TALE - 2 Course Design and Instruction of Engineering Courses

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Lecture – 19
Instructional an Overview

Greetings and welcome to Module 3 of TALE. This is in continuation of TALE Module 2. TALE Module 2 itself is a continuation of TALE Module 1.

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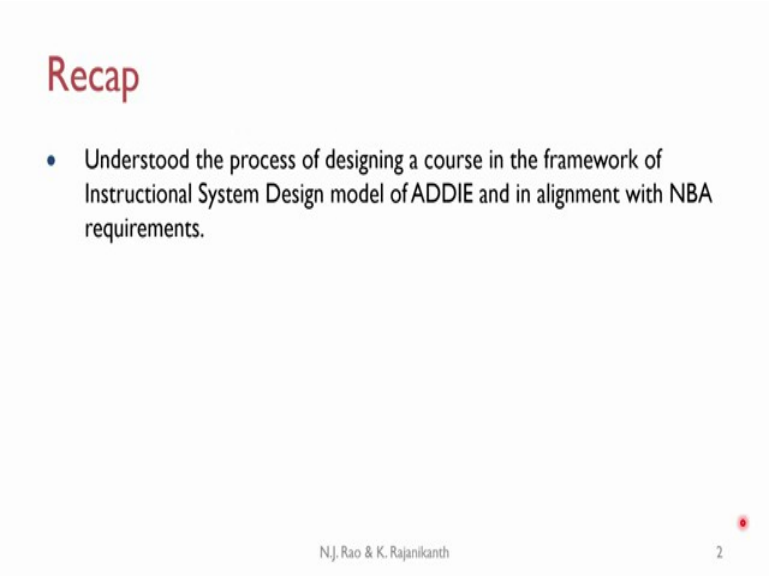

In TALE Module 2 we looked at the process of designing a course in the framework of ADDIE model. ADDIE model is a very generic model representing analysis, design, development, implement and evaluate activities. The sub-processes in each one of these phases are selected so that the finally, the course can be designed in alignment with the NBA requirements.

Now you are able to design a course right from the beginning with requirements specified by National Board of Accreditation. Till now what people have been doing is, they were designing the course in their own way. By and large it is really selecting a list of topics which is done by board of studies and then trying to see how it can be brought into in alignment with NBA requirements.

If you have a choice of designing a course you can use the ADDIE framework and design the course in alignment with NBA requirements, that the process of design and conduct of the course; which we have seen through the 5 phases of ADDIE.

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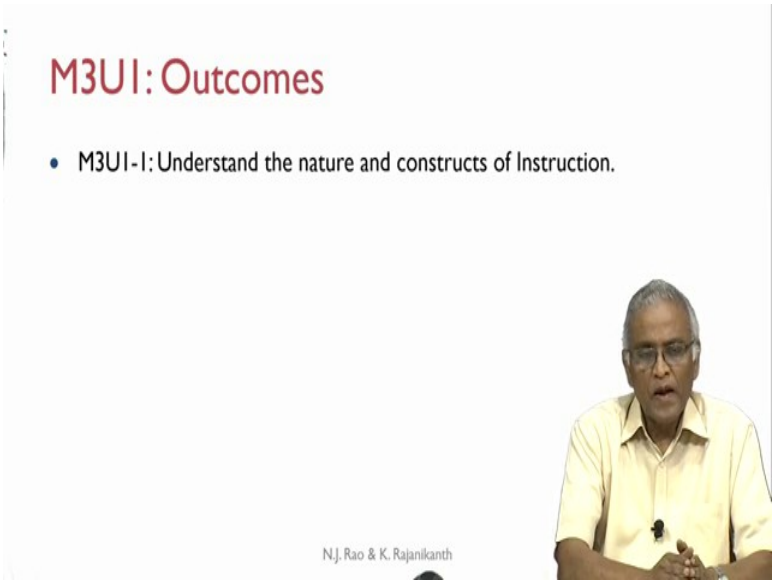

Module 3 is going to look at how to conduct the instruction. Learned how the course can be designed, how to write outcomes (explored in TALE Module 1.) Now we have come to the stage how we can do the instruction.

In this unit, we try to understand the nature and constructs of instruction. We also need to define what instruction is, and what is its nature and what are its constructs.

