Introduction to Cognitive Psychology

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Lecture – 26
Reasoning – 01

Hello friends, welcome back to the section on Reasoning Judgment and Decision Making. Now this particular section on Reasoning and Judgment and the one which is going to follow after this, decision making will be one of the last sections that we will be dealing in this course on Cognitive Psychology.

Now, in the last lecture on problem solving I explained to you how reasoning, decision making, judgment and problem solving are called higher order cognitive functions; what is the reason why they are called higher order cognitive functions. One reason is because these processes help us in making choices, in making decisions or in actually evaluating those mental representations or those information which has been stored by the primary cognitive processes.

So, basic primary cognitive processes like attention, perception, learning, thinking, memory, language all these cognitive processes actually taking information; raw information from the environment and does something onto it and store it into memory or store it into a some kind of a store as a mental representation.

Now, processes like problem solving, reasoning, decision making and thinking actually use this information which has been stored to make meaningful outputs out of the information which has been stored. And so, these meaningful outputs are then turned into a behavior because of these meaningful outputs a behavior is generated. So, basically the idea that we saw in the first class itself, the idea how of cognitive thinking or cognitive psychology really works is basically to take an information from the environment, to use some kind of cognitive operators onto it and arrive at a particular conclusion arrive at a particular decision and from this decision deciding a behavior.

Now, as psychologists believe that there is something called stimulus, there is something called response and there is one to one matching on stimulus and response and nothing exists between the stimulus and the response. The cognitivist's believe that there is

something called the organism or the O which they call in their paradigm. This organism has a mind which basically is involved into producing the output or making decisions based on incoming information which then decides the response.

So, basically stimulus response a response to a particular stimulus is not a association which is formed through trial and error, it is a well thought process. And so, this well thinking or the idea of how well thought process really works is the culmination of that thing is reasoning, judgment and decision making.

So, what is basically reasoning, judgment and decision making? So, we will take decision making into the next section; in this section we will just discuss about reasoning and judgment. So, what is basically reasoning and what is judgment? Now if I say that barking dogs seldom bite and then I say that Tony is a dog and if I conclude from this that Tony is going to bite is not going to bite because barking dogs seldom bite is what the premises, this is what reasoning is all about.

So, reasoning is about making inferences from some information which is given to you or making conclusions out of or concluding from some inferences. Judgment is a process which is happens after reasoning and in which we either we make some use some kind of a top down model to judge whether the conclusion that we arrived at is worthy of choosing or not.

And then the third process of decision making comes along which basically goes ahead and says that among the possible outcomes which are available to us through judgment. Judgment basically what it is what it does is judgment actually gives us a number of outcomes from a number of experiments or a number of information that has been gathered.

So, any information which has been processed to the basic cognitive processes; it leads to some kind of conclusions. And so, this conclusion accumulating this conclusion or deciding which conclusions are of use or not is judgment. Decision making is the is the process where we look at these number of conclusions and make the choice; final choice of which judgment to go with or which judgment not to go. So, as I said we look into reasoning and decision the judgment in this chapter and or in this lecture and in the forthcoming lecture or upcoming lecture we will venture into decision making. Now

most books will talk about reasoning, judgment and decision making a single chapter, but I have done I what I have done is I have split it into two parts.

So, let us then venture into the idea of reasoning and judgment and basically understand what is reasoning and what is judgment? So, the process of complex thinking as I said the process the higher order cognitive processes, it involves three processes of reasoning, judgment and decision making. So, here goes the definition: Reasoning involves evaluation of a conclusion based on solely given information. Given the fact that certain kind of information is given to you; given the given the fact that the primary basic cognitive processes provide you with some kind of mental representations which represent certain kind of information.

