Psychology of Learning

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Lecture – 18

Thinking and Cognition (Contd.)

Hello viewers, welcome back to this NPTEL course on the Psychology of Learning. So, in the last class, we were discussing about different types of thinking, and how thinking is a cognitive process. Now today, we will discuss about another cognitive process that is the metacognition. So, what is metacognition? Metacognition is actually a higher level of cognitive process which talks about knowing about knowing that is cognition about cognition thinking about thinking.

So, in computers, we say the metadata is data about data, similarly metacognition means, cognition about cognition. thinking about thinking. So, it is like a regulatory system. Then how do we observe our own thinking process our own learning process? We observe, we monitor, we regulate our own cognitive performances and that is the metacognition. Actually, it allows the people to take charge of their own learning, their own performance. So, it involves an awareness of how do we learn actually, how we evaluate our learning needs, how can we generate the different kinds of learning strategies, how can we achieve our goals (career goals learning goals) how to implement these strategies. After implementation also we monitor and evaluate the strategy's effectiveness. So, it means not just to understand our own learning processes thinking processes, but also to enhance and empower it with different kinds of strategies, different kinds of resources.

So, that is metacognition. That is not only we could understand our own cognitive processes, but also we could find out our necessary our necessary learning styles. What else we need in learning, our learning needs, our preparedness, our ability, our aptitude and similarly how to match it with our career goals or learning goals. It is a continuous process. It is a long process. In this process, we also not just learn and acquire the new competences and skills to control, to regulate our own learning process and thinking process, but it also gradually empowers us to build our self-confidence, self-efficacy capabilities. In this process if the learner is engaged in metacognitive applications of metacognitive learning processes then automatically he becomes an independent and self-regulated learner. These skills become very crucial for efficient independent learnings and self-reflection. So, the learner slowly becomes an independent learner self-regulated learner and he starts taking up the ownership and responsibility for his own learning processes. He can also enhance and improve his own intrinsic motivation, self-efficacy. All these things. So, it has different components also.

So, there are two processes of metacognition. So, knowledge of the cognition is the first thing. It has three components. Knowledge of the factors that influences our performance. So, in this process knowing the different types of strategies to use the learning, how to identify which strategies will be applicable in a particular kind of learning. Because there are different types of subject content. So, we have to identify which strategy will be optimum. Which would be

suitable for enhancing the learning in particular field. So, knowing what strategy to use for specific learning situations.

So, these are the you know these are the minute the specific thinking abilities in the metacognitive process that is knowing about the different learning strategies and how to use and when to use those things. Then regulation of the cognitive cognition regulation of then after application of this strategies also then automatically we also monitor and regulate. Regulation in terms of setting the goals deciding the plan of action that is a planning planning action monitoring monitoring and control the learning like for example, like we are more familiar with we are more familiar and comfortable with the particular learning style, but the content demand some other some other learning style like for example, content is a heavily loaded with the suppose with auditory content or content is heavily loaded with the complex algorithms and the formulas etcetera. So, we cannot just we cannot just that mean learn all the things only adopting one learning style or in which we are comfortable in. So, we have to change it.

So, that change can take place after monitoring regulating our own learning processes which and for that we need to set the goals like the self-regulation that means, for every subject content for course, for everything in that is specific goals, specific learning objectives, specific goals and accordingly planning the lesson, planning our preparation for preparation for having the mastery, acquiring the mastery for the on the subjects. Evaluating our own regulation that is assessing the results and strategies used like after using certain strategies and we can also self check our progress, our learning outcome, our learning and performances through self check exercises. So, in order to assess our self. So, all and assess our self and the effectiveness of the strategies that we have adopted to learn certain things. So, this meta cognition actually it is a continuous it empowers us with this this kind of self regulatory behavior, reflective thinking and better planning skills and it also it also prizes all that no we need to learn certain some new things.

