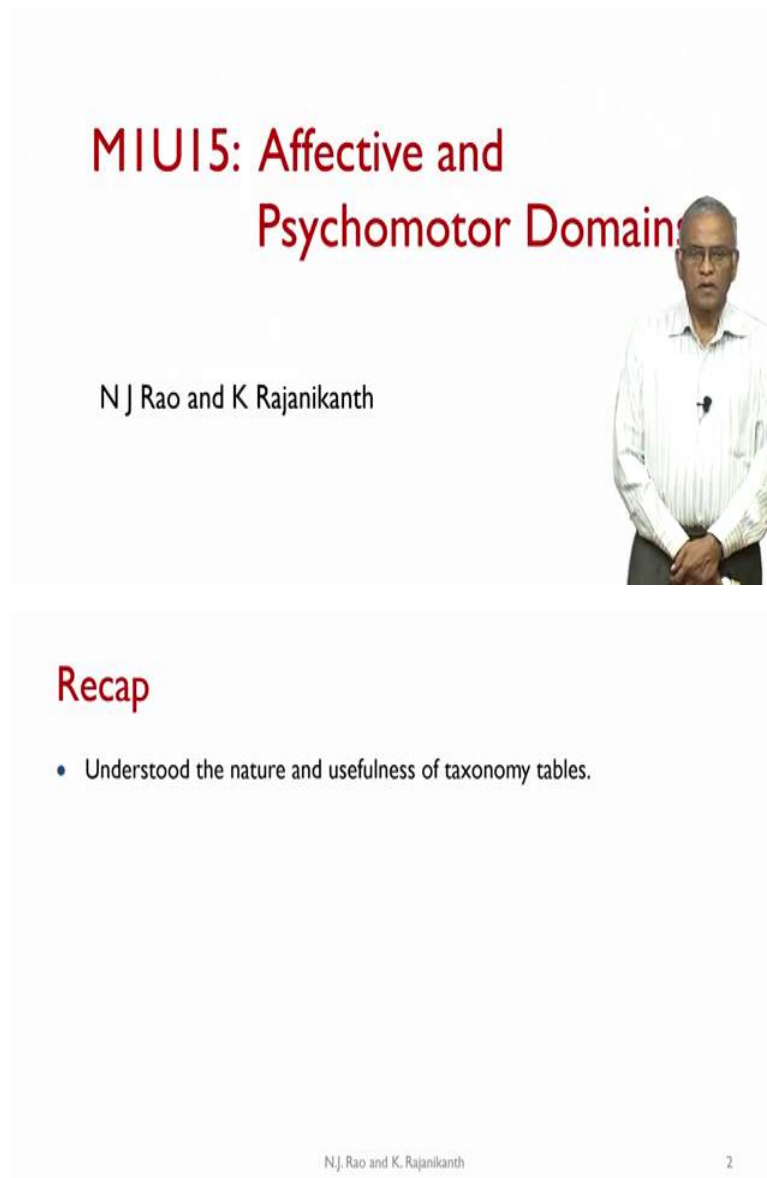


**NBA Accreditation and
Teaching – Learning in Engineering
(NATE)
Professor N. J. Rao
Department of Electronics Systems and Engineering
Indian Institute of Science, Bengaluru
Lecture 16
Affective and Psychomotor Domains**

(Refer Slide Time: 00:28)



The slide content is displayed within a white rectangular frame. At the top, the title 'MIUI5: Affective and Psychomotor Domains' is written in a large, bold, red font. Below the title, the authors 'N J Rao and K Rajanikanth' are listed in a smaller black font. To the right of the text is a photograph of Professor N. J. Rao, an elderly man with glasses wearing a white striped shirt. Below the title and authors, the word 'Recap' is written in a large, bold, red font. Underneath 'Recap' is a single bullet point: '• Understood the nature and usefulness of taxonomy tables.' At the bottom of the slide, the authors' names 'N.J. Rao and K. Rajanikanth' and the page number '2' are printed in a small, grey font.

**MIUI5: Affective and
Psychomotor Domains**

N J Rao and K Rajanikanth

Recap

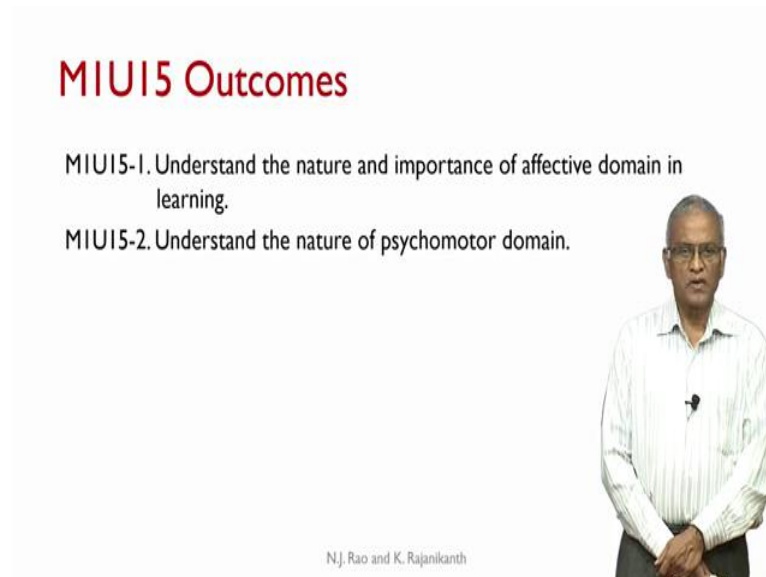
- Understood the nature and usefulness of taxonomy tables.