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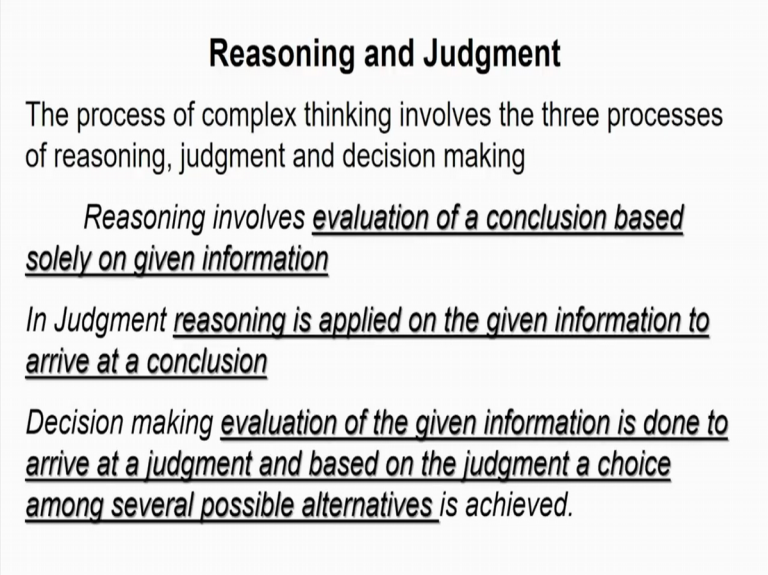

Making an evaluation of conclusion or drawing some conclusion from it and evaluating that conclusion whether it is valid or not, whether it is true or not is what is reasoning. So, reasoning is a process where we go ahead and do the evaluation of the conclusion in terms of its validity and in terms of its true.

Validity for statement is whether the statement follows from whatever premises have been given; now premises is a statements which are given before a conclusion. So, generally in how reasoning is looked at is there are a couple of premises given to you to start with. And then these premises are known to be are tested to be valid or not and the job of a reasoner is to look at these premises and then basically go ahead and conclude

whether the conclusion which follows after the premise is either valid or not and also look at the truth conditions whether it is truth or not.

So, that does the job of a reasoner and so, that is what reasoning is all about it is about evaluation of a conclusion. And how this evaluation is done? Is based on solely on the fact that certain given information is given is provided to and these given information's are what I call the premises.

So, we never actually go ahead and judge the truth of the premises. So, given the fact that given information is given to you certain information is provided to you, we never go ahead and judge the truth of these statements of these information. And these information the given information is called the premises; we only go ahead and test whether the conclusions is logical in sense or whether the conclusion which follows after a premise is logical in a particular sense or not and this logical being logical is what is called validity. So, validity is basically if the conclusion logically follows from the two premises or the two premises leads to a logical conclusion which we are seeing as a conclusion.

So, I will elaborate that as we move into the lecture. The second part of this chapter; we will look into something called judgment. So, what is judgment? Its reasoning is applied to a given information to arrive at a conclusion. And so, here what we do is; whatever reasoning we use from the reasoning whatever evaluation we do; those reasoning's are then applied to come up at certain conclusions and that is what is judgment.

So, given the fact that certain information is there and from that certain information we arrive at a conclusion or number of conclusions this process is called judgment. So, using the reasoning to arrive at conclusions is basically called judgment. And then what is decision making? Is the evaluation of a given information is done to arrive at a judgment and based on the judgment a choice among several possibilities is done; this is what is decision making.

So, reasoning leads you to validate or basically arrive at a conclusion, judgment goes ahead and look at this and use this reasoning to arrive at to give information about conclusions or to arrive at different conclusions. And these conclusions are then provided to the decision making operator in the brain or decision making cognitive process in the brain, which then looks at the number of conclusions which are there and based on the

need of the hour, based on the kind of requirement that is available that point of time chooses the most optimal decision.

So, there are several choices, there are several conclusions given to us, decision making is a process of making a choice. And this choice is done in based on terms of cost benefit analysis. There is several ways of looking into it when we run into the process of decision making; I will explain it to you there. So, basically decision making is making the choice right; so, these are the three process which is there. Let us then go ahead and describe these processes one by one.

