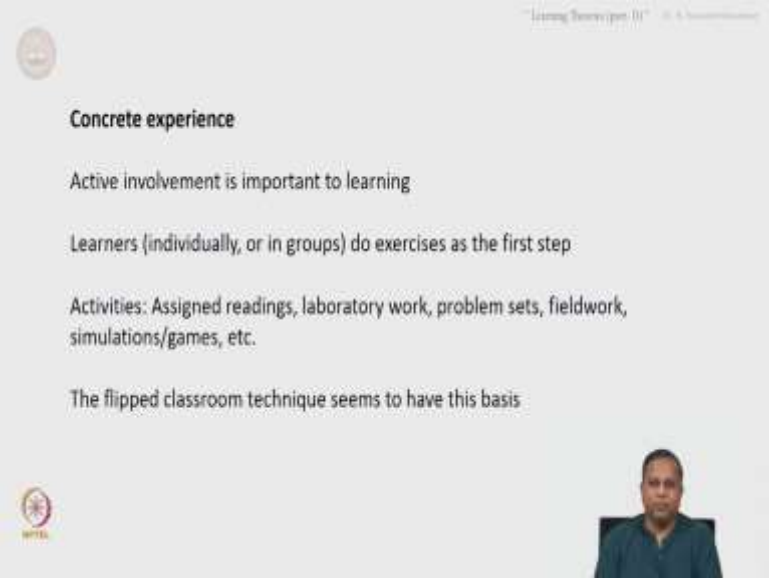

Concrete experience; active involvement is important to learning. Learners individually or in groups do exercises as a first step. Activities could be assigned reading, laboratory work, problems sets, fieldwork, simulations, games and so on. The flipped classroom technique seems to have this basis.

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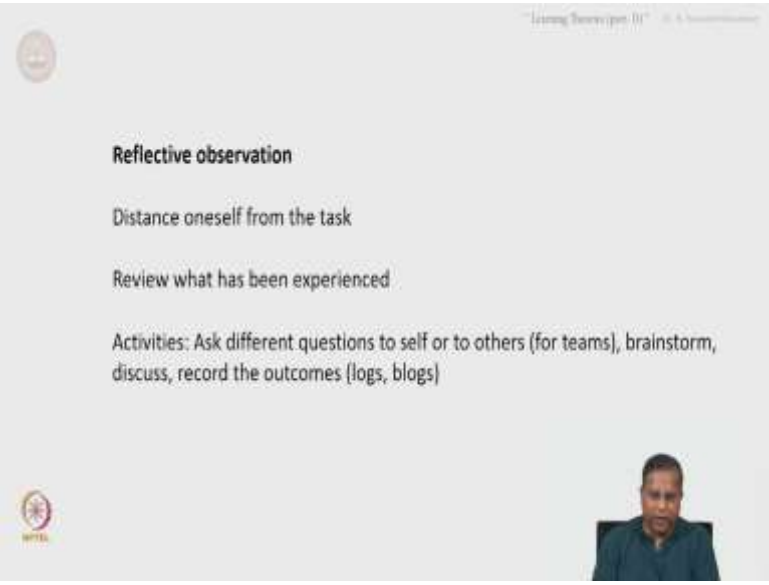

Then comes reflective observation; distance oneself from the task after having done the task; first immerse yourself in the task, that is the previous thing that we talked about, concrete experience. Then you move away from the task and reflect. Distance oneself from the task; review what has been experienced, the activities could include ask different questions to self or to others; for teams such as, brainstorm, discuss, record the outcomes; through either logs or blogs and so on so forth; those are the activities.

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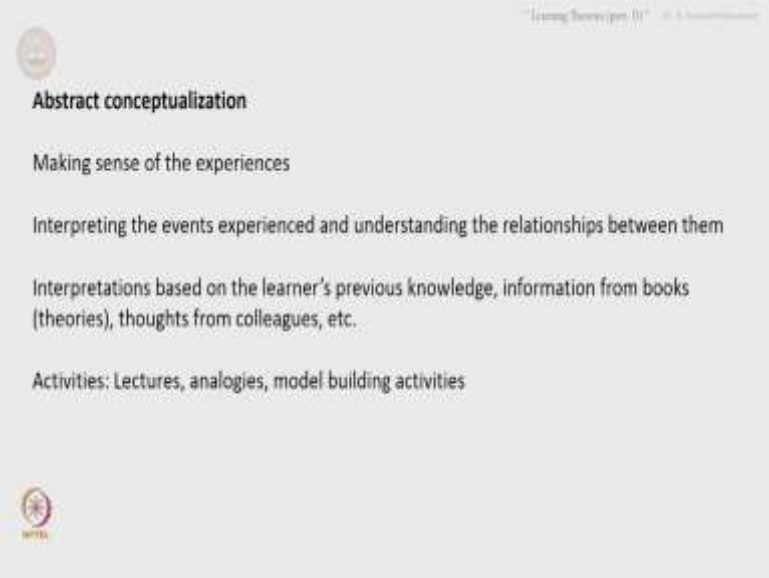

Then the next part is abstract conceptualization; experience, reflect; now conceptualize. Making sense of the experiences; interpreting the events experienced and understanding the relationships between them. Interpretations based on the learners previous knowledge, information from books such as theories; thoughts from colleagues and so on so forth become here.