N.J. Rao and K. Rajanikanth 2

Greetings and welcome to NATE module 1, unit 15 related to Affective and Psychomotor Domains. In the earlier unit, we will try to understand the nature and usefulness of taxonomy table, which is a very simple idea. That is you organize your cognitive levels and knowledge categories in the form of a table and looking at the cells of the taxonomy table, we address

the issue of alignment between the 3 major elements of a course namely course outcomes, assessment and instructional activities.

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MIUI5 Outcomes

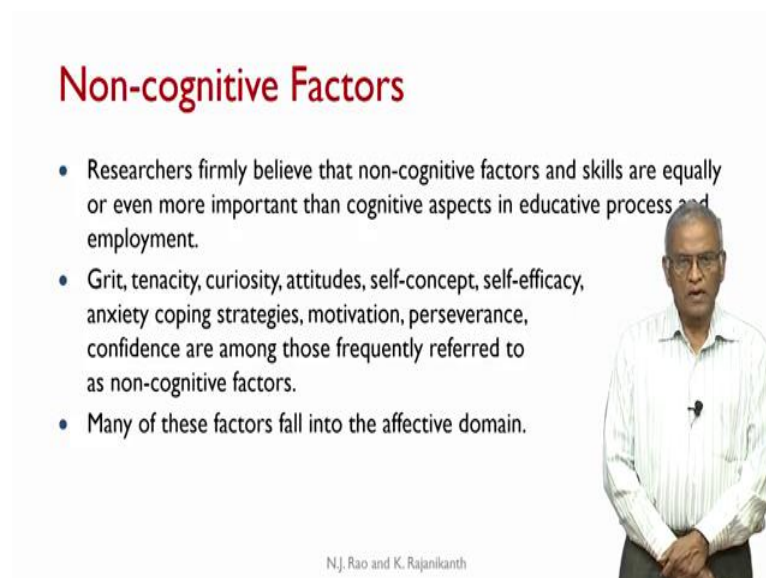
- MIUI5-1. Understand the nature and importance of affective domain in learning.
- MIUI5-2. Understand the nature of psychomotor domain.

N.J. Rao and K. Rajanikanth

The slide features a speaker overlay of a man in a white shirt and glasses on the right side. The text is centered on the left.

And now, in the current unit, we try to understand the nature and importance of affective domain in learning. And also understand the nature of psychomotor domain. As we mentioned, the learning can be seen in the 3 dimensions or 3 domains actually, which are cognitive, affective and psychomotor domains.

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Non-cognitive Factors

- Researchers firmly believe that non-cognitive factors and skills are equally or even more important than cognitive aspects in educative process and employment.
- Grit, tenacity, curiosity, attitudes, self-concept, self-efficacy, anxiety coping strategies, motivation, perseverance, confidence are among those frequently referred to as non-cognitive factors.
- Many of these factors fall into the affective domain.

N.J. Rao and K. Rajanikanth

The slide features a speaker overlay of a man in a white shirt and glasses on the right side. The text is centered on the left.

And let us look at there are what are called non-cognitive factors which all of us are familiar with. So, many people believe that non-cognitive factors and skills are equally or even more

important than cognitive aspects in educative process and employment, especially in employment. You may have heard these words grit, tenacity curiosity, attitude, self-concept, self-efficacy, anxiety coping strategies, motivation, perseverance, confidence are some of the frequently used non-cognitive factors.

And in various contexts you say, self-efficacy is important, you must be able to cope with anxiety. You must have perseverance. So, all these are desirable characteristics in ones life, both in employment or at home also, also at social level, so many of these factors fall into the affective domain. And that is the reason why the importance to affective domain. In one sense, NBA identifies these affective factors as important, but it gets reflected in writing what are called or what we call as professional outcomes of the program.

That is 7 to 12. If you look at majority of them, they required addressing issues related to the affective domain like working in a group, communicating affectively, understanding the impact of engineering on environment. So, many of the affective domain factors come into picture.

