

## **Psychology of Learning**

**Dr. Atasi Mohanty**

**Humanities and Social Sciences**

**IIT Kharagpur**

**Lecture – 19**

**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 the critical thinking skills. And to continue with other types of thinking skills, let us move on to the next type of thinking skill that is the reflective thinking skill. As we have already discussed that critical thinking takes into account some of the prerequisite skills like reflective thinking, analytical thinking, all kinds of things.

So, similarly, here is the table where you can find out how critical thinking skills and creative thinking skills are focusing on different aspects. And these are the different types of thinking with the different goals and purposes. Critical thinking has a different purpose. Similarly, creative thinking, decision making skills and problem-solving skills, each type of thinking has specific goals, specific objectives. So, it has been narrated here. And for each type of thinking what are the thinking skills, what type of relations are there all these things have been given here.

So, today we will go to reflective thinking skills because it is a much-needed prerequisite skill for critical thinking and creative thinking. So, critical thinking is a broader concept which takes into account the reflective thinking. And reflective thinking has a close relation with the metacognitive thinking because we do reflection with our metacognitive skills. When we know about our own knowledge, about our cognition, how do we monitor and regulate our own thinking process or learning processes that is when we do reflection. So, for that matter, for metacognitive thinking, definitely reflecting thinking is very important. Unless and until we try to reflect on our own thought process how can we know that we have understood. So, you can say reflective thinking is prerequisite for metacognitive thinking. So, thinking of our own thinking style learning style etcetera. So, reflective thinking is a skill of the individual. Self assessment, self-regulation, self-checking and self-regulatory behaviours are related to reflective thinking.

So, organizing, reasoning then developing the assumptions and the predictive skills of the critical thinking are within the scope of this evaluation process. So, under the critical-thinking skills, when we try to organize the things when we try to rationalize the things or find out the logical relationship, reasoning, assumptions for the hypothesis building. Then the different competencies related to solving of the problems all these things are taken into account by reflective thinking skills. That means, all types of thinking skills are interrelated. So, depending on their hierarchy, depending on their purpose and the specific level of difficulty it takes into account whichever are the preconditions or the prerequisites for this thinking.

So, developing the reflecting thinking. Similarly it should be developed from the very beginning and these are some of the ways writing and learning the text reflecting on like suppose it is not just a prescriptive it is not just mugging up it is not just memorization and

beyond memorization that is application, but after application again then giving the feedback reflecting on for getting the feedback. So, keeping the reflective diary portfolio making constructing the concept maps whenever we are studying and developing a concept maps actually concept maps are you can say these are the it is a kind of advance organizers like before actually going into the depth now we are just framing a mental map. So, self checking questions asking questions joining reflective discussion negotiated learning like you are you are you are when we are engaged in a debate. So, we are we are you know we are advocating for we are pleading for own view viewpoints and the perspectives and solutions whereas, others are also they are also coming up with their own ideas. So, this is a then when the debate we are engaged in the debate then how to come to the consensus how to come to the conclusion.

So, here again some sort of negotiation also takes place the negotiated learning self evaluation all these through, but practicing all these things we can develop the reflective thinking. So, then after reflective thinking is very much crucial for the critical thinking metacognitive thinking now we are coming to the creative thinking creative thinking as you know in the cognitive hierarchy is the highest level of thinking. So, creative thinking is nothing, but you know being innovative being innovative in our imagination in our approach problem solution that is thinking out of the box something different something new something unique. So, creative thinking involves, but creative creativity innovativeness and creative thinking. So, these are little bit similar similar terminology similar kind of terms and concepts, but they are some minor differences like creativity is a concept having creative products creative processes creative mechanisms all again.

So, creativity is a you can say it is a you know larger concept it is a kind of just kind you can say per say creativity as a per say that means, it takes into account many innovative ideas and things creative creative thinking is a process creativity is a larger concept who takes into account different processes products and outcomes and attributes. So, creative thinking is a process how can we think creatively creative thinking when we say that creativity means it also considers the products when we are come up we have when we have come up with the new idea new product new model new design it is a creative one. Similarly artistic creativity is also there then innovativeness is a innovativeness like for example, you have we have been creative in in in your thinking in our imagination when ultimately when we we have been successful in creating something and utilizing it or applying it is or installing it then it becomes innovation that innovation that is for the application purpose and we have created something and for the application purposes we have applied it install it etcetera. So, these are all similar terms just the the little bit slightly differences in the sense that creativity can be product creativity can be process like creative thinking creativity can be person the individual having some unique abilities unique skills and competencies that artistic ability creative ability in terms of you know design thinking in terms of artistry artistry artistry or extra that artistry that the singing or the painting or the writing skills that extraordinary things. So, that is that having the different personality attributes of being a highly creative person creative thinker.

