NBA Accreditation and teaching- Learning in Engineering (NATE)
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Indian Institute of Science, Bangaluru
Lecture 42
Direct Instruction – 2

Greetings, welcome to module three, unit two on Direct Instruction 2.

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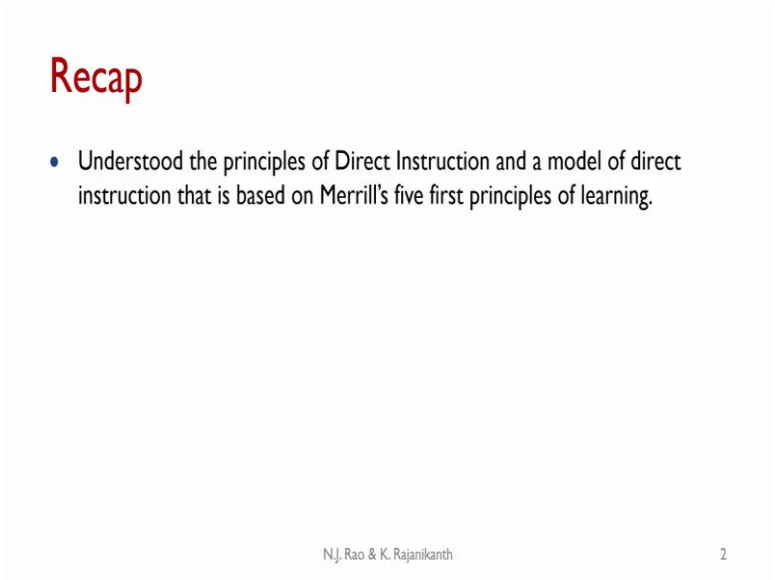

In the earlier unit, we understood the principles of direct instructions and a model of direct instruction that was based on Merrill's five first principles of learning.

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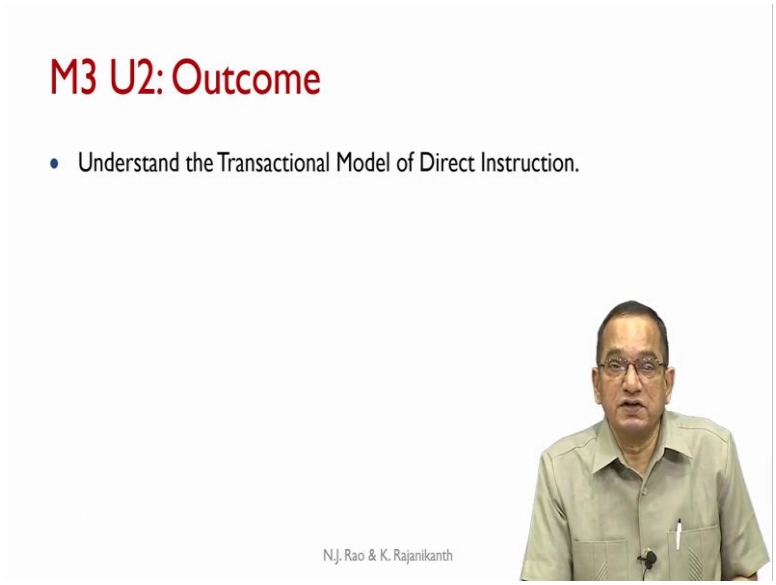

In this unit we will understand the transactional model of direct instruction.

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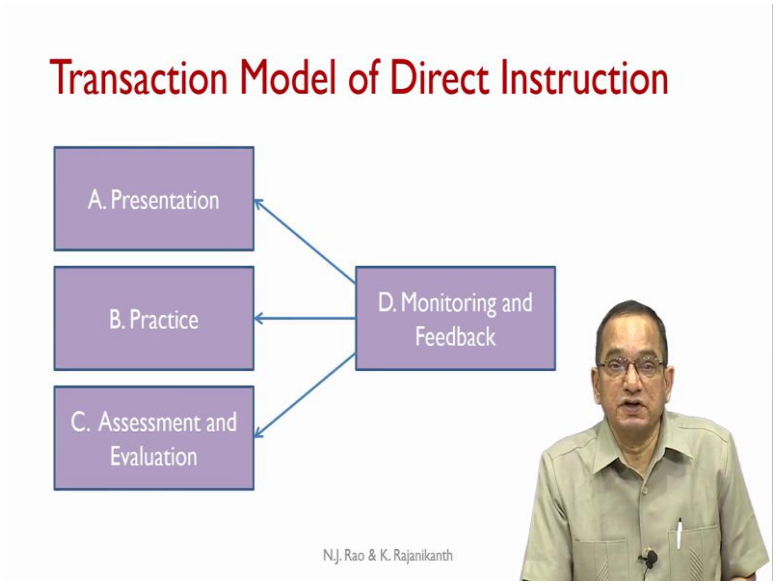

This block diagram outlines the key features of the transaction model of direct instruction. There are 4 basic phases to the transaction model, presentation phase, practice phase, assessment and evaluation and there is a phase monitoring and feedback which occurs throughout the instruction. That so, the arrows from the phase D are to all the other three phases.

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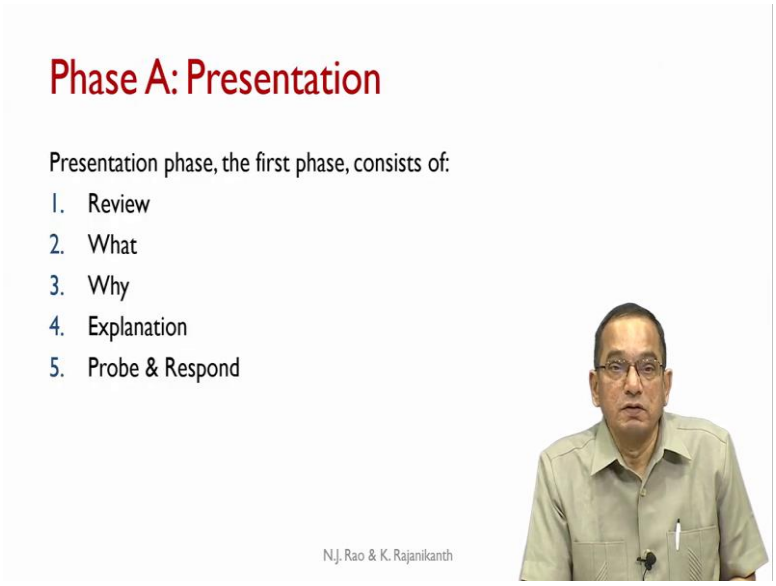

Phase A is presentation, this phase consists of five instruction activities; review, what, why, explanation, probe and respond. In the other phases there are similar instructional activities, at the outset it may look like the time available to address a given CO is inadequate to cover

so many instructional activities. But we will see that many of these instructional activities do not consume excessive amount of time.