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Affective Domain

- is most commonly associated with feelings and emotions
- is usually displayed in the form of positive or negative reaction to given events, objects, behaviours, policies or situations
- affective behaviours are accompanied by varying degrees of feelings and reflect distinct "approach" or "avoidance" predispositions
- person's past experience in interacting with environment shapes the nature and scope of affective responses

(Pierce and Gray, 1981)

N.J. Rao and K. Rajanikanth



Now, the affective domain is most commonly associated with feelings and emotions. Now, how does it get reflected? Whenever you sense anything by any of these sensory mechanisms that you have or when you listen to a lecture, first thing that you have you either have a positive or negative reaction. Something in that combination of various factors will produce a positive or a negative reaction, first the sign is fixed and incidentally that is how the brain functions.

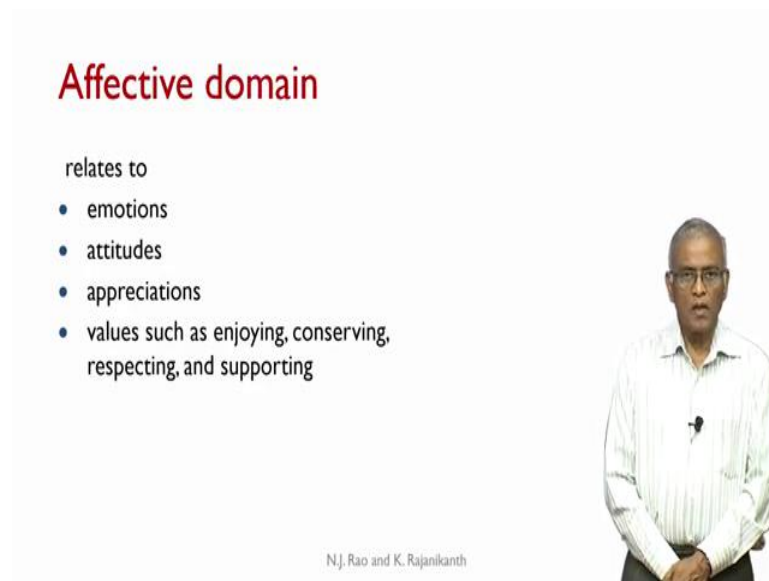
Your inputs go too directly to what is called amygdala and in the brain and in the amygdala in that in the region designated for that the, there is a positive or negative sign is associated with the input that comes. And unfortunately, that is a one that plays havoc with our teaching learning process. So, affective behavior is displayed in the form of positive or negative reaction to given events, objects, behaviors, policies or situations, anything that you have. You walk into a room, you will say I do not feel very positive in this kind of thing that you have to accept that is a way brain functions.

And these effective behaviors are accompanied by varying degrees of feelings that reflect distinct approach or let us say, if you have a positive feeling, then say, Okay, I am willing to pay attention and do something about it or avoidance, I try to keep, I tried to avoid something if I had negative reaction. And that means I cannot get the attention of the student, once they have the gradient to the predisposition of avoidance, then I have lost my student. So, obviously a teacher would want everyone to pay attention to what you are doing in the class.

So, to their extent, handling this approach and avoidance predispositions is also a necessary skill for the teacher. Some teachers do understand this issue intuitively. And they also develop their own methods of getting the attention of the students in the class. And why different students behave differently, because in the same class, some students pay attention to what the teacher says and some students do not and some are neutral.

So, this has a long history because persons past experience interacting with the environment shapes the nature and scope of affective response that occurs because of the previous experiences of the student and all these observations are due to Pierce and Gray.

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Affective domain

relates to

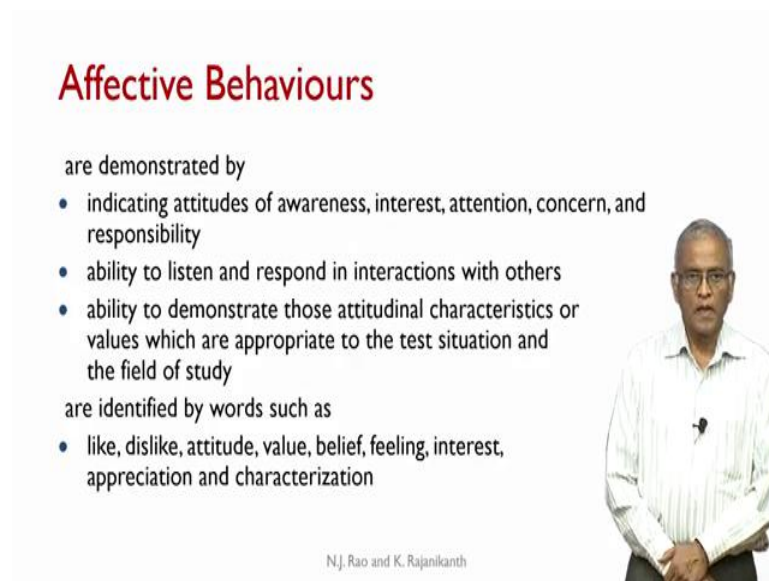
- emotions
- attitudes
- appreciations
- values such as enjoying, conserving, respecting, and supporting

N.J. Rao and K. Rajanikanth

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Now, approximately we can say affective domain relates to emotions, attitudes, appreciations, values such as enjoying, conserving, respecting and supporting. So, affective domain is also related to these values okay.