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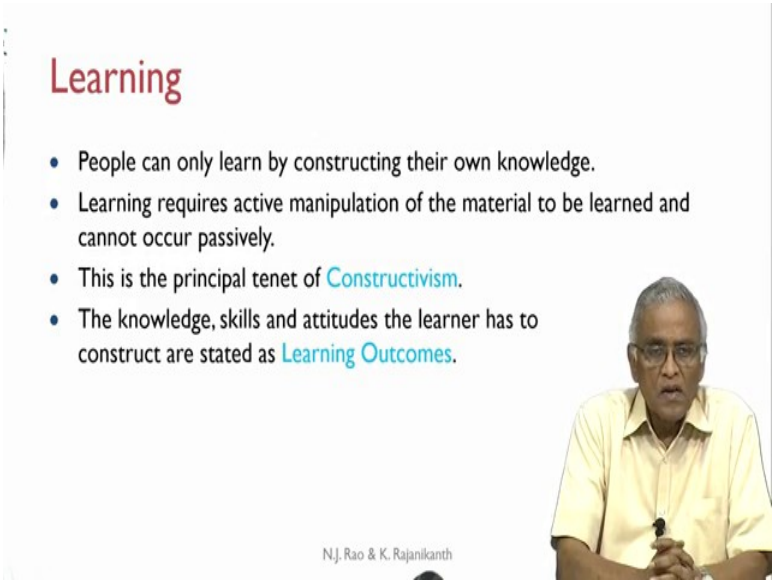

Now, the first thing that should be very clear; there is no unique method of instruction.

Based on the knowledge that we have (there is no exception to this), people can only learn by constructing their own knowledge. If you do not construct your knowledge, the only way you are supposed to be learning is to remember the answers to questions that are going to be asked for as many questions as possible (that is what we call rote learning.)

Unfortunately, many of the examinations or competitive exams, reduce learning to rote learning. But if you want to learn genuinely; that is, you can utilize that knowledge in conditions that are not familiar to you. If you need to apply your knowledge or solve problems in new situations, then you need to construct your own knowledge. The learners require active manipulation of the material to be learned, to construct their own knowledge and learning cannot occur passively. That means it cannot occur merely by listening. You need to work with the material that needs to be learned in whatever manner - it depends on the nature of the subject. Instruction tries to facilitate how the learner can manipulate the material to really learn.

This is the principal tenet of constructivism (see TALE Module 1.) Each learner is constructing his own knowledge. It is not as if something can be transferred and permanently stored in the long-term memory of anybody's brain. Every individual will

have to construct his own knowledge. The knowledge, skills, and attitudes the learner needs to construct are called learning outcomes.

We start with what is to be learned and state them as learning outcomes, and the instruction should facilitate all the learners to construct their own knowledge, that is what instruction is about.

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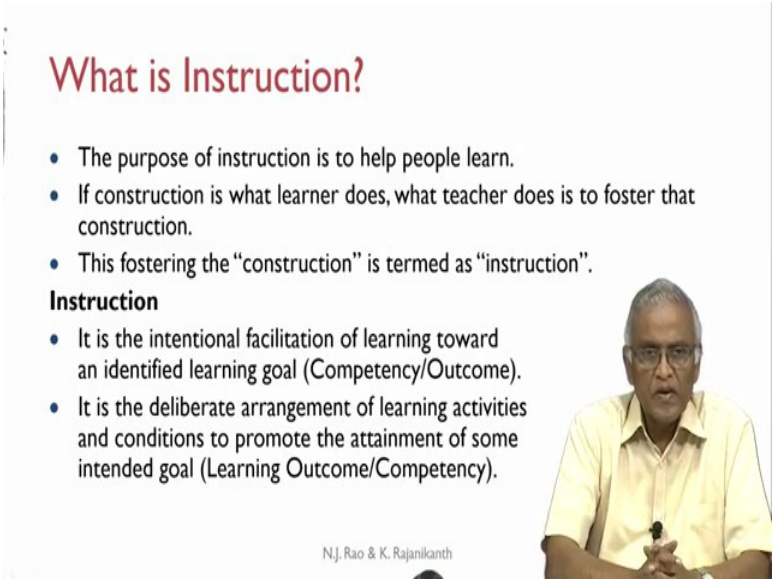

"The purpose of instruction is to help people learn," it is a very simple statement. That is why instead of calling somebody like a teacher, we are calling him/her as an instructor (though the word instructor is not palatable to some of the teachers, they somehow consider instruction is a lower-level process). All teachers do instruction in the classroom. What is the purpose of instruction? It is to help people learn.

If the construction of knowledge is what the learner does, what the teacher does is to foster that construction? By keeping on presenting lot of material the student does not learn. Therefore the main task of the teacher should be how do they faster the construction of the knowledge of all learners. Of course, the challenge is each learner is different from the other. Same methods, same techniques will not work the same way for all.

This fostering of construction of knowledge by the learner is termed as instruction (that is what we informally we talk about.) In a formal way, instruction is the intentional

facilitation of learning toward an identified learning goal. What is an identified learning goal? Either it is stated as competency or course outcome. (Competency is a smaller component of a course outcome.)

Sometimes an outcome does not have any competencies; there is no further elaboration of an outcome; that is why learning goal either is a competency or an outcome. Another way of stating - it is the deliberate arrangement of learning activities and conditions to promote the attainment of some intended goal. It is a deliberate arrangement of learning activities. What are learning activities? Learning activity would be listening to a lecture, solving a problem, two people discussing about something under the supervision of teacher, a field experiment etc.