Some new things may be know some new skills, new competencies or maybe that we need to change our learning styles like with the help of the multi multimedia, we cannot just lie depend on only on the visual visual things or only on the bookish things or only on reading the materials, but we have to collect the information from other sources, from virtual labs, from you know videos, from other other sources also to clarify our thought process, clarify our understanding to have to achieve to learn these subjects. So, so these are the two the primarily two processes in the meta cognition that is knowledge of the factors involved in involved in our learning processes which influences our performances and regulation of our own cognitive processes. Then so you can say the examples of meta cognitive skills like knowing our limits like we all of us we can know that by like what are our strengths and weaknesses. Some of us we cannot suppose we are we cannot remember so much of information data, data based number, number based, data based information that whereas, the some other other other people they are very comfortable in remembering those formulas, then these algorithms, the numericals etcetera. So, that is we know our limitation which in which area what are the our skills and competencies and how we can we can learn the things in a better way provided we better utilize our capabilities.

Self monitoring, the self monitoring from time to time, self monitoring strategy learning strategies can be done concept mapping, learning mapping, concept mapping how can we that means, such as the concepts by formulating different kinds of concept mapping and explaining self explaining it we can monitor our own things. And adopting the strategy if it is not effective

we can also change it. Modify noticing whether we comprehend something something then we just read it and modify our approach then we see no it did not come comprehend it then we have to modify. So, modification of the strategy that is these are the examples are we know our strengths and weaknesses we can self monitor our progress, we can modify our you know our study behavior preparation lessons etcetera. So, these are some of the examples.

Scheming also we make the scheming that is summarizing. Summarizing or just writing down the subheading of the whole thing important things and getting the summarizing the meaning the theme of the thing, rehearsing the again and again practicing it is self test exercises self check exercises. So, metacognitive strategies primarily it facilitates learning how to learn how to learn effectively with maximizing our performance. So, by asking the questions asking the questions means in the classroom especially in the classroom it should be the classroom that means, the teachers should encourage or allow the learners to reflect not just on their own learning processes, but also they can also reflect or reflect on reflect on others others perspective others answer or diversify their their thought processes in terms of allowing the more different strategy also in enhancing the comprehension. Asking questions of all the know hows know whys all questions not only you will ask to himself, but also try to get the meaning seek the meaning real meaning or utility or better strategy from other sources.

Force to the self reflection self reflection again it is a you can say it is a preliminary step or you can say it is a compulsory step of metacognition. So, unless and until we check our self reflect on our own thoughts and performance how can we progress how can we monitor and regulate our behavior. So, you can say it is a stepping stone of the metacognitive process that is to develop a habit of self reflection every moment. So, that means, we can we can apply the same formative assessment techniques on our self through self check exercises self you know self examination in terms of giving the some precondition for our self and then measuring our own progress. So, adopt some autonomous learning system also there are also.

So, there are also some information system also. So, is it the most efficient and effective way of learning that we can find it out autonomous learning system. So, if that is not the things like some self check automatic in the online platform some automated self check exercises self check tests are appraisal systems are there then we have we can also apply try try it out there if the existing strategy does not fit does not benefit us so much. So, these are the some of the things then yes to get the better idea to get the better idea better guidance guidance or better feedback we can say better feedback we can also find a mentor. Now usually in the higher educations institutions etcetera the students are being provided with the group mentor faculty advisor etcetera.

So, we can also seek the feedback and the guidance and the steps which can also help us. Find a group. So, cooperative problem solving problem based learning group discussion then group discussion exchange of exchange and sharing of our thoughts and ideas testing our knowledge in a particular project or subjects these are also the things like we can also develop our own learning group our own learning community where our own subject group ok. So, in this way we can also learn to learn to solve resolve the different types of problems and challenges and etcetera and then we can share our thoughts and knowledge with each other. Thinking aloud. So, thinking aloud is that that means, it is actually active thinking active thinking when we are actually we are not satisfied we are not getting the solution then we may try it out as if that means, playing the role of as if I am the teacher I am the tutor I am the tutor and I am the learner. So, in this way just discovering just to just to discover the just to discover the various you know opportunities or maybe there are some new innovative ideas.