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Affective Behaviours

are demonstrated by

- indicating attitudes of awareness, interest, attention, concern, and responsibility
- ability to listen and respond in interactions with others
- ability to demonstrate those attitudinal characteristics or values which are appropriate to the test situation and the field of study

are identified by words such as

- like, dislike, attitude, value, belief, feeling, interest, appreciation and characterization

N.J. Rao and K. Rajanikanth

The slide features a man in a white shirt and glasses standing on the right side, presenting the content. The text is in a clean, sans-serif font, with the title in red.

Now, how are these effective behaviors demonstrated? Now, by indicating attitudes of awareness, interest, attention, concern and responsibility, so you have to indicate your attitude for learning something either through showing interest or through your body language or paying attention or demonstrating concern in whatever way which will that means your attitude behavior, it gets reflected in this kind of thing responses.

And it also demonstrated by ability to listen and respond in interactions with others. If you are indifferent if some discussion is asked for in the class, many people kind of say that is if you do not have positive attitude, then you will not participate in the discussion. That is neither you listen properly not respond properly and also it is demonstrated by ability to demonstrate those attitudinal characteristics or values which are appropriate to the test situation on the field of study, because it depends on the nature of the subject as well.

And these are identified by words such as like, dislike, attitude, value, belief, feeling, interest, appreciation and characterization, so on. These are the words that you use to characterize any affective behavior.

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Pierce-Gray Taxonomy of Affective Domain

- | | |
|---|---|
| 1. Perceive <ul style="list-style-type: none">- Emotive Implanting- Response Setting | 4. Validate <ul style="list-style-type: none">- Examining Values- Accepting Values |
| 2. React <ul style="list-style-type: none">- Emoting- Recognizing- Controlling | 5. Affective Judge <ul style="list-style-type: none">- Establishing Value Criteria- Value Judging |
| 3. Conform <ul style="list-style-type: none">- Artificial Attitude- Consistent Attitude- Rationalized Attitude | 6. Affective Create <ul style="list-style-type: none">- Integrating Values- Inspirational Insight |



N.J. Rao and K. Rajanikanth

Now, like cognitive domain which was, which is considered to have 2 dimensions and which is elaborated in the revised Bloom's Taxonomy, several groups attempted to look at affective domain also, actually you have 4 or 5, very, what do you call popular or accepted taxonomies of affective domain.

Here we present Pierce-Gray taxonomy of affective domain. Here Pierce and Gray, they tried to look at all the 3 domains and try to have similar almost same levels of classification. And they have presented here a 6 levels in affective domain also, because you have 6 levels in the cognitive domain.

Similarly, they presented 6 levels in the psychomotor domain, that is the first thing and the other one is, these are arranged in such a way that as you go along, from first to 6, the level of cognitive activity or the cognitive levels keep increasing with that. So, there is a kind of

correspondence between the affective behaviors as well as cognitive behaviors. That is, because we said any experience is you cannot say it is devoid of such and such a, or it avoids completely on particular domain. All the experiences will have all the dimensions of these 3 domains to varying degrees.

So, here the degree of cognitive activity will keep increasing as you go from 1 to 6. That is the there is a basis for this kind of classification. Now, let us look at briefly the, what this affective levels are, first is perceive. Perceive is not directly demonstrated, it based on the perceiving, you have to react only it is demonstrated through reacting, the moment you come to that that means you have perceived.

So, the first one is accepted, what is perceiving? Emotive implanting and response setting that means, when something is presented to you, you have reacted emotionally. For example, you may I did not hear anything properly let us say sitting in the last bench, I do not even perceive. So, it neither produces a positive or negative reaction and there is no question of even want the possibility of responding to that even internally.

So, first thing you have to make sure that the students have a chance to perceive that this is related to the physical situation in the classroom that is the fan noise or the heat in the room or the distance from the teacher to the last bench, these are all the ones that will influence whether this last bench student is able to perceive or not.

Then you react, you emote now, that is you show your expression in through the body language or actually making a statement and so on. So, reacting consists of emoting, recognizing and control. Then what you do after you receive information you confirm, there is you may like or dislike or agreeable to this or you are convinced of that, that comes later. But first thing that you do is try to confirm that means you developed an artificial attitude because teaching says this is correct and desirable. I will also for the present accept it as desirable.

So, that is why we call it artificial attitude. And then that is consistent attitude, it is not just for one, for the entire whatever that you are trying to learn, you maintain this artificial attitude. And then you are also, you try to rationalize, why is it is it correct or not?

Internally I rationalize. So, by going through this process, I am conforming not to that is I have not, I am not yet fully convinced, but this is the first stage of conforming to what has been presented to me. Then you go through the process of validation.