There are several learning activities. The teacher will have to choose the learning activities he/she wants and their sequence – the deliberate arrangement of learning activities and conditions. Conditions will always go with that because it depends on the kind of environment and classroom arrangements that they have and so on. To promote the attainment of some intended goal which is nothing but (for us) a learning outcome/course outcome/competency, (competency under some course outcome.) Always keep in mind that "instruction is facilitation of learners towards an identified learning goal" that is a simple way of defining instruction.

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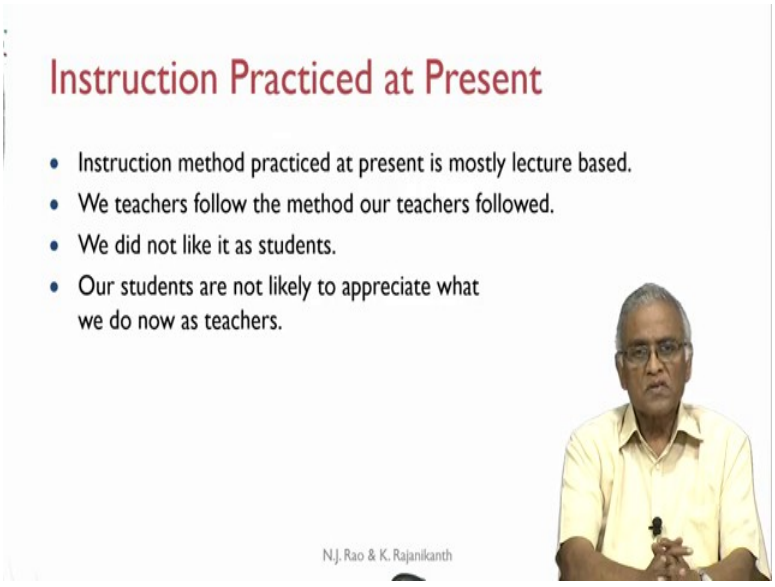

The instruction practiced is mostly lecture based; in more than 90 percent of the situations or classrooms is lecturing. Why did we get into this mode? Because we teachers follow the method our teachers followed, even during our primary school or secondary school or in the colleges where we studied our teachers followed lecturing method.

We continue to follow the same lecturing method thinking that is the only way to do. As students we did not like the way our teachers taught us. Yes, occasionally you will have some inspiring teachers, the way they speak, possibly the way they care or the way they organize information, but still even our good teachers are mostly lecturing. We did not like it as students. Our own students are not likely to appreciate what we do now as teachers.

The plea is, one should explore at least alternatives to mostly lecture based type of instruction. Lecturing is not the only method which we will explore in this module.

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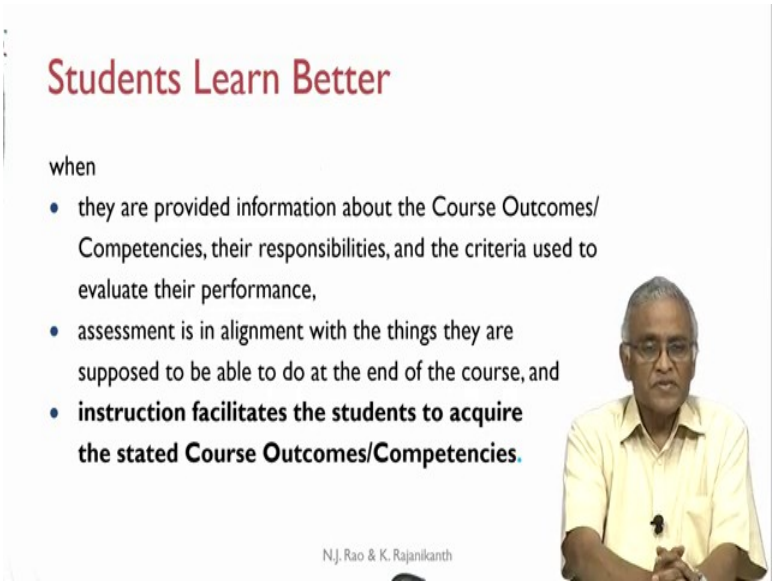

Students learn better when they are provided information about the course outcomes/ competencies, their responsibilities and the criteria used to evaluate their performance. This is what has been stated in Module 1 and 2. It is seen in Module 1, how to write course outcomes according to Anderson-Bloom taxonomy.

Assessment should be in alignment with what the learners are supposed to be able to do at the end of a course. We emphasized if the assessment is not in alignment with the course outcomes, the intended learning does not take place. Learning will not take place, because students will only learn as per their perception of what assessment is.

Let us say we assume assessment is in alignment with the course outcomes. Once these two are taken care of, students will learn better when instruction facilitates the student to acquire stated outcomes or competencies. Our main goal is instruction is to facilitate the learners to attain stated outcomes.