So, discovering any potential if it is there. So, while performing a difficulty task or errors or whether we are committing any errors while thinking all these things while learning the new information what type of problems we are facing what type of obstacles and hurdles we are facing what kind of you know like for example, things that we could not in easily connect to or integrate. So, these kind of things can be possible when we think aloud. Then self explanation talking aloud to our self improving our comprehension like suppose primarily suppose in the beginning as a primarily actually controlling our attention distractions. So, thinking aloud or reading aloud talking aloud these are the things first initially in the initial stage to control our attention and trying to focus it on the theme and content once it is in the flow then we can we can go ahead we can go ahead with this silent reading.

But initially to control our attention and focus to bring the focus on the content we can we can try it out with the thinking aloud or reading aloud all kinds of thing or self explanation self explanation is also going to improve our comprehension of a difficult subject and gaps in retention. So, when we are explaining to our self then we can also explore so many other things that we might not have known about us. So, then be okay with the making error. So, it is a that for example, in self check exercises or in any other appraisal system self appraisal system if you find that we have committed so many mistakes. It is we should not be we should not be upset with this because the because the errors like the errors and the mistakes are you can say the pillars of pillars of actual learning process like unless until we identify the gaps or identify our limitation identify our you can say lacunae then how can we recover how can we make up how can you improvise it.

So, metacognitive knowledge develops with age experience and learning and instruction. So, the so this is an so that cognitive and metacognitive relationship you can say it is a very much integrated as you can see metacognitive knowledge and metacognitive regulation to initially metacognitive knowledge is primarily about the declarative knowledge that we have procedural knowledge know how what we have learned and conditional knowledge that is the planning skills and decision making skill planning skills. All these are the knowledge about the metacognitive how to conduct how what know what is of the thing metal and meta metacognitive regulation is more of the know hows like planning skills monitoring evaluating regulating changing the strategy. So, is it can be of one of the knowledge type another is the regulation type. So, it has a it is very much well integrated in our cognitive processes itself.

So, it is a cognitive and a metacognitive processes are well integrated the thing is that with the mastery learning with higher competence with the higher learning learning behavior and study skills etcetera we slowly and slowly we explore it slowly we discover it then if you we become the you know well thought learner or self regulated we want to be self regulated learner independent learner then we have to explore what are the potential inherent potentials are there within within our system in our cognition in our in our cognitive processes like what are my strengths what are my weaknesses and how to regulate and how to make progress. So, all these things can be done with the self explanations reflective thinking self analysis all kinds of things. So, this is the thing.

Like for example, cognitive goals are here metacognitive knowledge is here here and the metacognitive experiences that in the past that we have already done it or we have tried it out various strategies these are the metacognitive experiences that also strengthens the cognitive goals. And metacognitive knowledge that just now a knowledge the knowledge also that also

strengthens our cognitive goals. So, metacognitive knowledge metacognitive experiences our cognitive goal career goals and actions of the strategies that is the planning a regulatory actions all these things.

So, all these things are well integrated in our cognitive system. So, cognitive tasks and strategies that knowing or finding out the some of the set of numbers like cognitive strategies that basically knowing how to reach a goal, how to solve a problem ok. Remember the things that learn earlier that might help us in the current task recover recovering, retrying, recapitulating the old things that is a cognitive task which we can use it as a strategy. Now, metacognitive strategies are like to make sure that the goal will be reached successfully. So, cognitive strategies that we were trying to finding out, trying to recall, trying to retrieve the how to or planning to how to reach the goal, but metacognitive ensures it further that with these strategies or these many strategies or maybe that by checking, rechecking and double checking, triple checking then we have to ensure that the answers are correct.