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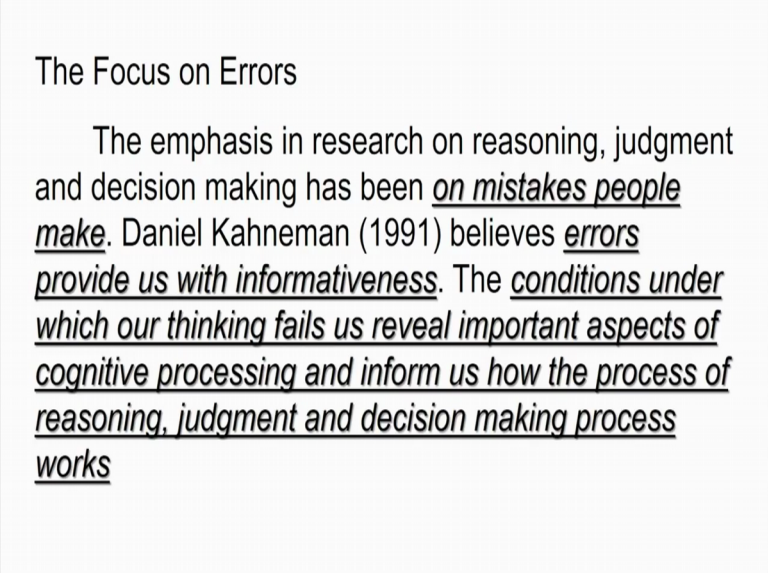

So, the first thing that we should be looking forward is how does this whole process of reasoning judgment and decision making really go about? And Daniel Kahneman and Amos Tversky some of the famous researchers in this area, they basically say that people should be focusing on errors and because why they should be focusing on errors? Because the focus of an error will provide you into the fact of how your reasoning, how is your reasoning going on and how is your judgment and decision process going on.

So, basically if you want to study reasoning and judgment; we should be not looking at judgments which are correct, we should be looking at errors in judgment and decision making. Because these errors in judgments and decision making will be giving you more information as to what should be done or what is wrong with a particular judgment process or what is the most optimal way of reasoning and judgment.

So, the emphasis in research and reasoning and judgment decision making has been on mistakes that people made. And Daniel Kahneman; Nobel Prize winner of Economics in 2004 or 2002 or 4; I am not very sure about that but he says he believes that errors provide us with informativeness. Now what does it really mean? When we look at when how a person does job correctly, it does not give you much of an answer because he does the job correctly and so, that is it.

What should be; what should one be focusing on is how an error is done or what should be one be focusing on is what kind of error exists in completing a job. Because this focus on error will tell you what not to do and so in any job or in any kind of decision system it is better to find out what not to do than to find out what to do. Because what to do is what is required, but then for arriving at what to do, we have to look at the hindrances and then look at the ways of getting around with hindrances. And so, that is what Daniel Kahneman says; he says that focusing on errors give us more information.

Now, the conditions under which our thinking fails us reveal important aspects of cognitive processing and inform us how the process of reasoning judgment in decision making process really works. So, basically that is what he conclude; he says that by looking at errors in either judgment reasoning and decision making, we actually come to know a lot about what is the way to particular reasoning or what is the process of a particular reasoning or a particular decision. And so, that provides us with what not to do or how to process because these errors will also tell us how the system look like.

Now, think about a think about a field in which a lot of people are playing football. Now there is one way to one of them use the correct method of a goal and goes ahead and scores a goal. Now if you only concentrate on that of how he scored the goals or how he is code a particular goal, will only be knowing that how a goal is scored but if we look at all the errors that he did while scoring the goal; we will come to know what not to do in a match and how to win matches.

Because this kind of problems or this kind of errors into a why a judgment or decision making does not succeed; will tell you more about the system of what are the hindrances which are out there. Because if you if you never face a hindrance you will only know one part to a goal but facing hindrances facing difficulty and it happens with life also; if you face difficulties in life these difficulties actually tell you what life is all about.

So, when I tend to take tell you that I have a lot of life experience what it really means that I have seen a lot of negatives in life. I had I have not always been successful and being unsuccessful is a good thing because the more you being unsuccessful, the more you learn. Because doing the correct thing does not give you opportunity to learn, learning does not happen because then you always reach the goal and so, there is no learning in it. And so, that is what our Nobel Prize winner Daniel Kahneman talks about.

So, how exactly do we know that a given chain of reasoning judgment in decision making is in error? What is the process in which tells you well whether a particular process of reasoning judgment and decision making is erroneous?