It would be a good practice to cover all these activities because they promote good learning. And depending upon the available time, instructor can allocate suitably the time to different instructional activities, but it would be good to address all these issues. So, in the presentation phase we have five activities, review, what, why, explanation and probe and respond.

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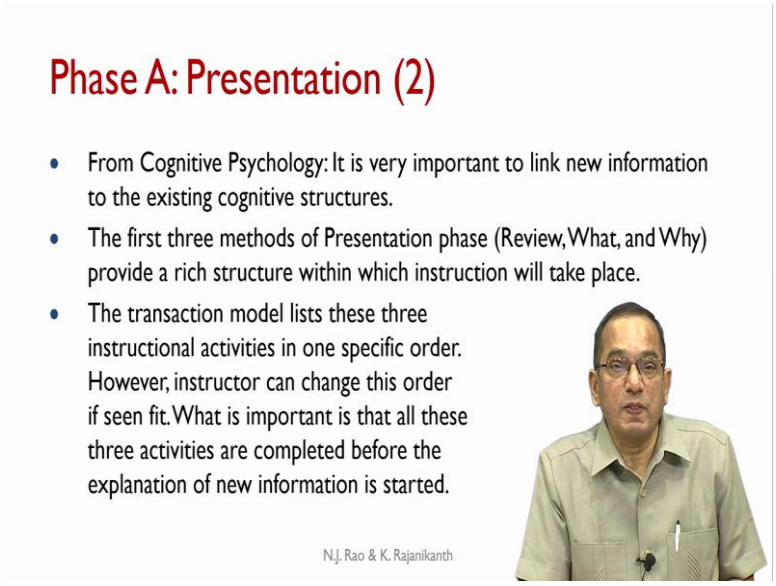

From the cognitive psychology perspective, it is very important to link new information to the existing cognitive structures. We saw the importance of this aspect in the earlier unit also. Students must be able to link the new knowledge with their prior knowledge with their prior model of understanding. The first three methods of presentation namely review, what and why provide a rich structure within each instruction will take place.

The transactional model lists these three instructional activities in one specific order that is review, what and why. However, instructor can change this order if seen fit. For example, in a specific context, instructor may first touch upon the what and then move on to the review and then why. What is important is that all these three activities are completed before the explanation of information is started. Review, what and why must be completed before new information is started.

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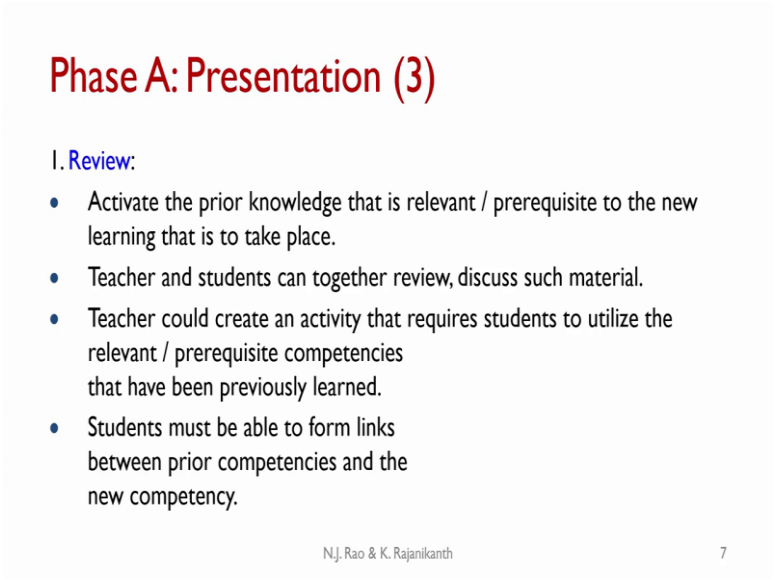

The first activity is review. Activate the prior knowledge that is relevant or prerequisite to the new learning that is to take place. Teacher and students can together review, discuss such material. Teacher could create an activity that requires students to utilise the relevant prerequisite competencies that have been previously learned. It is very important for the students to link the new knowledge with the existing knowledge.

Students must be able to form the links between prior competencies and the new competency. Instructor can sometimes conduct a small quiz and use that quiz as a vehicle to create a situation in which the students would be able to recollect the earlier knowledge, earlier models with which the new information can be linked.