We have to ensure that the problem has been solved. So, here cognitive strategy actually cognitive strategy instruction. So, how to use the cognitive strategies, how to build the cognitive strategy that can also enhances the metacognition. So, in the process of classroom discussion and learning process from time to time from time to time the teacher the instructor should also gives give us or teachers about how to build a cognitive strategy, how to build a psychomotor strategies, how to build the effective strategies for better learning. So, in this process cognitive strategy instruction exclusively the strategy instruction will be given cognitive strategy instruction will be taught to us then it can definitely enhance metacognition.

Because in order to have this metacognitive ability develops metacognitive ability we need to have some prerequisite preliminary abilities reflective thinking, critical thinking, then you can say problem solving ability these are you can say the prerequisites. So, these things can be taught in the classroom in the instructional process. So, as you can see these are the things like you can see metacognition and metacognition that monitoring the learning this is the diagram of you know the different components concepts of the metacognition. Yes, metacognition that is the concepts and how to how is thinking that means, we are very much monitoring being conscious we are monitoring how you are thinking how in which we are going moving on how we learn etcetera. Then monitoring our own learning from time to correct accuracy correct corrective correct answers then the processes then the you know you can say the understanding the elaborative abilities all kinds of things related to subject content and select to monitor and monitor the method and the strategy.

In this process when we know that this could be the possibility the better approach better approach to perform to learn the new things new methods etcetera. So, that we can achieve our career goal. So, all these things mixing together then the performance outcome takes place performance outcomes in terms of knowledge in terms of performance then again at the same time we have to again monitor map our own motive level of motivation intrinsic or motivation our level of achievement our drawbacks our inabilities our aptitudes our psychomotor skills and competencies. So, these are all these 4 components are important that means, it is again this is a learning cycle also. So, these concepts are continuously continuously going on linking one component to other giving the feedback to each of this domains in this is an ongoing learning process.

So, another type of thinking is critical thinking critical thinking is very important is the ability to collect and analyze the information to come to a conclusion. Suppose we are exposed to a

problem. So, we have to analyze what could be the what are the reasons what are the factors causal factors of that what could be the what could be the possible solution and how to resolve it. So, collect the ability to collect and analyze the information before coming to the conclusion. So, information can be maybe in terms of information maybe in terms of data in terms of statistics in terms of all kinds of things quantitative information are there qualitative information are all these things.

So, we have to then the we have to develop the critical thinking skill to evaluate it rationally logically without any bias. As the information and data is there we have to objectively rationally think about its background its antecedents its causal factors and its present status what is the present status. And then take some then decide or plan something to so to that means, to opt for different solutions different hypotheses to solution different mechanism. So, so automatically so this when we start reflecting on and critically evaluating in all these things objectively evaluating things that itself creates that itself generates or creates critical thinking skills that automatically. So, without being satisfied without being you know self satisfied when we start critically evaluating the components why it happen and asking all these questions why it has happened why when where and all these things then automatically it gives us a kind of you know backup backup backup process of the methodology or methodology or the methodology or the you can say strategy for solving that problem.

So, asking first thing is then critical thinking that evaluation it demands asking many more questions not being happy not being complacent with whatever it is giving given or maybe not or that is and otherwise if we think of it in a superficial level then we superficial we may not get the actual reason cause of that problem. So, thing is the first thing is that we have to we need to we need to you can say we need to embrace invite open mindedness evaluate it analyze it with open mindedness means we can invite the opinions of others we can invite the we can invite the different kinds of approaches we can apply options available different options available maybe we have the different approaches like technical approaches there you know methodical approaches there different kinds of the options are there. So, we have to critically evaluate those options. So, being open minded and being reflective and you know being sincere or being an analytical thinker definitely it helps us in critical thinking. So, most important critical thinking skills are like for example, analytical thinking it requires analytical thinking skills part of the critical thinking is to evaluate the data from the multiple sources in order to get the best self conclusion.