So, these are the different manifestations of the creativity. So, creative thinking involves a new approach to a problem it is a resolution to the conflict even even suppose for example, to resolve the conflict how to resolve the conflict that means, you have you have to think out of the box how to resolve that conflict how to how to resolve this complex very complex situation very complex you know problem. So, it is a new result with the existing data set, but a new approach with new things. So, it can be product product with the specific features new features etcetera. So, creative thinking again creative thinking is not just limited to artistic types or only

on painting or drawing or sketch etcetera, but this is the different.

So, different types of creativity also are also there creativity when we are talk what say that creativity as a process as a process that means, we have to introduce different kinds of mechanisms strategies etcetera in the workplace. So, which brings the freshness which brings an innovative approach which brings which is which proves to be very cost effective which which which which that means, it brings that freshness. So, for example, simple thing is that suppose whenever we are changing the interior of our house from time to time that is also creative process means the things that we need need some change and in order to bring that change we think just in different way. So, thinking differently out of the box and innovative means. So, it is it is a change it is a skill that anyone can nurture from the and develop it.

So, creative thinking again it is a thinking skill which can be nurtured from the very beginning that means, thinking differently. Yes of course, creative thinking requires the compilation of the analytical thinking, problem solving, organizational thing, communication skills etcetera because suppose when you think something differently, but you have to be you have to make sure that what exactly you are thinking you have to plan it, you have to communicate it, you have to narrate it. So, you have to organize the components also. So, and you have to identify the problems also how to solve the problems it is not just having some imaginary ideas is not enough. We have to be very specific like for example, with divergent thinking we come up with new ideas new ideas, but every idea cannot be implemented every idea cannot be experimented every idea cannot be solved.

So, out of n number of ideas then we have to finally, select one topic that means, again we have to converge all our ideas and just chalk out that oh the two and just to stop drop on one point now this is the most effective most important one then we pick up that idea. Then again we start analyzing what are the if this is the problem this is an issue then how to analyze it what are its different components, what are its different possible solution, what could be the thing. So, in this again analyze analyzing the whole issue all together. So, then searching for the options searching for the resources etcetera, but creative thinking thing is that the inherent tendency is there to think beyond the normal things beyond the normal solutions something different out of the box that means, beyond the predicted beyond the predicted kind of solution, but something unique something novel something different. So, developing the innovative solution to a problem that is the part again it is a innovative solution to a problem is again is the process.

So, creative thinkers actually brainstorm not only a large number of ideas, but also varieties not just creative thinkers. So, divergent thinking and convergent thinking again it is a part of creative thinking also. Because first to begin with you have to think divergently like brainstorming having getting the different ideas being open minded receiving the different information ideas etcetera. Then categorize it into different range different categories. So, here diversity is also there and large number of volume is also there large number of ideas are up there and varieties are there.

So, then again we have to range it categorize it in terms of different groups and etcetera. So, how to think creatively these are some of the steps. So, again creative thinking as because it is a cognitive process again it follows certain systematic steps also ok. So, because every learning creative thinking is it is also learning process every learning every cognitive process takes place in a systematic in a sequential and in inductive way. So, for creative thinking also first thing is that gather what information you already have.

You might have observed the leaders the leaders in the companies suppose when they are facing or they are about to produce something new bring something new to the to the company etcetera some or to launch the market launch a new product for the market they have to think of think of first it. Again it is a collective effort it is a collective consciousness it is a collective planning. So, that is there from the beginning gather what of a what information that you are already having collect the information from different sources like being open minded receive all kinds of the feedback receive all kinds of the ideas their viewpoints etcetera. So, collect all the information as much as possible. Consider the obvious solution or the pressure.

So, what is the normal practice just consider what is the normal, but brainstorm for another additional solutions. These are all expected these are all normal then brainstorm again for additional something above something beyond something beyond the normal situations and something beyond the normal solutions. So, that is going having that seeking for uniqueness then consider how the topic topics connected. Suppose then you brainstorm all additional solution possible ways and mechanisms etcetera. Then try to connect how each of these ideas how each of the solution how they integrate how they connect to each other.

