

**Teaching and Learning in Engineering (TALE)**  
**Prof. N.J. Rao**  
**Department of Electronics Systems Engineering**  
**Indian Institute of Science, Bangalore**

**Lecture - 14**  
**Affective and Psychomotor Domains**

Greetings and welcome to the Unit 14 of Module 1 on Affective and Psychomotor Domains. This is the lecture related to the Taxonomy of Learning.

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## Recap

- Understood the nature of knowledge that is specific to engineering.
- Understood the importance of categories of engineering knowledge.

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In the last session that is Unit 13, we understood the nature of knowledge that is specific to engineering and understood the importance of categories of engineering knowledge. If you want to differentiate, if you want to see the specific nature of engineering one has to address the categories of engineering knowledge as proposed by Professor Vincenti of Stanford University. That is what we looked at in the last unit.

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## MIUI4 Outcomes

MIUI4-1. Understand the nature and importance of affective domain in learning.

MIUI4-2. Understand the nature of psychomotor domain.



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And this unit, we make an attempt to understand the nature and importance of affective domain in learning. Understand the nature of psychomotor domain. Now, in this while it is universally acknowledged that affective domain has a major role to play in our learning but, we still do not know completely how to integrate the affective domain into learning and make sure that the cognitive learning takes place properly.

Whereas the nature of psychomotor domain is less dominant or you can say less important in the context of engineering courses. We will see both these affective domain as well as psychomotor domain, some of the sub processes that are involved; but we do not make any attempt to get into the detail and try to write outcomes for affective learning and psychomotor learning.

But a teacher of any engineering course should be aware of the role of affective domain and psychomotor domain and wherever possible the activities related to affective learning should be incorporated by, by the teacher which will greatly enhance the quality of learning by the student. These are the two outcomes that we will address here.

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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 potential.
- 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 the factors fall into the affective domain.



Now the word we use is non-cognitive factors that means both affective and psychomotor and if you wish to add even spiritual domain; activities factors in that are called non-cognitive factors. There is extensive research that was done in exploring the role of non-cognitive factors from school education to higher education. And till now, the research shows that the non-cognitive factors and skills are equally or even more important than cognitive aspects in educative process and employment potential.

To restate what happens if you are able to take care for non-cognitive factors we may be able to learn better at cognitive level as well as it will greatly enhance our employment potential. And which are these non-cognitive factors? Again these are some indicative names, not necessarily exact names but grit, tenacity, curiosity, attitude self-concept, self-efficacy, anxiety coping strategies, motivation, perseverance, confidence are some of the frequently referred to as non-cognitive factors. And many of these factors fall into the, what we are calling as affective domain.

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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)



Now, to understand the affective domain is mostly associated with the feelings and emotions and it is usually displayed in the form of positive or negative reaction to given events, objects, behaviors, policies or situations. This has been reinforced, this has been validated by the present understanding of the brain.

Anytime you are in an event or you look at an object or you anybody’s behavior, anything that you look at, the brain is wired in such a way the gland amygdala has regions where a positive or negative reaction is created and stored even. That means when something happens the brain without your conscious participation will attach a negative or a positive reaction to that and it stores that.

That means every time a similar event occurs the same positive or negative reaction also comes into our conscious area and that is the reason why affective domain has such a dominant effect. Affective behaviors are accompanied by varying degrees of feelings and reflect distinct “approach” or “avoidance” predispositions. That means what these feelings do is if the, it reflects in the form of approach.

That is I am willing to participate whereas avoidance means I am trying to avoid that particular one. So this has a major impact on the way we react in a classroom to the things that are presented. And how does this accumulation of positive and negative reactions take place? A

person's past experience in interacting with the environment because right from the time of birth, a person is interacting with environment; and whether it is positive or negative at that particular point keeps on getting imprinted and that is what decides the nature and scope of affective responses.

You cannot undo all this at any given point so you have to work with them or work around them to achieve your learning goals.

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## Affective Domain

relates to

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



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And affective domain relates to emotions, attitudes, appreciations, values such as enjoying, conserving, respecting and supporting. We will see that emotion plays a dominant role. Actually all these four are not mutually exclusive. One is dependent on the other and one can lead to the other and so on.

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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

The affective behaviors are demonstrated by indicating attitudes of awareness, interest, attention, concern, and responsibility. That is if you are a positive affective behavior first gets reflected as awareness of that. That means when something is presented you will first listen to and show some interest, pay more attention and sometimes concern and sometimes you take a responsibility. So affective behaviors are demonstrated by this.