So, analytical thinking is that to come to the best conclusion. So, unless and until we evaluate effectiveness of each and every options here you have to analyze everything we have to reflect on the task. So, we have to analyze everything that what are the strengths and weaknesses and which option will be most effective things. So, critical thinking it involves a lot of skills a lot of skills similar analytical thinking then open mindedness we have to welcome we have to invite invite others other options also like for example, without again objectivity also its objective means objectivity without any bias objective critical thinking that unbiased conclusion unbiased observation rational thinking that is logical thinking then unbiased unbiased unbiased you can say suggestions. So, open mindedness that is to welcome to invite the new ideas.

So, through brainstorming also we can invite the new ideas new ideas to receive and to think about to start to think about the new options available new ideas. So, then problem solving. So, critical thinking emphasizes most on the conclusion based on the problem solving ability suppose after collecting all kinds of all kinds of information through analytical things etcetera

then we may collect the further resources in more information about this. So, then we reflect on the effectiveness of all the options available then we can plan something we can hypothesize something then try it out one by one. So, this is again itself is a problem solving method problem solving system problem solving approach to thinking.

So, collecting information analyzing every information formulating the plans and strategic hypothesis, then experimenting or trying it out one by one. So, this is step by step progress towards solving the problem. So, in this process reflection debate also again conversation dialogue discussion these things are also important self regulation self regulation is also very much required here because whenever we are reaching it to the conclusion final decision conclusion etcetera we have to be very we have to keep aside our personal bias. So, how much how much effective we are in controlling our bias how much effective we are in regulating our behavior monitoring our thought processes and take the right decision because you know taking this decision decision making is the most difficult task. Then when we are taking the final decision, say about the this is the most effective solution.So, then we have to also monitor and regulate our own biases and more own thought processes then observation.

Observation skill also helps the critical thinking thinkers to look and look for the things beyond the face value like suppose for the timing. So, suppose we have got solution at the moment now we have to think of for the future implications usually in the research we do not only you have solved some problems, but we also plan for the future what could have what could be done in the future or it is it is just not just the phase value or the time some time by time bound or the time bound solution right now, but what could be the future possibilities we have to explore that. So, that is where to be the critical thinker we need to embrace multiple points of view multiple skills multiple competencies multiple you know starting from the self self reflective thing reflective thinking to self regulation to open mindedness to analytical skills.

So, all these things are required. So, critical thinking you know in the Bloom's taxonomy we have all already studied that how the in the hierarchies of the learning hierarchies of the after application of the knowledge and the analytical thinking then the then the critical thinking evaluation the critical thinking then the creative thinking similarly it is the critical thinking it involves all the prerequisite thinking processes. So, interpretation how the data should be properly interpreted then evaluating the effectiveness of that answer answers then communicating it to our communicating it to others to have a discussion to have a discussion and that means, to find out its efficacy and effectiveness effectiveness. So, I mean the there are different strategies that we can use in critical thinking first one is the cognitive strategy definitely the macro skill what are the macro skill overall skill that we require then in the micro skill what are the specific skills that we need to acquire or learn in solving that problem and the effective strategies like mental habits study habits effective strategy like the motivational level then the willing then passion or the that means, willingness to complete the task. So, these things study habits mental habits all these things and cognitive strategies both at the macro and micro level it helps a lot. So, these are some of the strategies given here mental habits effective strategies independent thinking process objective thinking rational thinking and understanding the relationship like how to understand the relationship or the type of pattern patterns that is inbuilt pattern is there then and mental tenacity persistence you know perseverance and you know rational thinking and trust in thinking as because we are at I am adopting the rational thinking I must also believe in that these kind of the effective strategies are very much required.