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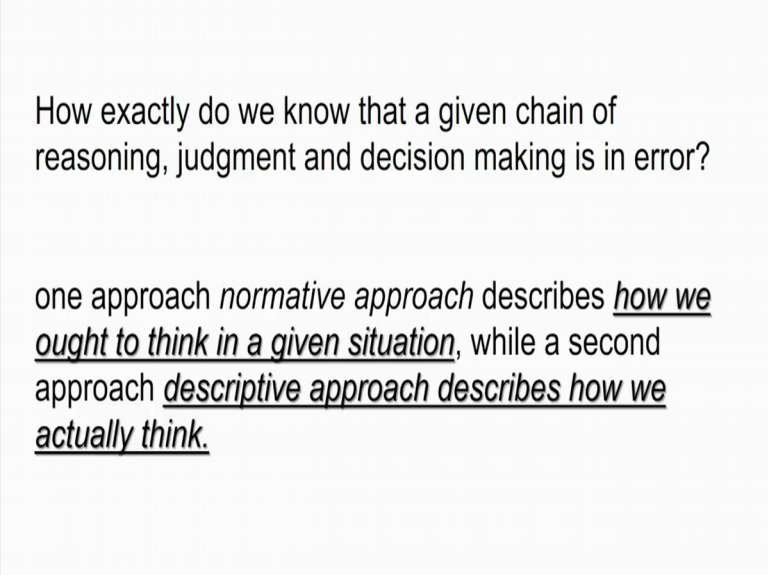

Now, there are several approaches to it, but what Kahneman and Tversky actually propose is there had two ways of particular thinking. One approach is called the normative approach and which describes how we ought to think in a given situation; so, these are the rules right. So, normative approach are the norms which are settling by society; it says that this is what we tend to do. So, normative approaches are those approaches which are what people should be actually doing. While the second approach is called the descriptive approach describes how we actually think and descriptive approaches is what people actually do.

So, normative approach and descriptive approach the difference between them is; normative approach are rules, are ideal conditions of what should be done in a particular

situation. And descriptive approach is actually the thing or actually the process which is applied to reach at a conclusion. Because nobody is ideal or no system is ideal and so, descriptive approaches are the optimal solutions which lead you to the final result; whereas, descriptive approach is whereas, the normative approach is the ideal process or the ideal condition of doing a particular task.

Now, let us look at a problem. So, given the fact that there is a family and so this family has had the chance of child rearing. And so, for the past 4 or 5 pregnancies; a woman has let us say 6 boys right, then comes a boy along which is the then comes a 7th child. Now what do you think? If I ask you the question what do you think? So, the condition is that I have a family or I have a woman who has produced off springs 6 boys in number and then she is also ready she is now ready for a 7th offspring, so what is the chances or what is it that the probability that or rather what do you think will be the 7th child?

And so, what happens is the normative approach says that whether it is a girl or a boy is independent of the probability of what happened before. And so, in terms of normative approach each case or each boy or girl being born; it has a probability of 50 percent; half the chance of being born. And so the 7th; in fact, the 7th child in the case of the 7th child also the probability of a girl or a boy is 50-50.

Whereas the descriptive approach will say that since 6 boys have already been born; the chances are these there is something novelty would happen and so, there are higher chances of a girl. Now the thing is this higher chances of a girl it does it is not supported by the theory of probability because each event of childbearing is independent of each other and there is no relation to it.

And so, the 7 should also be independent to each other, but people misjudge this kind of a fact and they say that or they conclude that where the 7th child will be more of a girl. Simply because of the reason that 6 children which have been born before were boys and so, this is the difference between what a normative approach and descriptive approaches.

Normative approaches what norms are and so norms of probability say that the chances of girl or boy is still 50 percent in the 7th child, but descriptive approaches how people actually think and so, people misconstrued this. So, they say that or they believe that the chance of a girl increases because 6 boys have already been born in a row and so, this is the difference of what a normative and descriptive approaches.