And it also demonstrated by ability to listen and respond in interactions with others. And then ability to demonstrate those attitudinal characteristics or values which are appropriate to a given situation and the field of study are identified by words such as like you use the words like, dislike, attitude, value, belief, feeling, interest, appreciation, and characterization. If you look at even at student's level, we keep using these words.

For example if you take any subject in engineering or any other place there is nothing like a good or bad subject. A subject is a subject but we say we like or dislike a subject or we also feel; we express our feelings towards the subject which is nothing to do with cognition because all subjects in one sense are important, they are relevant. So we develop based on our past history of interacting with environment.

We develop our affective responses by using word, how many times we would have said I do not like this subject or I like such and such subject. We all do that and that is affective response.

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## Krathwohl's Taxonomy of Affective Domain

Five progressive stages of personal growth in the affective domain

- Receive
- Respond
- Value
- Organize
- Characterize



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Now there are, there has been several taxonomies of affective domain. One of the first ones was presented by Krathwohl's group back in early '60s. And these are receive, respond, value, organize, and characterize. Roughly speaking, receiving means when something is presented to you, you are in a mood to, you are receiving.

You are not indifferent at that stage that many times when we listen to some topic in a lecture that we do not particularly care about, we do not let that information even get into us. We do not receive that information. We just kind of block ourselves. And then next stage is, if we like it, we start responding to that. If there is a question, if there is something that is asked, we are willing to respond. And then after a few responses, you see some value in that.

You attach a value. That means you consider it is interesting or of relevance to you and so on. But then what happens this value if you further pursue that you organize. That means you kind of rationalize its relevance to your present state. In the sense you will start integrating this new values into your existing value system and you start rationalizing and relating to your earlier values.

And next higher level it is so thoroughly integrated into you that you are willing to act and link by the new value structure. Roughly this is the, what do you call the taxonomy of affective domain.

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## Pierce-Gray Taxonomy of Affective Domain

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



But there is a little more elaborate taxonomy was presented by Pierce and Gray and these six stages are again once again approximately the same as Krathwohl's taxonomy and here the first stage is perceiving and it is further subdivided into two sub processes emotive implanting and response setting. These two are completely internal and they do not immediately kind of result in any affective behavior.

That means emotive implanting means that whatever that has sensory information that has come it has been emotively implanted. Sometimes we do not even perceive if you are indifferent straightaway. Write a few words that you listen to, you may say you are not interested and then you shut your responses. So first thing is emotive implanting and then you are setting, readying yourself for responding to that. Then you react. React means you emote now.

That means you can express emotion and then recognize that emotion. This is where after emoting, recognizing this is where some cognitive activity is associated with that. Once you start recognizing and then you control that emotion. Then the other stage that comes confirming you



first develop it is not internalizing in you, you are not completely accepted but based on what you have received you develop an artificial attitude.

Yes, it could be important, let me look at it kind of thing. Then after repetition when you consider important; that is you now take it a little more seriously it is considered consistent attitude. That is every time you confront the similar event, you express the same attitude rather than, it is not natural still. Then after few encounters like that you have consistently shown the attitude then you start rationalizing.

That means you now are convincing yourself that it is important and it needs to be taken into consideration. You rationalize that is next higher level cognitive activity. Then what you do, you validate. You examine the values and then accept the values. These two have more cognitive activities associated with them and then having examined and accepted you now judge. For example why should I accept this and make it part of my, what do you call my mindset.

That is for accepting it you first establish some value criteria and then finally judge. After the judgment then it becomes you are willing to accept it as your own. After that the next stage is affective create. What it means is now the new values are getting integrated with our existing values. Now the way you integrate may lead you to a completely different mindset, here what you are calling the highest level as inspirational insight.

That is what Pierce and Gray call the highest aspect of for example in cognitive domain, highest cognitive level is create. So here it is affective create. You are creating a new way of looking at things.

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## Taxonomy as per Emotional Intelligence

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



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Now, the same taxonomy, the affective domain can also be looked at in a different way as per emotional intelligence which is now for the last 20-25 years it has become quite accepted ones and putting in simpler words like knowing one's emotions. That is what we called as the earlier perceive and react. You can say these two activities are knowing one's own emotions. Knowing one's emotions you have to manage the emotions.

For example this is one of the basic skill that every human being requires not necessarily with respect to higher education. In our day to day life it is, your affective behavior will vastly improve if you are able to do this. One is knowing one's own emotions. That means one has to acknowledge to himself or herself that I am presently feeling sad or angry or some other emotion. First I have to acknowledge to myself that I am feeling such and such.