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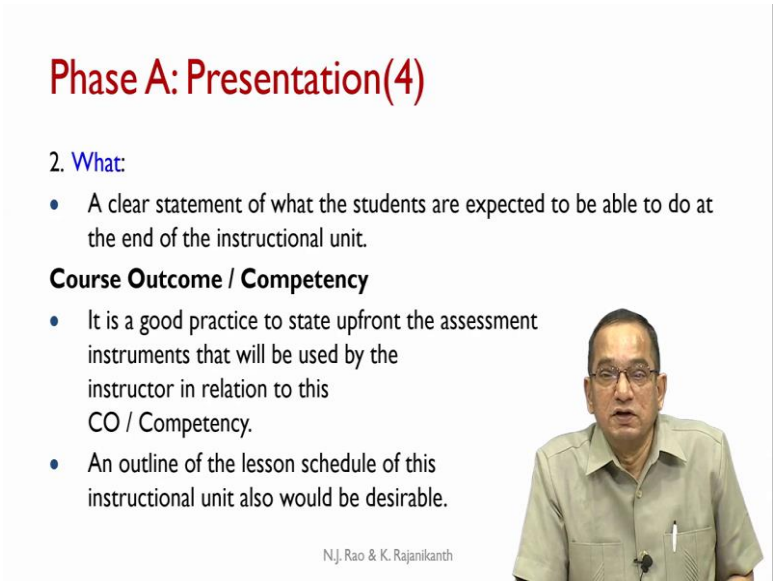

What: This activity is to essentially make it clear upfront to the students as to what is it that they are expected to be able to do at the end of the instruction unit. We have been calling this as the course outcome or when the course outcome is expanded further into a set of competencies, we are calling this as a competency. So, a clear statement of a course outcome are competency is always helpful.

It is a good practice to state upfront the assessment instruments that will be used by the instruction in relation to this CO and are competency. This makes the CO or competency more clear to the students. Students would be clear as to how they would be assessed. This would make it clear to them what is it they are expected to do at the end of the instruction unit. Thus, it is a good practice to state upfront the assessment also.

Further, an outline of the lesson schedule of this instruction unit also would be desirable. Students would have an approximate idea of the number of lessons that constitute this particular instruction unit and the sequence in which this material is going to be presented but essentially the what activity is to make the students clear about the CO or the competency that is concerned with this particular unit.

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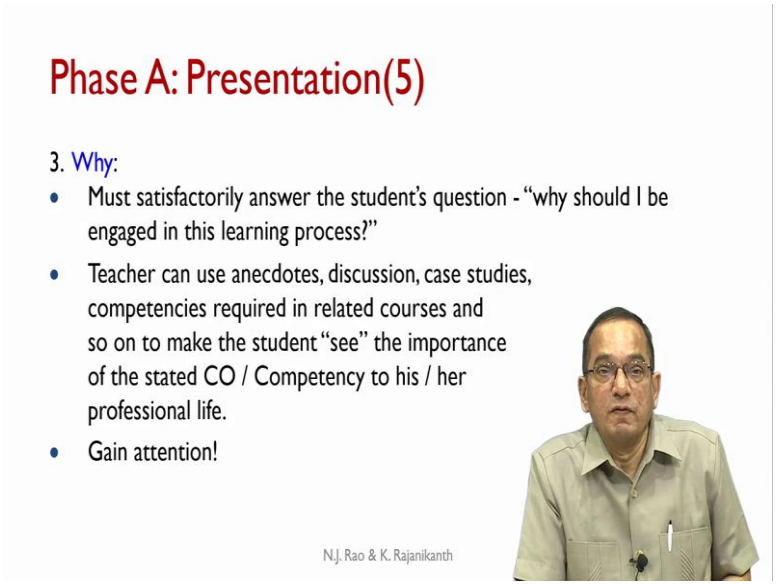

The third activity is why. Instructor must satisfactorily answer the students' question, why should I be engaged in this learning process. What is the relevance of this particular competency to my professional carrier? How is it related to what I am going to do in the near future? How is it linked to the competencies that I am to acquire in the subsequent semesters?

Essentially the teacher must answer this natural curiosity of the student as to why the student should be engaged in this particular learning process. Teachers can use anecdotes, discussions, case studies, competencies required in related courses and so on to make quote "see" unquote, the importance of the stated CO competency to his, her professional life. Essentially, this also serves the purpose of gaining the attention of the students.

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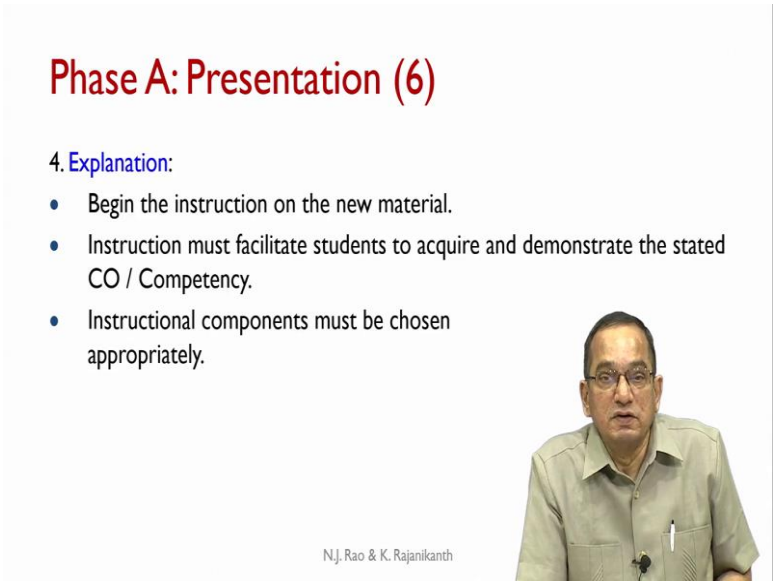

Then, the actual explanation of the new material commences. Begin the instruction of the new material. Instruction must facilitate students to acquire and demonstrate the stated CO competency. We have touched upon this point, several times in the earlier units also. Instruction must facilitate to acquire and demonstrate the stated competency. Instructional components must be chosen appropriately. In an earlier unit, we discussed the variety of instructional components which are available to the teacher and teacher can choose from these components based on the content that is to be delivered.