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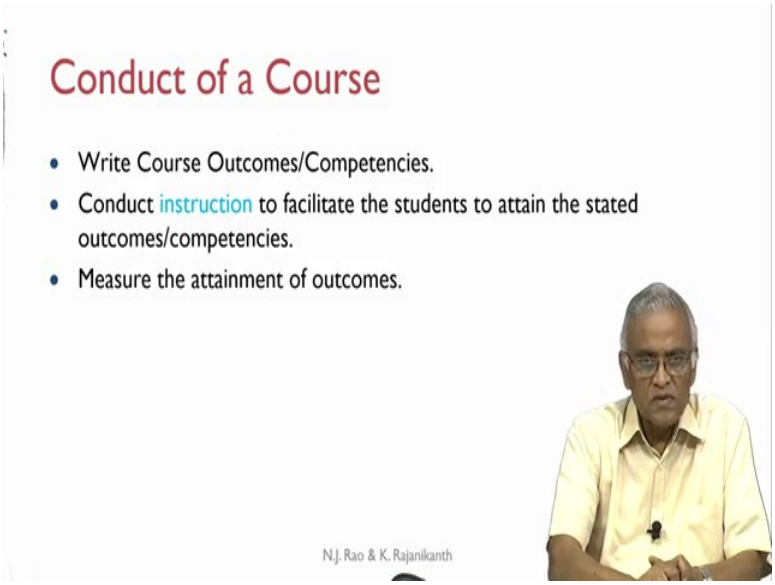

How do we conduct a course? We write course outcomes and competencies and conduct instruction to facilitate the student to attain the stated outcomes. Then measure the attainment of outcomes, and many times we do it as we go along through assignments and the class tests, and finally we will do end semester examination. We are conducting instruction and as we go along in a semester, we keep measuring the attainment of outcomes which is the sequence of conducting a course.

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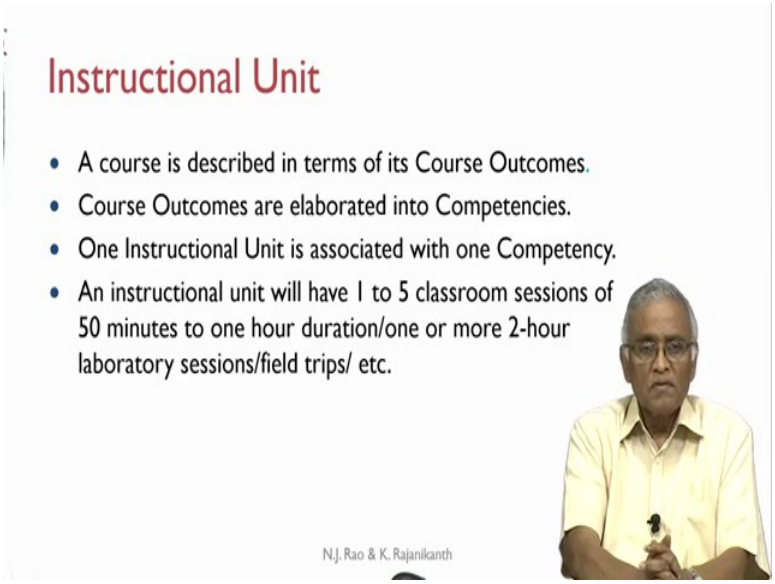

Let us redefine what an instructional unit is? We have communicated in Module 2, "a course is described in terms of its course outcomes." Course outcomes are elaborated into competencies. Let us assume we have about 7 course outcomes and once we elaborate course outcomes into competencies, (let us say) we have about 15 competencies.

One instructional unit is associated with one competency. That means, instructional unit and competency go hand in hand, they are essentially the same. That means, if I want to label an instructional unit, I will label it with the competency statement. An instructional unit will have 1 to 5 classroom sessions of 55 minutes to 1 hour duration or one or more two hour laboratory sessions, field trips etcetera.

An instructional unit will consist of; 1 to 5 classroom sessions and/or 1 or more 2-hour laboratory sessions. Some instructional unit may have only 1 hour, some may have 2, some may have even up to 5, but very rarely you will go beyond 5 classroom sessions for one instructional unit.

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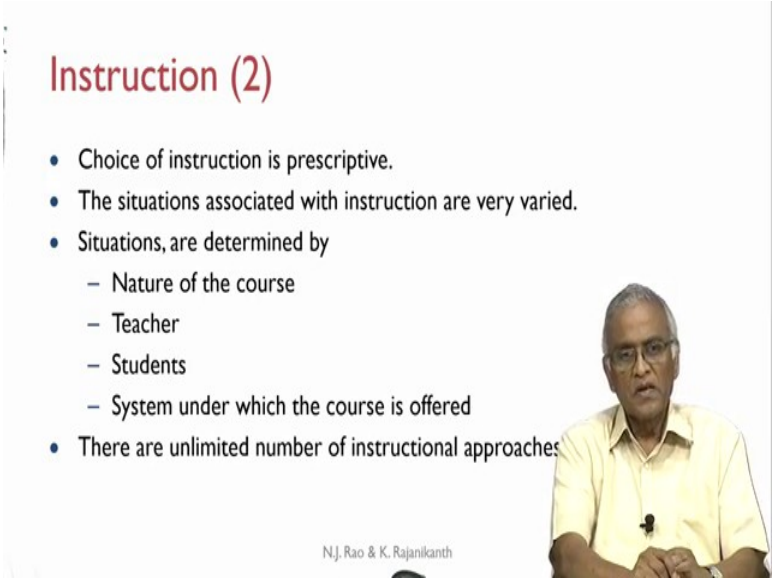