So, what happens is, what is the value involved in, what is the value that is being communicated? Do they coincide with my values that I have? Do I accept this or not? So, I examine the values and then I go through the process of accepting. So, first I take an artificial position and then after validating, I may accept or may not accept the values, having accepted you have what is called effective judge.

Now, I have to relate the new acquired value to what I already have. Now, I need to establish value criteria and value judging. Now, I may want to put it in certain level of hierarchy with respect to the other values. Now, what you do the final stage have what is called effective create? The choice or the words as you can see Pierce and Gray they tried to use words which are pretty close the cognitive level also.

For example, validate is very close to analyze, effective judge, judge is close to evaluate and the final word is create itself. So, your whatever values that you have judged now, you are integrating into your own, what do you call into you into your world? Now, whether you consider equal important and how do I relate to my other values, in what level that I take them all that is integrated. And then I developed my inspirational insight based on what I get.

So, these are the 6 Pierce-Gray taxonomy levels of affective domain. We are not going to elaborate very much on this. It takes lot more time and effort. The purpose is only to kind of sensitize you to this and request you to explore on your own.

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Taxonomy as per Emotional Intelligence

- Knowing one's emotions
- Managing emotions
- Motivating oneself
- Recognizing emotions in others
- Handling relations

N.J. Rao and K. Rajanikanth

The slide features a list of five bullet points under the heading 'Taxonomy as per Emotional Intelligence'. To the right of the list is a photograph of a man in a white shirt and glasses, who is the speaker. At the bottom of the slide, the names 'N.J. Rao and K. Rajanikanth' are written.

Now, there is another way of looking at the affective domain, there is what is called emotional intelligence. Maybe some of you have heard about that word. And the most

popular book on emotional intelligence by Daniel Goldman, which is written for a common person, not a specialist psychologist. And based on the knowledge this book is already about 25 years old, and it is still very popular and the taxonomy as per emotional intelligence is this knowing ones own emotions.

The earlier 6 levels are much more formal, systematic structure. These are little bit but you can relate to them. First thing is knowing ones own emotions. What does it mean? I am aware of my emotions. For example, if you are very angry, let us say, which happens often for everyone. I should be able to acknowledge to myself that I am presently angry. You not say no-no, I do not feel angry, you cannot make a statement.

So, first thing is I must be, I must know my own emotions. And in fact, if you are able to classify your emotions better that I am sad or I am angry, I have rage. If you are able to use all the appropriate words, you have already solved half the problem by acknowledging to yourself. Then the next thing is, you have to learn to manage your own emotions okay. For example, if I am angry, what do I do?

Everyone need not react in the same way. Somebody may just count 1 to 10, so you come back and become normal or you may use any other method that you find it convenient or appropriate to the situation. And another issue of managing emotions is you should not behave in the same way whenever you get, let us say angry that is if you are behaving or you are responding in the same way every time in a particular situation, then you become predictable which often happens.

All students manipulate their teachers precisely through this. So, my teacher will react in a given situation like this. Once I become predictable, I become manipulatable that is the other person works out how to circumvent your consequences or the consequences of that particular emotion okay. So, managing emotions is also an art and the better you are able to manage your emotions, the better you will you become a better person in all ways.

Then once you cross this stage of managing emotions, then you work out how to motivate one-self and the fourth stages, you should be able to recognize emotions in others. This is an art and I think everyone should develop that you recognize the emotions in others. And the moment you are able to recognize, you start respecting that as well. For example, the road rage as we call it in a busy road comes because you do not recognize the emotion of the driver in the who is in head of you, whose behavior you do not like.

So, you should not only be able to manage your emotions, then you should also be able to recognize emotions in others. Then finally, you should be able to handle relations with your, with the people around you with whom you are interacting. So, this is the taxonomy that emotional as per emotional intelligence, this is usable at an operative level.

But in a more formal level, if you want to start writing outcomes that are relevant under affective domain, then you may have to use the Pierce-Gray taxonomy okay. Ideally speaking, for every cognitive domain, course outcome, I must be able to write relevant associated outcomes of the affective domain as well as psychomotor domain.

If I am able to write all the three, then based on that I should actually be planning my instruction okay, which is a tall order, but that is the may be a goal, in near to near future. If any of you are following this course, if you can think of that and find out and work out a method of writing affective domain outcomes will appreciate if you share with us.

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Some Action Verbs (AD)

- Accept
- Attempt
- Challenge
- Defend
- Dispute
- Join
- Judge
- Praise
- Question
- Share
- Support
- Volunteer

N.J. Rao and K. Rajanikanth

Now, some of the action verbs that are used in affective domain or this accept, attempt, challenge, defend, dispute, join, judge, praise, question, share, support, volunteer you can add many more. So, these are some action verbs if you want to write in a course outcome based on belonging to affective domain, you can start with one of these words.