Activities could be lectures and analogies, model building activities and so on.

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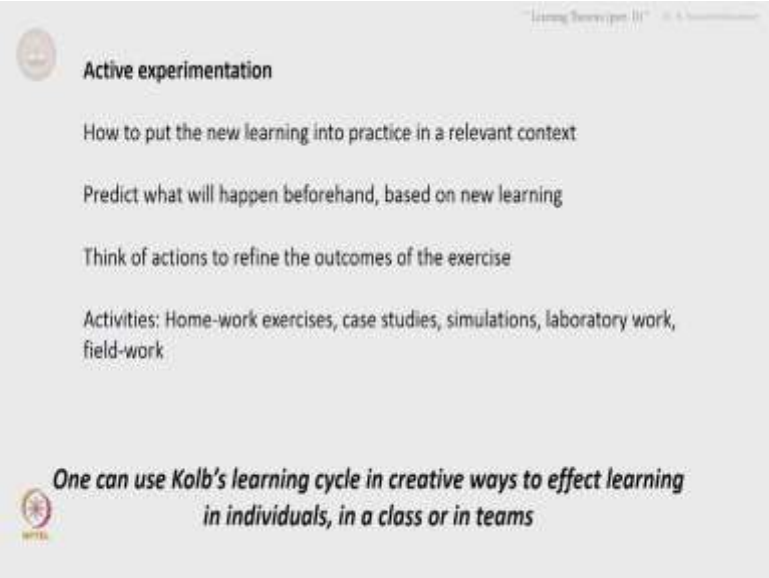

And the final step is active experimentation; how to put the new learning into practice in a relevant context? Predict what will happen beforehand, based on new learning. Think of actions to refine the outcomes of the exercise. Activities could include homework exercises, case studies, simulations, laboratory work, field-work. And once the learning is set here, then go back and immerse yourself and that completes the learning cycle.

So, this is how a learning could happen is what Kolb says. So, one can use Kolb's learning cycle and creative ways to affect learning in individuals in a class or in teams. So, this is an introduction to some aspects of theoretical knowledge; please read your reference book and take things forward from there. What I thought, I would also do at this stage is to review what we have done in the course so far because there is only one lecture left.

We first looked at an inexperienced engineering teachers view, then we went from traditional lecturing; I talk you listen to helping students learn better by expanding the scope of the lecture. Then we looked at what really is better learning and we use Bloom's taxonomy to understand better learning.

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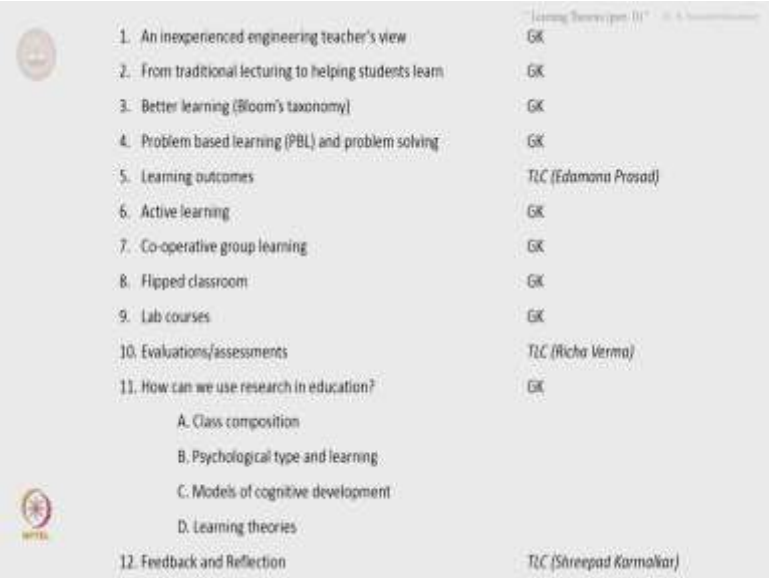

Then we looked at problem based learning which is the first step to expand a lecture to facilitate better learning in students. And since problem solving is an important aspect needed for engineering students, we also looked at some aspects of that. Then the learning outcomes were covered by Dr Edamana Prasad; the head of TLC, then we looked at active learning, cooperative group learning; these are all techniques to improve learning. Flipped classroom, where the first exposure is at home and then in the classroom, we discuss. How to run effective lab courses one example was given through a peer accepted method.

Then Dr Richa Verma from TLC talked about evaluations, assessments and then we got into this major chapter on how can we use research in education. We looked at four parts; class composition, class as a whole; the average students, right students, left students; predominantly how to improve their learning. And that we used as some sort of a bridge from practice to theory, then we looked completely into theory; psychological type and learning, models of cognitive development and learning theories today.

And the final chapter will be on feedback and reflection by Professor Shreepad Karmalkar of TLC. I hope you enjoyed the course, you found the course useful; please participate in the discussions, in the forum and I will try my best to participate in that and let us take this learning to a higher level. Wish you all the best. Thank you.