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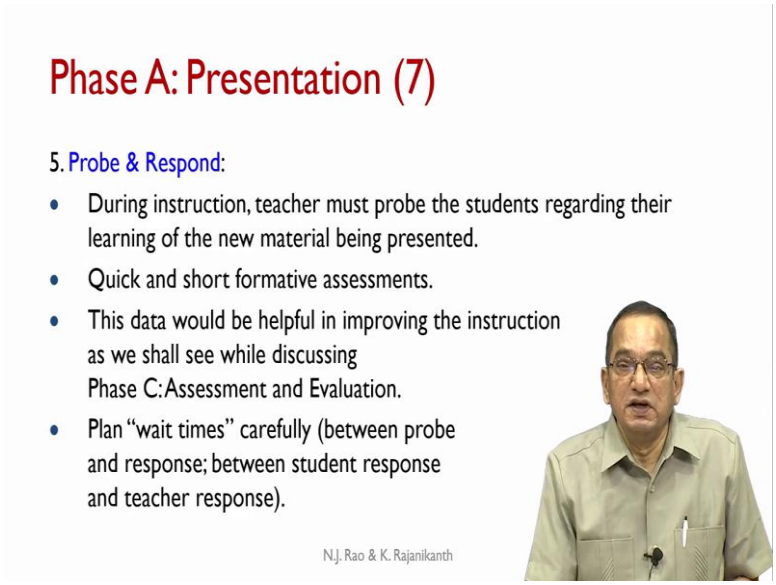

The next activity is probe and respond. During instruction, teacher must probe the students regarding their learning of the new material being presented. The probing consists of quick and short formative assessments. They can be in the form of very small quizzes conducted frequently are they could be in the form of structured questions to be answered by all the students or they could be very small diagnostic problems to be solved by the students.

These are essentially quick and short formative assessment instruments. This data would be helpful in improving the instructions as we shall see while discussing the phase C on assessment and evaluation. While posing the questions to the students and assessing the extent of their understanding, care must be given to the passed times or wait time. Plan these wait times carefully.

These wait times occur between the probe and the response between the response and further teacher's response. If teacher asks a question, what is the time that the teacher should allow for the students to respond. If it is too short, students may start feeling somewhat acetated that they are not getting enough time to respond to the queries.

If it is too long, it may impinge on the instruction schedule. So, teacher must plan this pass carefully. Similarly, once the students respond to the queries, there must be reasonable pass before the teacher further responds to the responses of the students. So, plan this wait times carefully, they cannot be too short nor they can be too long.

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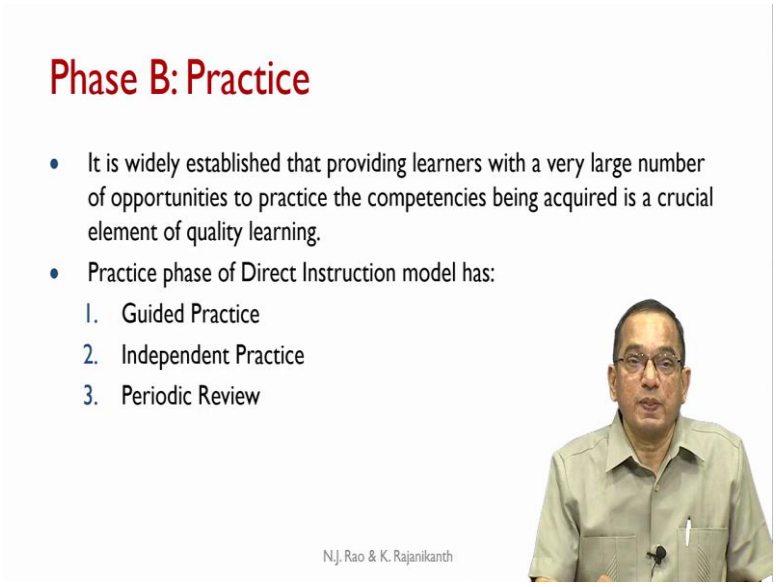

Then we get to phase B, which is practice. It is widely established that providing learners with a very large number of opportunities to practice the competencies being acquired is a crucial element of quality learning. Student must be able to apply the newly acquired knowledge or students must be able to engage with the newly acquired knowledge and or skill in order to ensure quality learning by them. The practice phase of this model has three activities, guided practice, independent practice, periodic review.

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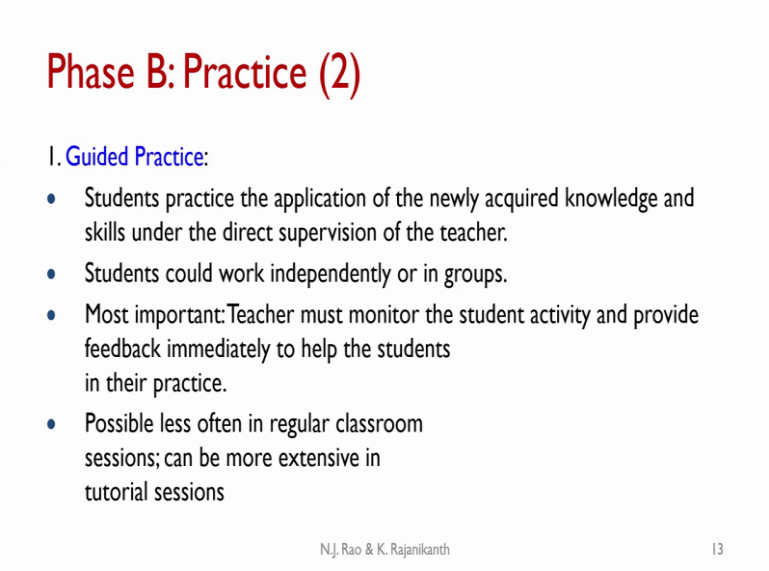

In the guided practice, students practice the application of newly acquired knowledge and skills under the direct supervision of the teacher. Students could work independently or in groups. And teacher closely monitors, supervises what the students are doing. The most important aspect of this activity is that the teacher must monitor the students' activity and provide feedback immediately to help the students in their practice.

The value of providing such an early feedback to the students is well recognised today. And many people consider that such an immediate feedback is the most important element that ensures good learning by the students. To have this guided practice frequently in the classroom may be difficult because of the time pressures. It is possible less often in the regular classroom sessions.

However, it can be more extensive in tutorial sessions. If the course plan does not have enough tutorial sessions then probably, teachers have to device alternative means of providing the practice to the students. This is particularly an activity that consumes fair amount of students' time as well as teachers' time. So, the schedule of the instruction must

take into account, the requirements of guided practice and teacher must plan these activities carefully upfront.