Then apply the solution may be that in this process you also formulate we also formulate different hypothesis yes strategy number 1, strategy number 2, strategy number 3. So, then apply trying out the applying the solution. So, everyone is born the some of the researchers they say that every man is born of born creative. So, that was the question like whether the creative persons are in born or they can be prepared they can be trained. So, yes, but it is the thing is that I will if you go you refer to the intelligence theories like every individual for the all academic achievement we need the general minimum general intelligence that is the general that is the g factor that is general intelligence of our cognition cognition.

For that for example, we through which we can grasp we can understand we can comprehend the things etcetera that is primarily for academic achievement academic intelligence. But beyond that you might have observed that beyond the academic intelligence academic scores etcetera, but some people are unique or very highly skill in some of the domains may be highly creative, may be a very outstanding sports person, may be very good painter, may be a very good you know mechanic. So, that means, so, this is it is very clear that besides our general intelligence, besides our general intelligence required for the academic intelligence academic performance. There are also specific abilities like the you know Gardner's multiple intelligence theories we have discussed. So, that these are the specific ability their specific intelligence specific abilities are there.

So, specific abilities can be nurtured and that can also be manifested through some creative thinking creative creative products. So, these are the specific intelligence, specific aptitude, specific abilities or unique qualities are there which can be culminated, which can be nurtured, which can be which can be groomed and nurtured to be a creative output at the at the creative person. So, the person can be a creative extensively creative person, creative thinker and some we can also find out some creative piece of work, creative product, etcetera. So, everyone can become so, that was that is his opinion that everyone is a creative thinker because creative again creativity adds value ok. When we say that individual differences are there every individual is different from the other one even the identical twins are also different.

If every individual is different and every individual is having some specific ability that why cannot he not be a creative person because creativity that is, we just need to identify it, nurture

it, train it, boost it, enhance it, polish it, etcetera. So, when we nurture the creativity that means, it adds value, value to our behavior, value to our thinking process, value to our performance in the workplace. So, it always creative thinking creatively always adds some new values ok. So, that is a it helps on, but with the nurturance of polishing or nurturance of creative thinking. So, gradually the individual becomes more confident, more self relying, more scientific in its aptitude, scientific in its meant scientific bent of mind like you know always try to experiment, always try to validate, always try to find out the or find out the grass root reality or its effect or impact.

So, thinking open mindedly can also can also be very helpful for creative thinking, but because it gives us a reason to think differently. So, thinking creatively is also thinking differently. So, it can so, through this also thinking differently means we can also explore the new ideas, new thoughts. So, for that also we need observation. So, as if we become very observant then definitely we can find out the gap areas what is the gap areas usually you might have observed the creative people whenever even though that first of all they are they do not socialize so much, but even if when they socialize they always look for search for the gap areas.

Because they are they are you know their talent their skill is towards beyond the normality beyond the normality. If everything is normal at appears to be normal everybody is satisfied their complacent. So, that is the general trend, but they always look for search for something different, something unique, something different and primarily they focus on the gap areas. So, that is thinking out of the box and the, but in this process when we nurture it we need to learn. So, in order to enhance the creative ability creative thinking ability we need the resources, we need the environment and ecosystem, we need we need the inputs, we need the nurturance, training, education all these things we need to manifest it or to achieve it to a culminating point.

So, that is why so, most experience the more we experience we get in the thinking process the easier it becomes to master the difficulties also. It is so, it is a continuous effort it is a continuous learning process continuous initiative continuous effort. So, if we experience these things again and again then then definitely you know when we say that practical intelligence. For example, practically he is very competent he is very these practical intelligence very very good. So, he can deal with any kind of situation he is a problem shooter he is a negotiator.

So, so they can handle the most difficult situation. Similarly, the creative thinkers if they get more experience then automatically they face it very they face easily that it the most difficult situation also becomes very easy for them to deal with in the face to life. So, their tolerance, their sustainability, their perseverance it becomes you know it is slowly and steadily they becomes it becomes effortless that means, they can deal with any kind of situation. So, how to apply the creative thinking in the learning process? Yes, there are there are some strategies we can say the creative thinking strategy we can say risk taking behavior. Like for example, all of us normally with a we are in a we want to be in a cocoon of you know self satisfying complacent position that we do not want to do not dare to cross the boundary that is to venture into a new unknown domain.