But if I am not even aware of it, if I do not even know my own emotion, I do not have control over my reactions or activities. Then comes managing an emotion. One of the most common emotion that everyone experiences is anger. And how do you manage anger? One of the first things is one should not react to anger in the same way all the time. Each time depending on the situation one should be able to exercise the choices that you have and if you are in control of the situation.

What happens if you all the time, every time you become angry you behave in the same way you become predictable and people can, people around you can exploit you if you are predictable. So managing emotions in a what you may call as intelligent way will greatly help you in your all aspects of life whether at home with family members or with friends or in the profession that you have.

Next stage is motivating oneself and subsequently recognizing emotions in others. That is the next level capacity. Can I recognize the emotions in others? And then if I am able to recognize emotions in others, I can handle the relations with other people much better. So this is something those of you interested in this dimension you can look at the famous book on emotional intelligence.

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## Some Action Verbs (AD)

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



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Some of the action verbs like we have action verbs in cognitive level for affective domain, these are a few words but you can add many more. Accept, attempt, challenge, defend, dispute, join, judge, praise, question, share, support, volunteer etc. And you may observe that some of them may fall into the, may look like cognitive categories. Because with respect to action verbs we cannot be very precise saying that such and such action verb will/does belong to only this affective subcategory or this cognitive subcategory and so on.

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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.



Now coming to the psychomotor domain it includes physical movement, coordination and use of the motor skill areas. We are involved especially at primary school age or even preschool age one of the major things is the children will have to be trained in the motor skills. And development of the skills requires practice obviously. Even learning to walk requires lot of practice. Learning to stand requires practice. Running requires lot of practice.

So the skills are measured in terms of speed, precision, distance, procedures, or techniques in execution. But right now, the way we are conducting our engineering programs there are very small number of courses where the role of psychomotor activities is becomes either central or important.

That is we are not expecting the engineering students to develop skills let us say for running your lathe very precisely, turning precision components that are required nor while we should know how to solder properly but we do not expect to achieve speeds and precision that very well, right? So to that extent the role of psychomotor activities is limited in engineering programs as offered at present.

But these activities become important and even dominant in course/ in programs in theater because one has to act. So you require right from facial expressions to body movements you

require. Music for example, painting, sports, medicine, nursing, dentistry, emergency medical services etc., all of them have very dominant part of psychomotor activities.

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## Simpson (1966)

Taxonomy of Psychomotor domain

1. Perception
2. Set
3. Guided Response
4. Mechanism
5. Complex Overt Response
6. Adaptation
7. Originations



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Now Simpson who first proposed the Simpson's group that proposed the taxonomy of psychomotor domain, they gave seven subcategories. Perception, set, guided response, mechanism, complex overt response, adaptation, originations. We will not go through this.

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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

We will go through again Pierce-Gray taxonomy of psychomotor domain and as you will see it is somewhat runs similar to the Pierce and Gray classification of affective domain as well. First thing is sensory transmission, physio functional maintenance. Then activating the physical

outputs. If somebody shows let us say how to hold a bat in a table tennis or a tennis game so first you should be able to hold the bat in that position. Then mimicry.

Somebody shows how to hit a ball. He shows different movements in that depending on how the ball is coming. So you mimic that action. Then after that practice, you deliberately model that model your movements. Then you execute. You start executing the way you are told, you are trained and then you start playing a game. It is operational execution and then starts increasing the skill of your execution.

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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

Then you maneuver. That is you inspect your own skill and select your skills. And then you set some performance criteria and then you judge your own performance. You are able to judge your own performance. Then what happens psychomotor creating means you yourself develop by combining different skills you get such a performance insight that you are able to execute your action in completely different way.

And I am sure you will find let us say actors the way they emote in a given situation there is something unique of their own. The same emotion let us say an anger or sadness or happiness each good actor will emote in a somewhat different way and something that people will still like. So that is where what you may call as psychomotor creating.

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## Sample Action Verbs (PD)

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

Some simple action verbs of psychomotor domain. Bend, grasp, handle, operate, reach, relax, shorten, stretch, write, differentiate, express, perform skillfully and so on. And we are only looking at psychomotor domain very briefly because in our subsequent units we will not be focusing very much on action verbs because we are not dealing with courses where psychomotor behavior starts becoming important.

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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.