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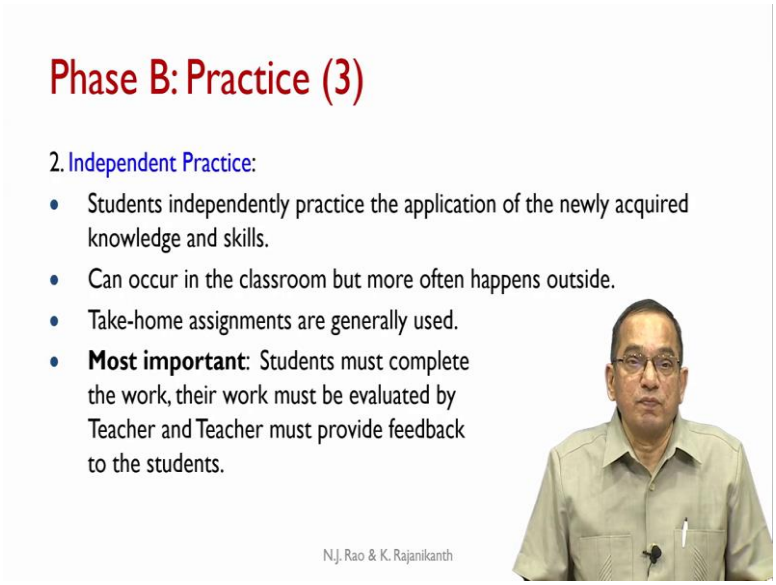

Independent practice, students independently practice the application of newly acquired knowledge and skills. In the initial stage, students practiced the newly acquired skill under the direct supervision of the teacher, gradually the supervision is withdrawn and students must be able to practice independently the application of the newly acquired knowledge and skills.

This can again occur in the classroom but consumes fair amount of time, so most often this happens outside the classroom. Take home assignments are generally used for this purpose. But when take home assignments are used or when the practice occurs outside the classroom, there is one extremely important requirement for this activity to be useful. Students must complete the work and their work must be evaluated by the teacher and teacher must provide feedback to the students.

If, all these three activities do not happen then the independent practice would not be contributing much to the learning of the students. So, it is essential, that students realise the importance of the independent practice, they complete the assigned work and is equally important that the work is evaluated by the teacher and that is followed by the feedback that the teacher provides to the students.

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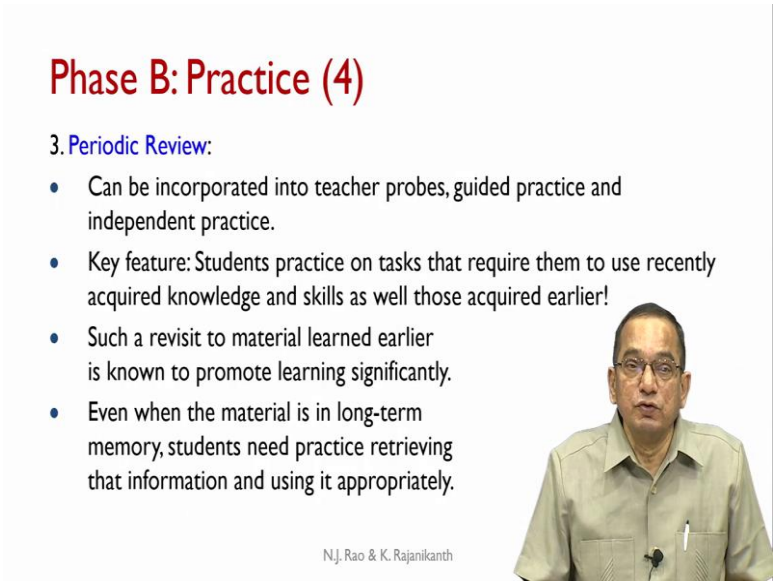

Periodic review, this activity can be incorporated into teacher probes, guided practice and the independent practice. The key feature of this activity is that, student practice on tasks, that require them to use recently acquired knowledge, and skills, as well as those acquired earlier. So, important aspect of this periodic review is that, students work not only on the newly acquired knowledge but also on the knowledge acquired earlier.

Such a revisit to material learned earlier is known to promote learning significantly. Thus, there is a phase during which students practice on the newly acquired knowledge together with earlier acquired knowledge. Even when the material is in long term memory, students need practice retrieving that information and using it appropriately.

This component generally is missing in most of the instructional plans that are presently being used in several institutes. But it has been established that the periodic review contributes significantly to the learning of the students. It would be nice, if we could incorporate this activity into the instruction plan.

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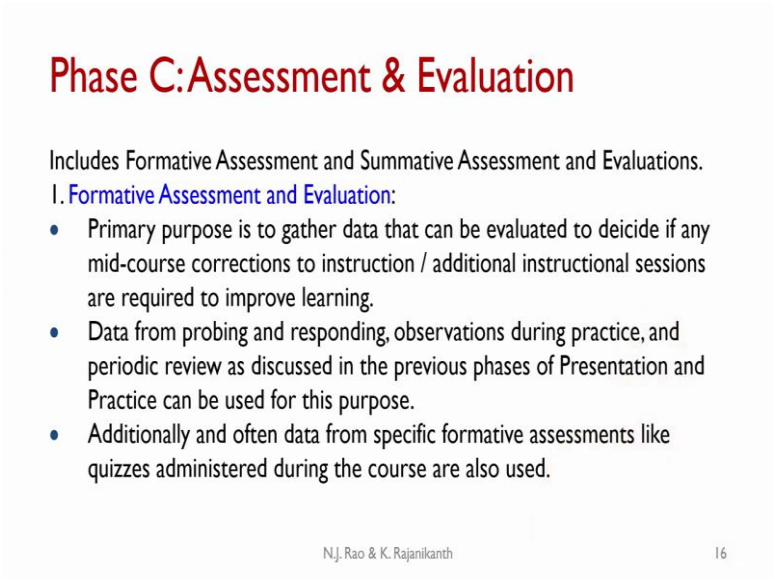

The phase C is assessment and evaluation. It includes formative assessment and summative assessment and evaluations. Formative assessment and evaluation, the primary purpose is to gather data that can be evaluated to decide if any mid-course connections to instruction and or additional instructional sessions are required to improve the learning.