And similarly cognitive strategies at the micro skill some of the micro skills like the you know

transfer of learning how can the transferring insights into new context like whenever we are creating something we must have some kind of you know some kind of thinking about the future implication what could be the future in future insights what could be future implications and then to analyze the thing from different perspectives and perspective analyzing the words phrases language and the standard of evaluation like whether it meets the criteria or not what are the parameters and how to how to and how to establish its credibility its authenticity its reliability and after the basic important questions to evaluate its efficacy its its efficiency its interpretations its trustworthiness. So, all these things are the micro skills and the micro skills as you know micro skills like you know comparing and differentiating all the real implementation of the ideal then using the critical vocabulary then paying attention to the important similarities and its differences probing and evaluating the premises that is minute details in minute details how to observe evaluate it and finding out the flaws and reestablishing it really reestablishing its trustworthiness credibility and reliability and these are the some of the macro skills that we can use. So, they will starting from the communication to discussion, to sharing the thoughts ideas perspective all kinds of things. So, this is all about the critical thinking skills which we need also in our learning process in the with the higher level of thinking with higher level of learning of automatically from up to application its ok that means, knowledge understanding application of the knowledge and that is primarily transform of transform of learning into different different situation context or similar kind of thing, but beyond application these are all higher order thinking processes. Analytical skills evaluate critical thinking or evaluations critical thinking skills and then the creative thinking skills.

So, these are the critical thinking skills like the reliability of source that we can also develop slowly predictions, analyzability reasoning by analogy conditioning conditional reasoning all these are the critical thinking skills that we can slowly develop evaluating differentiating skills or differentiating noticing something evaluating it. So, how to improve this active thinking skills like writing studying mind mapping discussing debating. So, how to engage our brain in different kinds of activities and self checking and self evaluating and self appraisal that is yes I these are the techniques I have applied for we applied different different strategies which strategies have been proven to be effective. So, this is again this is a table that you can find out the critical thinking skills skills are given in details. So, critical thinking skills will be primarily boosted enhance first thing is observation skill analytical skill inference drawing predictions assumptions ok then better communication skill and then the problem solving thing.

We can we can say that these fives are the pillars of we can these are the pillars basic pillars of critical thinking skills. That means, critical thinking skill is not just one component, but it takes into account all these five preliminary skills. So, these are whatever it is there. They are observation, analysis, inference drawing, communication skills these are discussed here only. So, now, these are some of the some of the steps that we can follow how to think critically step by step how to how to organize the information data. So, there is a strategies that are given here how to we can start thinking critically, but again now in the education system school education that has been that is why from the very beginning from the very beginning it is being advocated is being insisted upon that the every child should think independently should be given the freedom to think independently and because independent thinking independent learning actually you know it shows the pathways for critical thinking or creative thinking.

So, unless and until we exercise freedom, unless and until we give the opportunity to explore the things on our own way, we cannot be an independent learner. Unless and until we become

an independent learner, critical thinking or creative thinking remains a little difficult. So, that is why it should be embedded in the system itself, in the pedagogical framework itself from the very beginning and it has been done in our school education with national policies. So, that is why it should be there from the very beginning.

And then slowly it becomes a part of the cognitive process. So, it is a process developed over a period of time period and cannot happen overnight. So, it is continuous process. It is a long term process. It has to be embedded in our thought processes, in the learning processes, cognitive processes from the very beginning. So, we need to practice it. We need to learn it we need to develop these kind of critical thinking skills, analytical thinking skills or reflective thinking skills. These can be taught by the mentors, by the teachers, or by the parents from the very beginning by giving different exercises, different stories, different questions etcetera. So, you can say, there are many different types of thinking skills: creative thinking to enquiry skills to information processing skill, to reasoning skills, to narrating or giving elaboration skills. All these are cognitive skills. So, all these skills have to be incorporated and embedded in our learning process and to be practiced to be encouraged, to be monitored, to be reflected, to be corrected throughout the learning processes.

So, it is not just an overnight outcome. It is this long process starting from the beginning of a learning. We can develop slowly and steadily. We can develop particular kind of study habits, learning styles, learning strategies and metacognitive strategies. All these things. So, this is all about different types of thinking skills. So, we are yet to discuss some other things that we will do in the next class. So, thank you very much.