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Psychomotor Domain

- It includes physical movement, coordination, and use of the motor-skill areas. (Simpson, 1972)
- Development of these skills requires practice and is measured in terms of speed, precision, distance, procedures, or techniques in execution.
- The role of psychomotor activities is limited in engineering programs as offered at present.
- The psychomotor activities become important and even dominant in courses in programs in Theatre, Music, Painting, Sports, Medicine, Nursing, Dentistry, Emergency Medical Services etc.

N.J. Rao and K. Rajanikanth

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Now, we come to the third domain, psychomotor domain, what is psychomotor dominant? It includes physical movement coordination and use of the motor-skill areas. This is a formal definition given by Simpson back in 72. And development of the skills require practice right and is measured in terms of speed, precision, distance, procedures or techniques in execution.

And you can add another word because cricket has become a religion in India, you can say this course you run the wickets you take these are all the, these are all measurements okay. If you want to score more runs obviously, you require the corresponding psychomotor domain skills besides the both effective as well as cognitive skills.

But if this skill is not there psychomotor domain skill is not there, that is what audience are, spectators are, they do not have the required psychomotor skills, but they do have the other cognitive skills. So, they start commenting on that how the player should play and so on. Anyway, that is besides the main point.

Whereas the role of psychomotor activities is limited in engineering programs as offered at present except in small number of courses, you are not looking for any psychomotor skills. But these activities become very important or even dominant in courses in programs like theater, music, dance, paintings, sports or a medicine, nursing dentistry are what you call emergency medical services.

In many of these types of courses, the psychomotor skills become dominant first if you do not have that, the other skills are less important. Whereas, it has to be first dominantly you must have psychomotor skills accompanied by relevant, affective and cognitive domain skills.

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Pierce and Gray Taxonomy of PD

1. **Psychomotor Perceiving**
 - Sensory Transmission
 - Physio Functional Maintenance
2. **Activating**
 - Physical Outputs
 - Mimicry
 - Deliberate Modelling
3. **Executing**
 - Task Execution
 - Operational Execution
 - Skilled Execution

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Here, this is a taxonomy of psychomotor domain. Actually, if you look at all the sub classifications, they come very close to close to the affective domain classification as well. So, psychomotor perceiving sensory transmission and physio-functional maintenance that is if you want to run or if want to box or if you want to play an instrument, you must have the required physio-functional maintenance.


If you do not have that, if you cannot let us say, flexibility in your movement, obviously, you cannot even perceive a particular psychomotor input. And then activating physical outputs, mimicry and deliberate modeling, this is how anybody learns right, then when you learn music, you first mimic the teacher. And then you start modeling the way, the teacher is presenting to you.

Either in singing or playing an instrument or let us say, you are boxing or you are playing tennis, any of that, the instructors moments are mimicked and you produce your physical output. And you deliberately model that exactly in the same way. Then you execute the task and again it is not generally in isolation, it is operational execution and also skilled execution. You should be able to exactly hit it to the exact distance and so on. So, you learn to execute.

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Pierce and Gray Taxonomy of PD (2)

4. **Maneuvering**
 - Inspecting Skills
 - Selecting Skills
5. **Psychomotor Judging**
 - Establishing Performance Criteria
 - Performance Judging
6. **Psychomotor Creating**
 - Combining Skills
 - Performance Insight



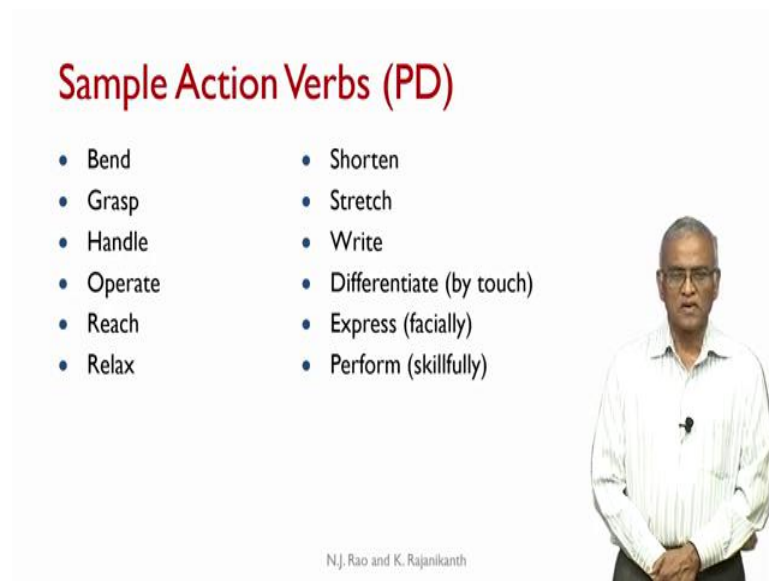
N.J. Rao and K. Rajanikanth

And then you maneuver, maneuvering requires, now we have learned individual skills and then you inspect all the skills and you select these skills in a given situation that is maneuvering and psychomotor judging, if you look at you must establish performance criteria and performance judging. This is what is required for empires or the judges in all sports activity. For example, if you look at the gymnastic activity, the judge is so well trained, the all the judges sometimes they have 7-8 judges.