Teacher uses this kind of formative assessment to understand the extent to which learning is occurring and based on that data may wish to modify the further instruction or teacher may wish to add some additional instructional sessions to the plans already made. Data from probing and responding observations during practice and periodic review as discussed in previous phase of presentation and practice can be used for this purpose.

Additionally and often data from specific formative assessments like quizzes administered during the course are also used. In other words, teacher may explicitly administer certain quizzes and the data from these quizzes can be used to determine if any modifications are required to the way the instruction is happening. Any mid-course corrections to instructions or any additional instruction sessions required can be decided based on such data.

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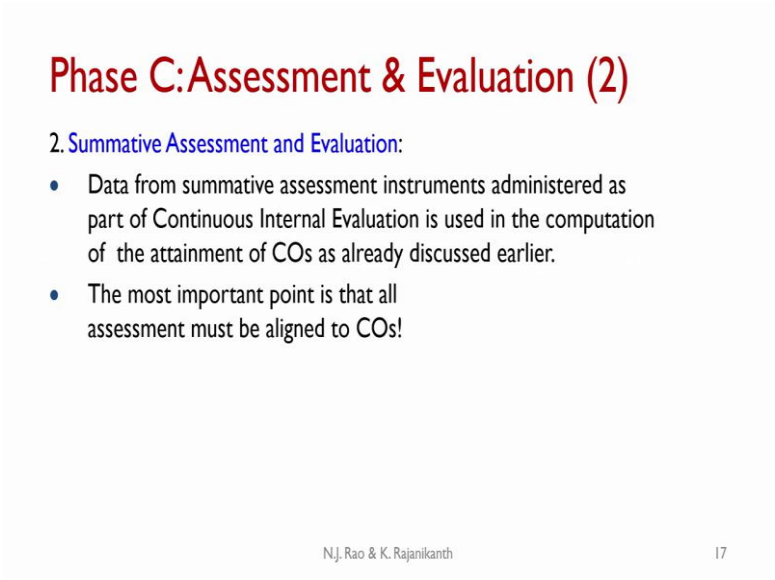

Summative assessments and evaluation: Data from summative assessment instruments administered as part of continuous internal evaluation is used in the competition of the attainment of COs as already discussed earlier. The most important point is that, all assessment must be aligned to COs. This aspect also we have seen earlier that alignment must exist among instruction, course outcomes and assessment if good learning is to occur.

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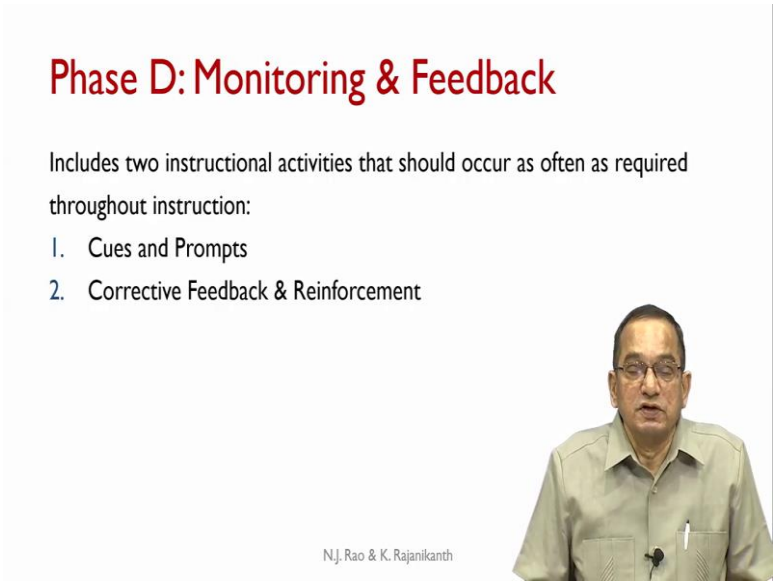

The phase D which is monitoring and feedback includes two instructional activities and these activities should occur as often as required throughout instruction. These activities are: Cues and Prompts and Corrective feedback and reinforcement.

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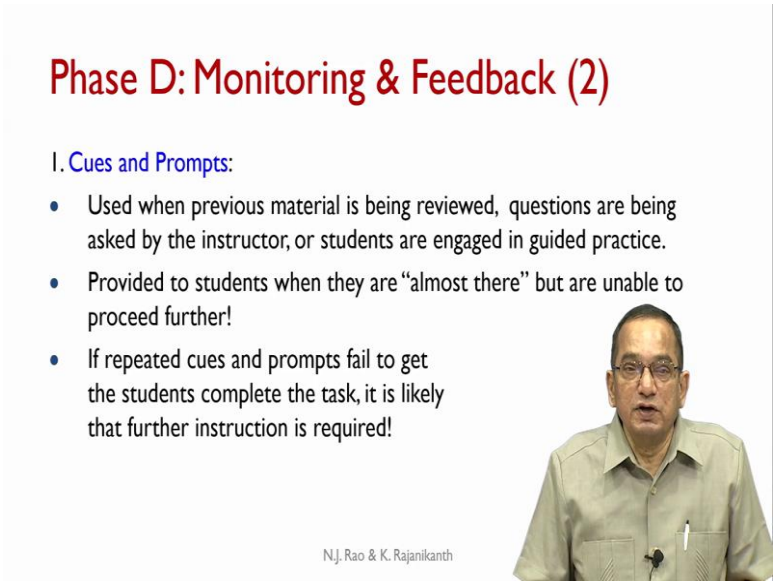

Cues and prompts. These are used when previous material is been reviewed, questions are being asked by the instructor, or students are engaged in guided practice. In all such cases, cues and prompts can be used. These are provided to students when they are almost there but are unable to proceed further. They are very near to the complete solution of the problem on which they are working but they are unable to complete the process.