The choice of instruction is prescriptive: means you are saying "this is how instruction is or should be." Another person may want to rearrange the instructional activities in a different way. We are 'prescribing,' it is not as if it is derived from some well-established theory and this is the only way to conduct an instruction.

As a teacher we choose an instruction that is 'deliberate ranging of learning activities' in a manner that I consider most conducive to student learning - prescriptive, it is not unique. Situations associated with instruction are very varied. For example, situations are determined by the nature of the course; a mathematics course, statistics for engineers, a course in physics, a course in mechanical drawing or an electromagnetic theory. They are all very different in their nature, the emphasis and the way to learn them are all different. Situations are different and determined by the nature of the course.

There are different teachers for different courses. Each teacher (after all based on his experience and his abilities) will look at the course in his own way. Students are not the same in all institutions. You may have a very large number of very good students, let us say in slightly better ranked colleges, but in other colleges you may have people with relatively lower cognitive abilities and different motivation levels and so on. For example, if I take a third-year electrical engineering branch and I look at students across the country and different institutions we cannot say they are the same. Therefore, you

cannot take the same instructional approach to all types of students. The nature of students will determine the situation.

On top of that, because higher education is highly privatized: each college has its own management and we all know different managements will look at the institution in different ways. No two managements will look at the engineering college in the same way; for some it is purely business, for some something that is working is quite satisfactory, you are not too keen to improve, someone would want to micromanage everything, and some managements would want to legislate many things like the way the a course will have to be taught and so on.

The system under which the courses offered is very different again. To that extent situations are different and quite varied (we will explore that a little more in the next unit.) There is unlimited number of instructional approaches and still people are contributing. The choices that you have keep on increasing, (the technologies are also continuously improving.) with the technologies the choice that you have keeps on increasing more.

The teacher needs to make a choice looking at what is available and what is possible, Unfortunately or incidentally most to the teachers make the choice of instruction by lecturing most of the time. We urge you to explore alternative instructional approaches for your course.

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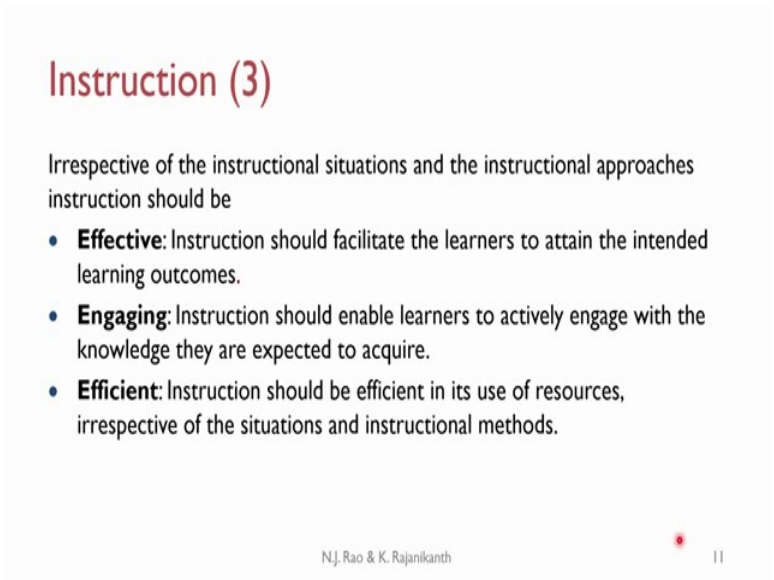

Irrespective of the instructional situations and instructional approach - how should instruction be? It should be effective first. Effective means the learners have to attain the intended learning outcome, or here for example, with respect to an instructional unit - at the end of instructional unit the student should be able to construct his own knowledge that will facilitate him to attain the stated competency. A competency is the goal for each instruction unit. If it is not effective, it is practically useless.

Then it should be engaging; that means, instruction should enable learners to actively engage with the knowledge they are expected to acquire. If they are not engaging with the new knowledge, they will not attain the intended learning outcome. The teacher organizes or arranges the learning activities to facilitate student engagement. Listening is not an active form of engaging with the knowledge. The teacher has to address the issue of how to make their students engage with the knowledge.

Instruction should be efficient in its use of resources, irrespective of the situations and instructional methods. Efficient in the sense - in any formal program there is only limited time available to a teacher when teaching a course. The number of hours available, or when the student is trying to do 5 to 6 courses, the amount of time the student has. A teacher cannot assume that the student is available to you all the time all the days in a semester.