And if you look at the marks that are given by all of them, they differ from each other in a very small percentage. That means all of them are trained to exactly judge the performance of the, that means they have excellent psychomotor judge. And then you have psychomotor creating. Now, whatever skills that I have learned from others and I have mastered that, then I start combining the skills or modify my psychomotor behavior based on my, based on the inside of the performance that I have.

That is why different players somehow produce or create their own way of doing things. And those are the ones that become the top players okay. So, this is the classification of psychomotor domain.

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Sample Action Verbs (PD)

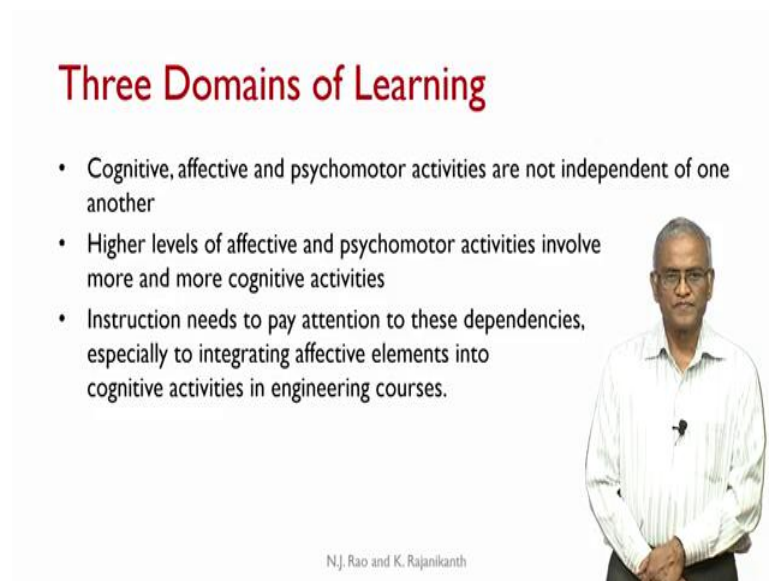
- Bend
- Grasp
- Handle
- Operate
- Reach
- Relax
- Shorten
- Stretch
- Write
- Differentiate (by touch)
- Express (facially)
- Perform (skillfully)

N.J. Rao and K. Rajanikanth

The slide features a list of 12 action verbs in two columns. To the right of the list is a photograph of a man with glasses, wearing a white shirt, standing with his hands clasped. The text 'N.J. Rao and K. Rajanikanth' is located at the bottom left of the slide.

Some action verb, some of them bend, grasp, handle, operate, reach, relax, shorten, stretch, write, differentiate, express, perform and so on. You can add words action verbs from different disciplines as well.

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Three Domains of Learning

- Cognitive, affective and psychomotor activities are not independent of one another
- Higher levels of affective and psychomotor activities involve more and more cognitive activities
- Instruction needs to pay attention to these dependencies, especially to integrating affective elements into cognitive activities in engineering courses.

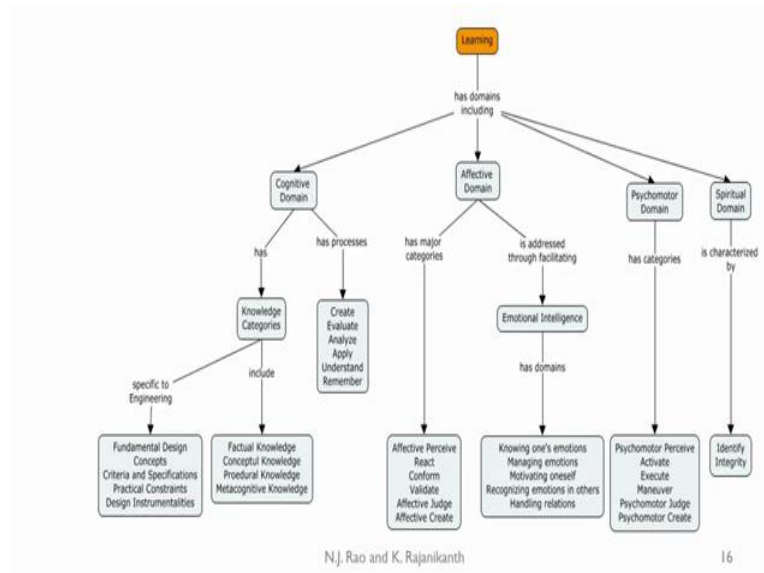
N.J. Rao and K. Rajanikanth

The slide features three bullet points on the left side. To the right is a photograph of the same man from the previous slide. The text 'N.J. Rao and K. Rajanikanth' is at the bottom left.