A cue may help them to complete that activity. If repeated cues and prompts fail to get the students complete the task then it is likely that the understanding of the students is incomplete. In such cases further instruction may be required, if the understanding of the students is reasonable, a small number of cues and prompts should help them to complete the process of applying the new knowledge if they are stuck somewhere close to the solution.

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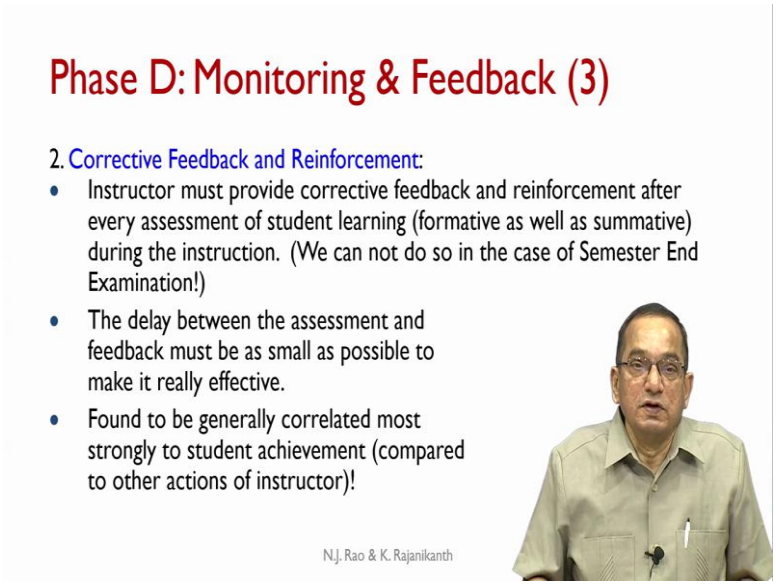

The other activities, corrective feedback and reinforcement: Instructor must provide corrective feedback and reinforcement after every assessment of student learning, formative as well as summative, during the instruction. Evidently, we cannot do this in the case of semester examination but teacher must do this activity of providing corrective feedback and reinforcement after every other assessment. During the entire continuous internal evaluation activity there are several assessment instruments which are administered.

Teacher must provide corrective feedback and reinforcement after all these assessments. The delay between the assessment and feedback must be as small as possible to make it really effective. If in internal test is administered feedback regarding the performance of the students in that test must be provided to the students as early as possible after the completion of the test, similarly, with all other assessment instruments.

This is found to be generally correlated most strongly to student achievements compared to other action of the instructor. Once an assessment instrument is administered, students' responses are available; teacher must provide the corrective feedback at the earliest available opportunity. This is considered as extremely important.

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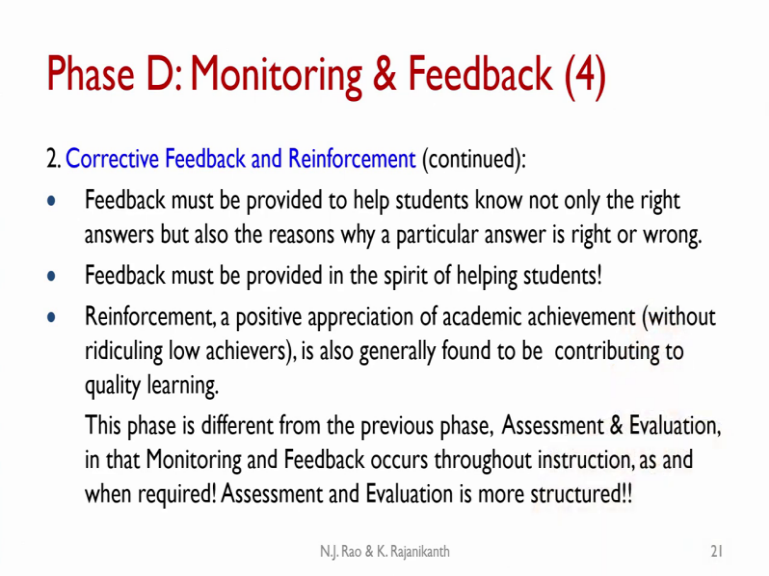

Feedback must be provided to help students more, not only the right answer but also the reason why a particular answer is right or wrong, as it could be. That means students must not only know the correct answers but also must be able to understand correctly, the logic behind the answer be correct. Feedback must obviously be provided in the spirit of helping the students, ridiculing the students, insulting the students or making the students feel inadequate are totally inappropriate ways of providing the feedback.

Students must see value in the feedback provided by the teacher. Reinforcement, a positive appreciation of academic achievement is also generally found to be contributing to the quality of learning. If a student does provide a high-quality response, it would certainly motivate her better, if teacher provides a positive appreciation of the performance of the students. Of course, such an appreciation must be provided without ridiculing low achievers.

It is very important while the appreciation of the bright students is happening; there is no ridiculing of the low achievers. In such a positive appreciation is also found to be contributing to quality learning. This phase is different from the previous phase, assessment and evaluation in that monitoring and feedback occurs throughout instruction as and when required! Assessment and evaluation on the other hand is more structured.