So, risk taking to some extent, but yes it should be calculated risk usually the creative people they are the risk takers be it in the workplace, be it in the corporate, be it in the learning situations they try they just try to experiment on the new things. So, that is the kind of risk taking behavior they just want to go beyond the boundary. So, so how to enhance it by you

know from the very beginning if you can do our self thinking. So, play that play the brain you know puzzles and playing the mental games, puzzles all these things and regularly asking the questions about know hows, whys, how it is happened, why it happened, understanding all the reasons underlying reasons of any kind of event or the information, generating the last volume of ideas, collecting from different sources, thinking divergently and producing a big number of possible solutions to a critical problem, daydreaming, imagining, imagination, reading a lot of stuff and travelling a lot and meeting people and meeting people different people across the travelling because travelling not just gives us the exposure to different localities and the different cultures etcetera. But when we interact with different people from different culture that also that also strengthens our observation skills, a kind of feedback.

So, feedback so another type of thinking is that the lateral thinking. Lateral thinking is that lateral thinking that we when we collect different kinds of things information etcetera as expanding our knowledge, exploring many things not that not that immediately we are using it, but it is there in our backup. Whenever we require we can we can we can find it out. So, we can so there is no boundary. So, it is expanding our thinking limits it freeing our self across the boundaries we are collecting as many as information is possible, but that means, allowing our mind to discover many options different with looking beyond the normal things, diverse strategies, resources etcetera, but right now immediately it may not be of use, but later on because it is there in our repository.

So, later on maybe by taking in in the new situation in any kind of different problem situations that repository that that learning things strategies are there which are there in our backup that will be useful. So, strategies these are the yes creative thinking thinking if you think is as a process then it has the different stages. First thing is that you know preparation stage like for example, after divergent thinking process or diverse ideas etcetera then we pinpoint on one or two topics suppose this is a problem. Then we start preparation, preparation that means, that is called the initial inspiration phase that we and how we try to collect as many as information from different sources talking to people, going through the library, going through the content all generally all kinds of thing or preparation start preparation by collecting the information about that. Then then observing and processing then after that then we we keep on thinking about it trying to get the solution.

So, it is an kind of absorption that means, whatever information you have gone through we have collected we are thinking actively thinking about it and processing all these information and trying for the possible solution. So, but still we are not we are not getting the solution like in the moment like in insightful learning also takes place we are we are trying out what could be the possible solution we are continuously engage etcetera. So, that is the incubation period that means, all the ideas are being processed all the ideas are not just absorbed in our brain, but these are integrate cell that means, we are these are actively being processed. So, that is the this active processing and absorption of the ideas different ideas it this stage is called as the incubation stage ok. So, then all of a sudden when we get the solution like maybe that we are consciously thinking about it or may not be we are not at that moment we are not alert about it, but we are doing something else, but all of a sudden that eureka moment that is 'ah I got it' I got the answer that is the insightful learning situation that is the insight that is the insightful learning situation that is another phase.

Then thereafter we when we get the ideas then we start start putting the things into order then trying to experiment it evaluate it is efficacy its implication all these things evaluation process. So, after evaluation if you are happy if you are satisfied or maybe that we have addressed its

flaws etcetera then we further elaborate it then we narrate it with pen and paper we we narrate it we explain it and then we may put it in the platform for use for practice for being a making it a part of our day to day activity. Be it marketing marketing research something being in the sales department being in any workplace or any learning learning platform. So, problem solving similarly the problem solving is the same thing the problem problem solving that means, maybe that the creative thinking is that that we identify the we identify we select some topic on our own. Problem solving is that the moment we face the problem or we have been assigned that this is the problem you solve it.

So, first the problem solving the same thing the thing problem identified understood problem solutions generated by collecting information resources then solutions examine and evaluate evaluated then the solution tried out like like suppose we develop a prototype. Prototype we develop that is the solution tried out results even the prototype we have already development then developed then then we will experiment it whether it is going to be effective or not or how to what extent it its capacity can be utilized to what extent it has its stretchability its usability its applications can be generalized. So, these are the primary proper the problem solving also these are the primary strategies. First thing is that trial and error like in conditioning learning also we have already studied that by doing it again and again and again every time we repeat it definitely we identify our flaws our error. So, in this way in the trial error method so, thing is that slowly and gradually the errors get diminished the error gets rectified.