Within the resources that are available, one should minimize the amount of resources used. If you require longer times, then it is not efficient; for example, for the same competency instead of 3 hours if you take 6 hours, you can make everybody engage with new knowledge and try to make it effective, but will not be efficient.

E3 instruction - Effective, Engaging and Efficient. All the three need to be addressed at the same time. Sometimes you have to sacrifice one of them; for example, a difficult concept may require more time and I may not be able to make it efficient, but if it is not effective it is of no use.

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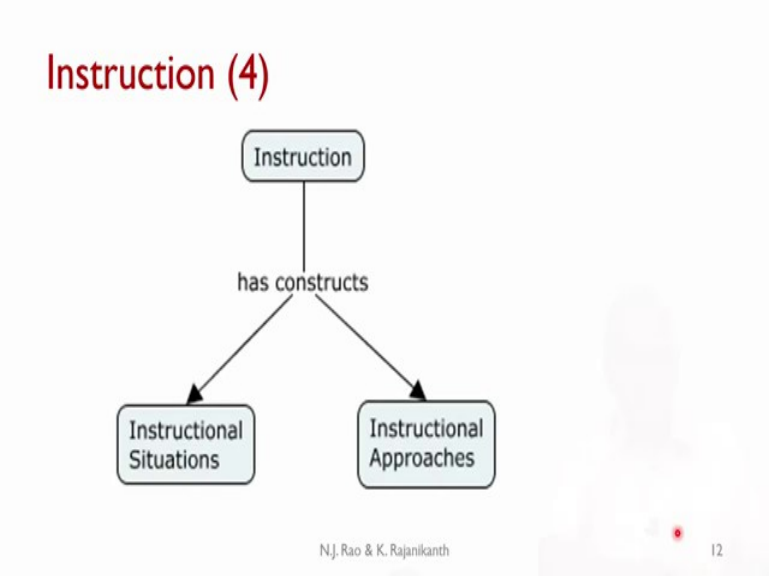

We are trying to classify the various aspects of instruction - a subjective way of classifying. Instruction has two constructs; one is instructional situations and the other is instructional approaches, (each one will be expanded.)

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Instructional situations - are characterized by values and conditions. Values are learning goals. I can choose my learning goal, for example the learner not only get sensitized, but also have a feel for or be concerned about the influence of technology on society. But I may not have such a learning goal. The choice of learning goal will make a difference to the instructional situation.

Then what are the priorities and what are the methods that are being used and who has the power, who decides. In many of our privatized, smaller (Tier 3) type of engineering colleges, 'who has the power' seems to be playing the dominant role.

Instructional situations are also characterized by conditions. Conditions include the content, that is, nature of subject material, learners themselves, (learners are not uniformly the same across all institutions), and the kind of learning environment that you have.

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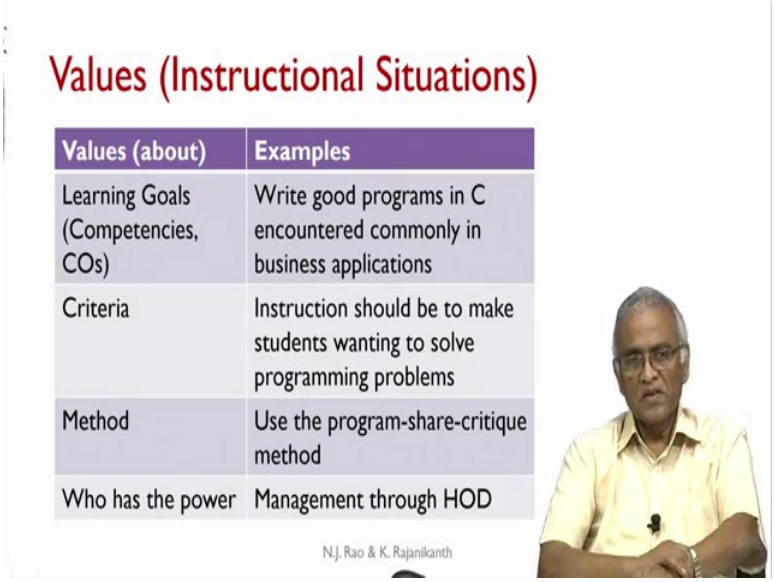

Values or instructional situations: values are about learning goals nothing but competencies and COs. Example: "write good programs in C encountered commonly in business applications." When I write this kind of learning goal it may not be like solving the problems that are already worked out in the class or the end of the chapter problems.

What is the learning goal I have put for myself? Write good programs in C encountered commonly in business applications. That means, a teacher will have to make a list of these commonly encountered business applications, and then facilitate the student to solve those problems. You may solve some sample, but the students should be able to solve those problems by themselves.

Criteria of my instruction: instruction should be to make students wanting to solve programming problems, that means, the student should be excited to solve more programming problems.