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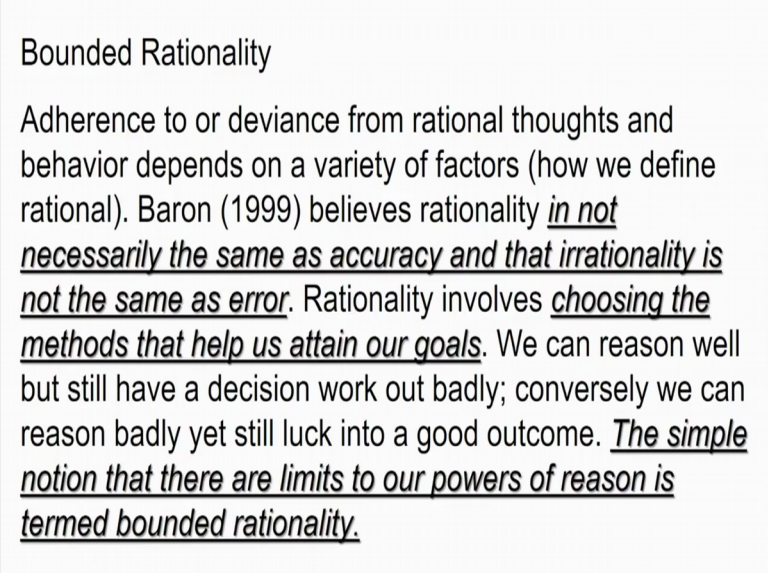

Further to it, there is a concept of bounded rationality and so, what does it say? So, Baron 1999 believes that rationality is not necessarily the same thing as accuracy and that irrationality is not the same thing as error. When I say a judgment or when I say a particular reasoning is rational what do I mean by that? What is rationality? How do we describe rationality?

And so, what Baron says is being rational is not same as being accurate. So, if you do a job nicely, if you do a job correctly; it may not always be rational, you may not always be rational in doing it. Similarly if you create errors or if you get into errors by doing a particular job; if the way of thinking that you employed may not be irrational in nature. And so, this rationality and irrationality is basically independent of the accuracy of performing a job. Now rationality involves choosing the method that helps us attain our goals.

So, basically then rationality says that use those methods whether it on the on the effectiveness of it. So, those methods which produce results I am using those methods to attain goals is what rationality is. Rationality it does not talk about whether accuracy is affected by it or not and so, that is that is what is the difference between it. So, we can reason well, but still have a decision which will work which may not work out.

And so, given the fact that we use best of a reasoning and still the conclusion may not work in our favor or the job output or the situation output may not work in our favor and

sometimes you reason badly and still the conclusion is in our favor. And so, there is no way to actually to suggest what is rational and how this is related to the accuracy or doing a particular job.

Now, the simple notion that there are limits to our power of reason is what is called bounded rationality. And so, bonded rationality basically says that human beings since they are bounded by this structure, they are not calculators or they are not people or they are not physical calculators or calculators in terms of physical sciences, they are not computing machines and so, they have limits in terms of thinking and reasoning and so, they make errors and that is what the whole idea of bounded rationality.

It says that rationality; the idea of rationality of what is rational and what is irrational depends a lot about the thinking process, but who is making the decision? In terms of computer, a decision a particular decision may be rational or not, but in terms of humans that same decision when the computer has given may not be rational right. And so, this kind of rationality is of how we define rationality is what is called bounded rationality concept that people are bound by limitations on through the power of reasoning.

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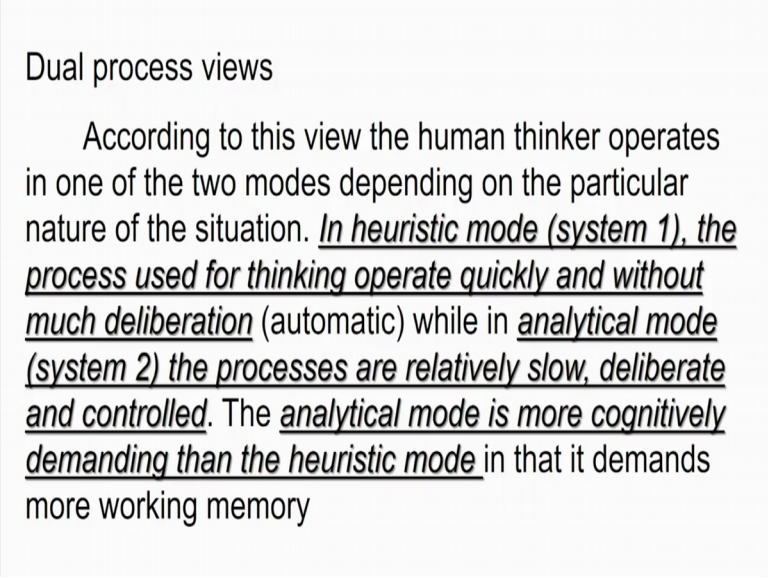