Then algorithm if you have any guaranteed solution any particular formula any specific pattern or given formula then we can apply it or if they or by analogy analysis another strategies for solving the problems where applying the solutions that were previously successful with the other problems in similar situation trying it out in the new situation also. Applying the same analogy which has been allowed to be used and trying it out the new thing that this new situation trying to examine it apply it maybe that maybe that through this also we can also resolve the issues or maybe that similar things can be done and if not then we can further explore the things. So, problem solving and problem based learner. So, nowadays nowadays in our learning education system we are primarily promoting collaborative learning, problem based learning, project based learning because these are all the parts of the constructive learning approach ok. So, problem based learning is also is a constructive learning approach like problem based either the problem will be given to the learners or the learner will be learner will be given the freedom free hand to opt to select the problems on their own.

So, they can identify their own select their own problem or the problem will be assigned to them. So, in, but while trying to solve the problem this is a learning pathway. So, that is it is also it is a part of the constructive learning process it exposes the students to a problem is it is complicated situations. So, the problem based learning represents a learning based on experience, experience of doing it in the real life context, experience of trying out the various strategies in the real life situation, getting exposed to the real life issues and challenges that is there which may not be there in the classroom and theoretical books knowledge repository.

So, learning how to learn. So, here aiming to skill. So, in this process of experiencing the whole situation the learner will learn the new skills, new learning skills that learning how to learn, how to build different kinds of capacities and increase their capacity different skills to learn, how to define the real problem, how to apply the different kinds of means and approaches to approaches develop the different kinds of skills competencies and then to try out how to you know how to solve that problem, how to verify that problems. So, in this process he develops lot of skills. Yes of course, motivation is very much important reflective thinking

motivations skills and again skills for perseverance skills for the lifelong learning all these things are very much important in this process of. So, here you can see the PBL has the 8 essential elements these are all the elements and the skills and the both effective cognitive and the psychomotor skills are required. So, we can go through it is a part of the constructive learning process while that means, it is a experiential learning while experiencing the whole situation we are trying to trying to solve the problems.

So, these are the characteristics of the problem based learning as you can see steps of practice, practice how to practice the problem based learning that is determining the things, determining the determining what we know, what we need to know, putting the thoughts in the in the sequence in order, gathering information, sharing information, then producing the different potential solutions hypothesis formulation, learning issues and application of the new knowledge in the new knowledge in the problem and the reevaluation in the explaining it, evaluating it, presenting it, discussing like in the situation is discussing, sharing the perspective, different perspective, knowing from each other, peer tutoring, learning from each other, discussing with other, critical evaluating everything. So, this is the whole lot of thinking skills need to be practiced for solving the problem. So, this is also the problem based learning some of the clippings are there how to present it, how to get the solution, how to collect the information again it is a lifelong learning. Learning cycle it is a learning cycle and the role of the learner in the PBL situation is analyzing. So, here in the problem based learning, problem based learning learner is the you can see is the nucleus of the whole thing.

So, to develop the starting from the developing the practical solution to decision making to learning, setting the learning goals to identifying the resources, strategies to evaluate the conclusions all all these activities are to be done are to be taken up by the learner by the learner. And after resolving the whole thing it has to be presented, it has to be discussed among others for its credibility, for its general generalizability, and applications for the future situations. So, similar the different different viewpoints even. So, same thing has been all these things have been narrated here you can go through it. And metacognitive processes how it can also be in it is a very important process problem based learning.

So, whatever till now we have discussed the critical thinking, reflective thinking, metacognitive thinking along with the effective components like you know intrinsic motivation, strategies, inquisitiveness, curiosity all these things will be incorporated in the process of experience or learning. So, we are proposing constructive learning, because the problem-based learning or project based learning, collaborative learning are the processes or the mechanism where the learners are supposed to learn different kinds of thinking skills. They acquire the mastery over different kinds of competencies and skills, and learning together, and performing together, collaborating not just the cognitive skills, but they also learn the affective skills, they also learn the social skills. So, then that means, they also become very innovative and creative when they listen to others. So, there is a you know cross fertilization of the diverse ideas, unique ideas, creative ideas.

Which is the end product. And in this way the end product, the output is you know immensely effective, immensely helpful. It has the far-reaching applications and implications. So, similarly these are some of the things like assessment, evaluation are all the examples of the problem-based learning. So, the problem-based tradition. How the problem based learning was being given in the traditional approach, and what is the difference between traditional approach of solving the problems, and what is the PBL approach which is a non-traditional approach. So, all these PBL approaches: collaborative learning, project learning are part of the

constructive learning approaches. These are the advantages of problem-based learning as you can say and it is the learning cycle.

So, learning cycle. So, with these I am now completing it. In the next class I will discuss further.