The method that the teacher has chosen is use the program-share-critique method. That means, each student creates a program, shares it with his neighbor, the neighbor will critique. Once you use this method it takes time for sharing, critiquing and modifying. As we can see it takes time, if we want to use this method, and you have to incorporate this feature into planning.

Who has the power? A specific instance - management through head of the department. For example, if I take an IIT or Indian Institute of Science, there is no need to talk about management through HOD, it is a teacher who has the power. Whereas, in many colleges that we have seen or heard about, management through HOD has the power and; obviously, that will have great influence on the instructions that is followed.

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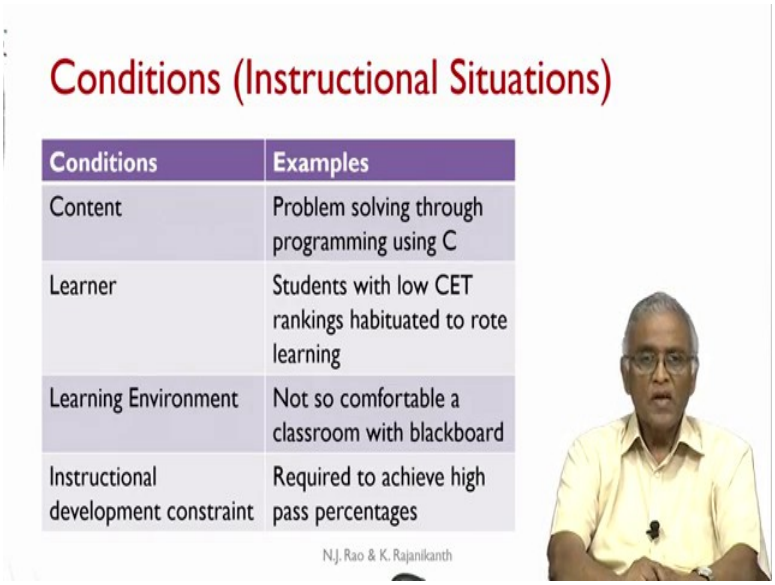

Conditions: Example “problem solving through programming using C”. Students are dominantly with low CET ranking are habituated to rote learning.

Learning environment: you may not have so comfortable a classroom and you have only blackboard and chalk piece. In some other place you may have LCD projector. In a hot place if there are fans running all the time, then it is so noisy that the backbenchers cannot really listen to what the teacher is saying.

One important instructional development constraint is the requirement to achieve high pass percentages; that is what the HOD orders or the management requires, (whatever you do we have to achieve high pass percentages.) Whether it is a private University or in an affiliated college, unfortunately or incidentally this is the major requirement. That means instructional development constraint - how do I make sure that you have high pass percentages?

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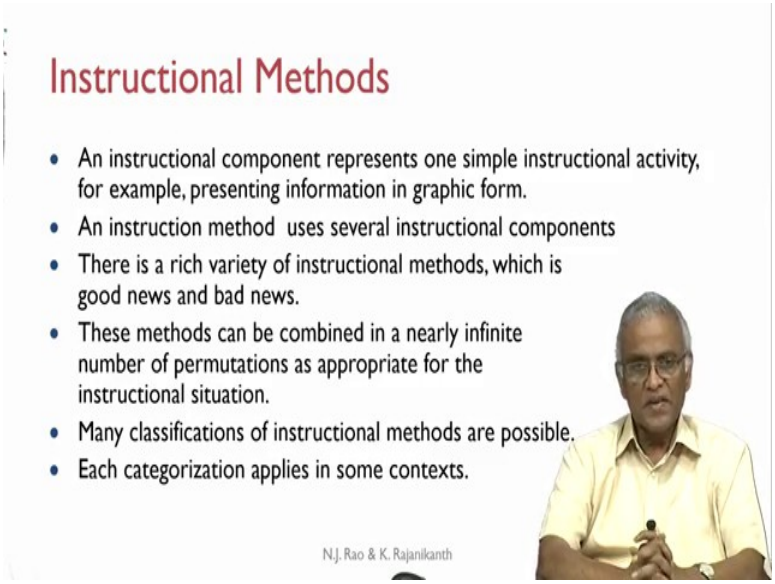

We spend a little time on instructional methods. When you have almost unlimited ways of doing instruction - how do I classify? We are trying to arrange hierarchically like this; highest level - instructional approach and at the lowest level instructional components. That means, an instructional method will have several instructional components organized in one way.

An instructional approach will use different instructional methods. What instructional method do I use? That characterizes the instructional approach that we are taking.

An instructional component represents one simple instructional activity; for example, presenting information in a graphic form. Either I am drawing a graph or a table and then I draw the graph along with the students or I project a table and a graph, but presenting information in graphic form is one instructional component. An instructional method uses several instructional components and there is a rich variety of instructional methods in the literature. Of course, which is both good news - you can choose, and bad news - you have to choose.