Now, again once again trying to put all the three domains together, cognitive, affective and psychomotor activities are not independent of one another. Higher levels of affective and psychomotor activities involve more and more cognitive activities that we have mentioned. Instruction needs to pay attention to these dependencies and especially to integrating affective elements into cognitive activities in engineering courses.

So, the affective elements become important irrespective of the discipline that you are handling. If you can learn to how to integrate them into your classroom activity, it will be a great help to your students to learn.

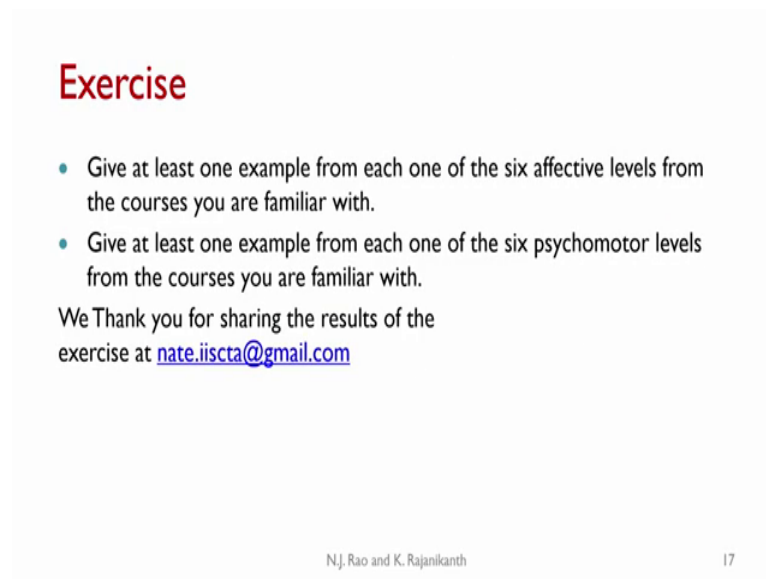
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Now, all these are captured in this concept diagram. And if you look at we are talking this of, okay this is learning, it consists of cognitive domain, affective domain, psychomotor domain. And we have this already we have talked about, you have cognitive processes, arranged hierarchically, knowledge categories, which are general for all and then specific to engineering or this and then affective domain as Pierce-Gray taxonomy.

These are the levels and as from emotional intelligence perspective, these are the categories. And psychomotor again as Pierce-Gray taxonomy you have these levels. And just for completion, if you want, you can add spiritual domain. As I understand from the literature, these are the 2 levels so called in identity and integrity. You may agree or disagree. But let us say that is not our concern, we are not going to look at this domain. But just for the completion, we put the 4 domains like this.

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Exercise

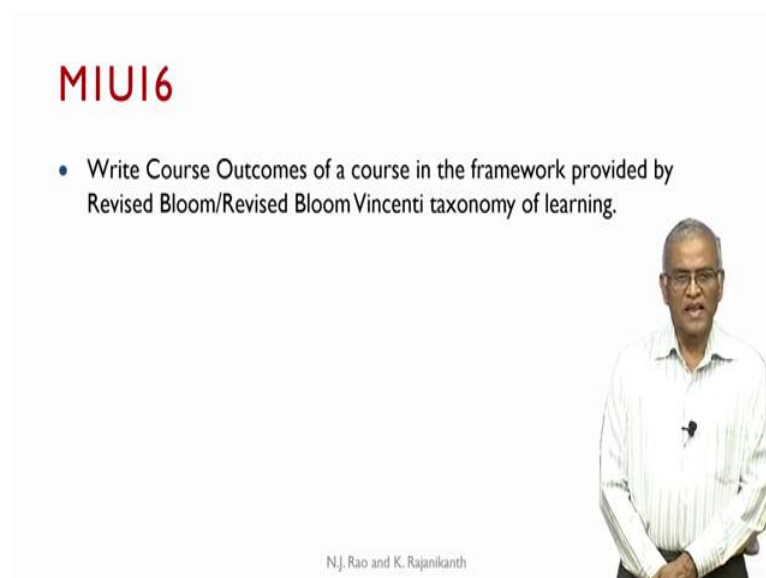
- Give at least one example from each one of the six affective levels from the courses you are familiar with.
- Give at least one example from each one of the six psychomotor levels from the courses you are familiar with.

We Thank you for sharing the results of the exercise at nate.iiscta@gmail.com

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Now, as an exercise, we request you to give at least one example from each one of the 6 affective levels from the courses you are familiar with. Similarly, give at least one example from each one of the 6 psychomotor levels, from the courses you are familiar with. And if you are able to identify, we will be happy to receive them from you at this particular mail.

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MIUI6

- Write Course Outcomes of a course in the framework provided by Revised Bloom/Revised Bloom Vincenti taxonomy of learning.



N.J. Rao and K. Rajanikanth

And the next unit, we will look at course outcomes in the framework provided by revised bloom or revised bloom incentive taxonomy of learning. That means, how do we write course outcomes based using the knowledge of taxonomy of learning, assessment and teaching. And thank you very much for your attention.