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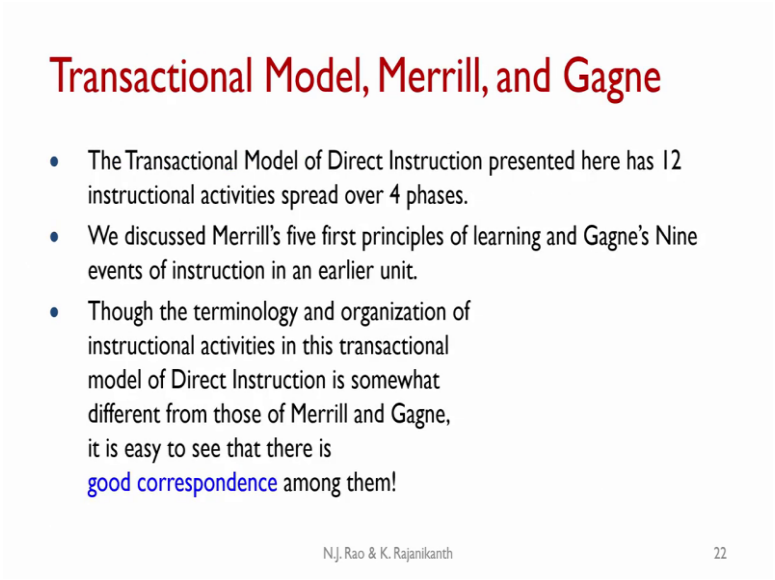

The transactional model of direct instruction presented here has twelve instructional activities spread over 4 phases. We discussed Merrill's five principles of learning and Gagne's nine events of instruction in an earlier unit. Though the terminology and organization of instructional activities in this transactional model of direct instruction is somewhat different from those of Merrill and Gagne it is easy to see that there is a good correspondence among them.

The transactional model incorporates, features from Merrill's first principles of learning as well as features from Gagne's nine events of instruction. Thus, this is another instance of a direct model which makes use of Merrill's principles and Gagne's events of instruction.

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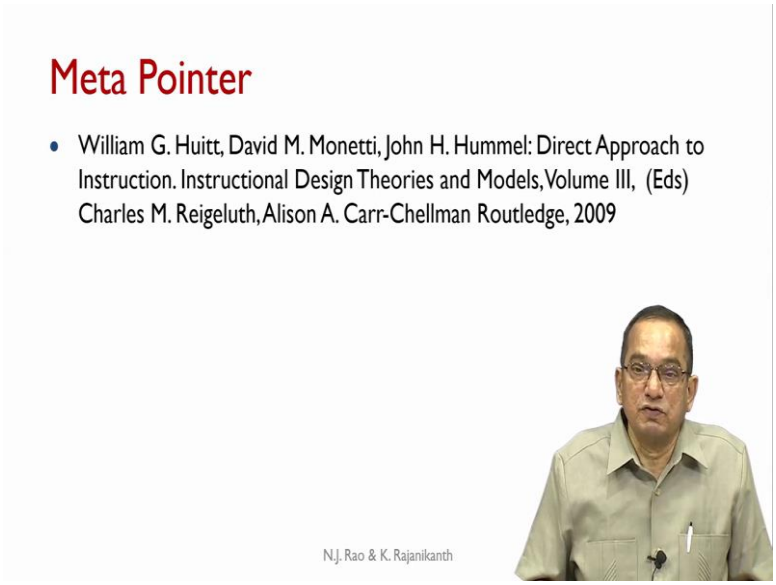

This is a good reference to get more material on the transactional model of direct instruction, William Huitt et al. Direct Approach to Instruction; this is in volume three, on Instructional Design Theories and Models, edited by Reigeluth and his associates.

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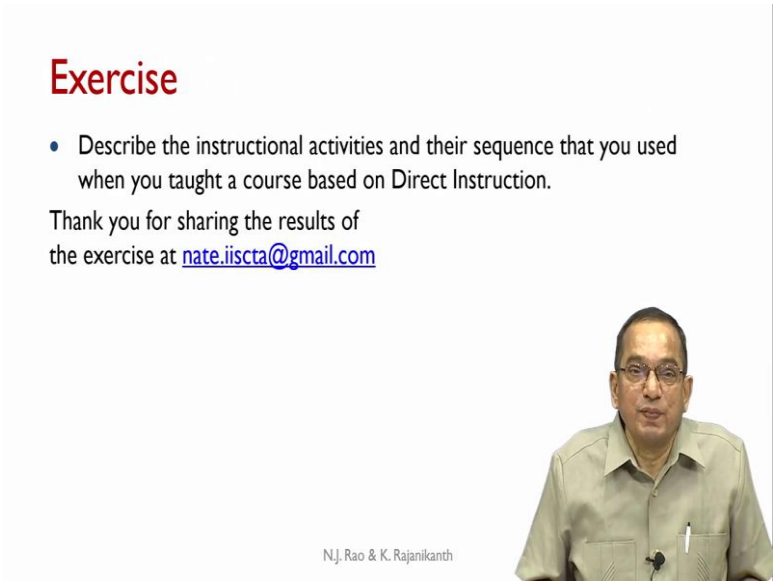

An exercise for you – Describe the instructional activities and their sequence that you used when you taught a course based on direct instruction. Thank you for sharing the results of the exercise at nate.iiscta@gmail.com.

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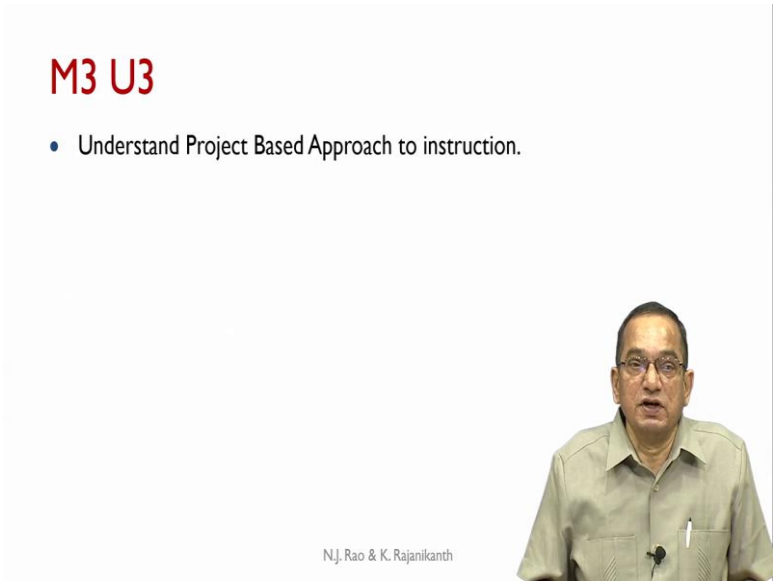

In the next unit, we will understand Project based approach to instruction. Thank you.