Okay to summarize, cognitive, affective and psychomotor activities strictly speaking are not independent of one another as we have seen in the taxonomy 1. That is earlier unit we showed that all the three activities can be integrated at the highest level. Take any of those activities that

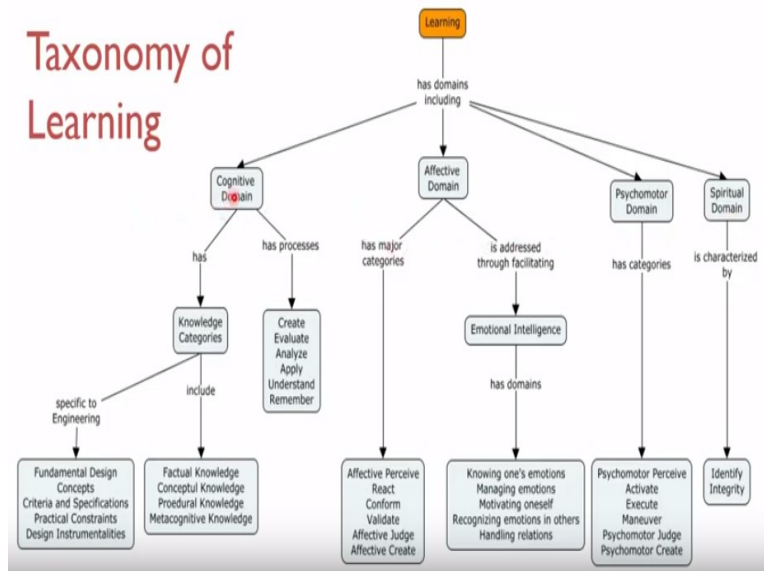
we have shown like a top class musician or a dancer will have all the three domains. They will have activities in all the three domains.

And another comment that we would like to make, higher levels of affective and psychomotor activities involve more and more cognitive activities. Higher level affective activities are not pure affective activities. They involve cognitive processing of the information making cognitive judgments and so on. So higher level, affective and psychomotor activities will involve more and more cognitive processes.

Now instruction needs to pay attention to these dependencies especially to integrating affective elements into cognitive activities in engineering courses. This is still an art. Good teachers may do it intuitively. For example how do you arouse or make people make your students pay attention to you? Maybe you want to create a small story or you enact something or you show a video that arouses the interest and to get the attention of that.

That getting the attention is an affective activity and good teachers find their own way of doing actually. They may not be a good teacher, may or may not be aware of these domains and so on but intuitively they seem to be performing this activity in the affective domain.

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Now let us take a look at the, all the three domains are presented here graphically using the tool I have mentioned earlier, Concept Map. Learning has domains including Cognitive Domain, Affective Domain, Psychomotor Domain and for completion we will include Spiritual Domain. And Cognitive Domain till now through all our lectures we have seen has processes been hierarchically arranged, Create, Evaluate, Analyze, Apply, Understand, and Remember.

Remember is the lowest level. And similarly Cognitive Domain has Knowledge Categories. These include Factual Knowledge, Conceptual Knowledge, Procedural Knowledge, and Metacognitive Knowledge. And there are some categories specific to engineering outside these four. They include Fundamental Design Concepts, Criteria and Specifications, Practical Constraints, and Design Instrumentalities.

Coming to Affective Domain has major categories where we included all the six here as given by Pierce and Gray and is addressed through facilitating Emotional Intelligence which consist of these five from knowing one's own emotions to handling relations. And the Psychomotor Domain has categories again as given by Gray and Pierce these six levels. Incidentally Pierce and Gray preferred to look at the Cognitive Domain also as six categories.

So he would like to have or they would like to have all the three domains as six each, okay? It seems to be affecting that but they do not directly address the Knowledge Categories. They only the process part is these six in each and each one has sub processes; including even these and several sub processes. And for completion one Spiritual Domain is obviously quite controversial and each one will have their own way of looking at it.

Spiritual Domain is characterized by identity and integrity. We will just leave it at that and you explore what exactly this would mean.

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## Assignments

- 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



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And now the assignments for this. Give at least one example from each one of the six affective levels from the courses that you are familiar with. Whatever course you are familiar with can you explore a little bit and say for each one of the affective level can you give one example? In what way you can relate to your course? Same way give at least one example from each one of the six psychomotor levels from the courses you are familiar with.

They need not belong to a single course but anything that you are familiar with. If you are able to give one example for each one of the six levels of Affective Domain and Psychomotor Domain possibly you would have got a basic understanding of these two domains.

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## MIUI5

- Understand the nature and importance of taxonomy table in achievement of alignment among outcomes, assessment and instruction.



The final aspect of taxonomy in next Unit, 15th Unit we understand the nature and importance of taxonomy table in achievement of alignment among outcomes, assessment, and instruction. So we present you a table that can greatly facilitate your planning of your writing the outcomes, designing assessment, and planning instruction. So that will be the focus of our next unit. Thank you very much.