These methods can be combined and nearly infinite number of permutations as appropriate for the instructional situation. Lot of literature and information exists about how to effectively utilize the instructional methods, in what context they work, whether there are many tools available for instructional methods on the net. There are many ways

of classifying instructional methods and any characterization will apply only in some contexts.

There is nothing like a universal instructional method which is applicable to all. At every stage an instructor does not have to follow a method that is given to him by someone. An instructional method can be tweaked or adjusted according to his experience, to his preference, to the students that he has, to the subject is dealing with. As you can see when you are tweaking you are creating essentially new instructional method.

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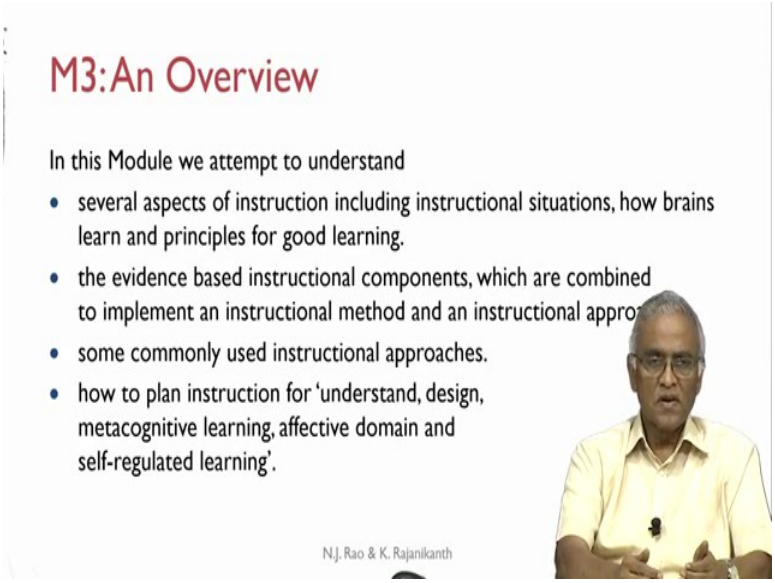

Based on the kind of understanding that we had what instruction is all about, let us look at what we are going to deal with in Module 3 of TALE. In this module, we attempt to understand several aspects of instruction, including instructional situations, how brains learn, and the principles for good learning.

Whatever little knowledge that we have – 'how brains learn', that knowledge can be used in instruction. Then we talk about the evidence based instructional components which are combined to implement an instructional method and an instructional approach.

Evidence based instructional component has been established through extensive field work. Certain use of instructional components will greatly facilitate learning or greatly facilitate this student to get engaged with the knowledge.

We also look at some commonly used instructional approaches; then how to plan instruction for understand, design, metacognitive learning, affective domain and self-regulated learning. We talked about various Anderson-Bloom taxonomy levels; for example, how do I instruct for my focus on understanding not on rote learning, not on remembering, or sometimes how do I train my students for create activity that is design or sometimes metacognitive learning. And how do I address affective domain and can I also approach self-regulated learning, can I make my student go for planning his own learning. That means, he should be able to take care of himself through self-regulated learning. So, these are the things that we will look at in Module 3.

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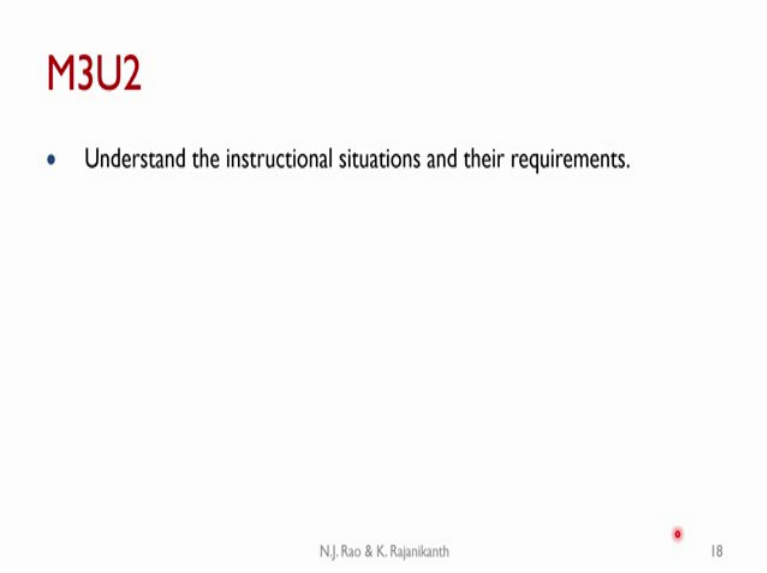

In the next unit we first focus on instructional situations and their requirements. I am sure all of you as teachers would have experienced many of these issues and you have to take the situation where you are in, and plan your instruction. You cannot follow somebody else's instruction which is done in entirely different situation.

Hopefully a better understanding of instructional situations and their requirements will help you to plan your instruction.

Thank you very much for your attention.