So, basically then how do people reason? And for answering that question; it was proposed that human beings actually go ahead and use two modes of reasoning. The first mode is called the heuristic mode which is called the system 1 mode and in this the process used for thinking operate quickly and without much deliberation. So, the first

way is quick reasoning process where a heurist is used, a mental shortcut is used. So, heurist remember from problem solving chapter heurist is basically a thumb rule, a rule of thumb, a shortcut of an algorithm; so, that is what a heurist. And so, in heuristic mode people use some kind of a shortcut, do not think too much and reason automatically.

In a position to that; there is an analog analytical mode of thinking which is called system 2 thinking and where the process are relatively slow deliberate in control. So, there is one kind of thinking; there is one kind of judgment and reasoning process which is automatic in nature, which is called system 1. And there is another kind of thinking for reasoning decision making process which is more deliberate.

And so, depending on what how much value the decision and reasons have to you either use the deliberate mode or the analytical mode; the heuristic mode or the analytical mode. The analytical mode is more cognitively demanding than the heuristic one and that is what since you have to do a number of alterations a number of calculations. So, analytical mode are more demanding more engaging and so, they require a lot of working memory too. So, that was what about thinking was that is a brief description of what thinking is.

Let us now jump into what is reasoning. So, what does it reasoning really mean? There are two types of reasoning; as I said reasoning is basically looking at conclusions or drawing conclusions from given pieces of information that is what reasoning is. So, basically then two type of reasoning exist one is called the deductive reasoning; the other is called the inductive reasoning. And we will start with our section or we will be sticking to deductive reasoning in this particular lecture.

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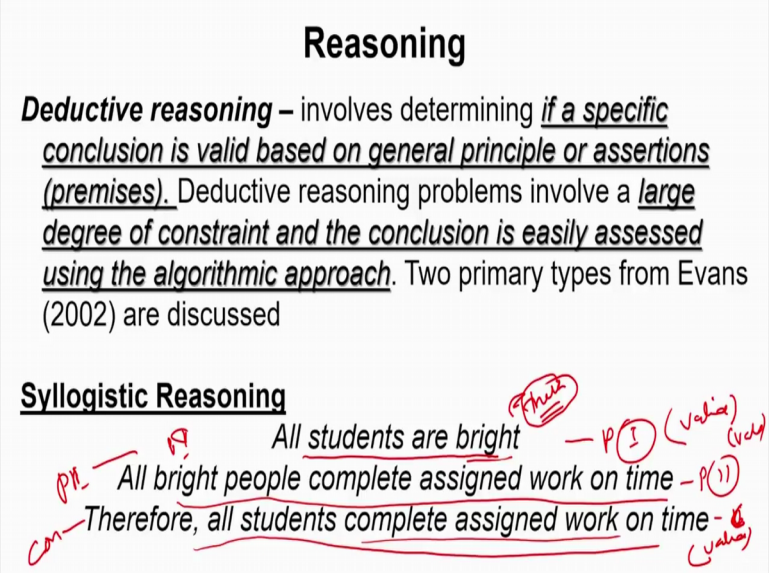

So, what is deductive reasoning? Deductive reasoning is very simple; it involves determining if a specific conclusion is valid based on general principle or assertions or premises. So, basically there are certain premises which have been given; now when I say valid a valid statement may not be true right.

And so, the thing that I was explaining at the beginning of the section in reasoning in deductive reasoning; it might happen that the premises that the values that have been given to you that; the previous knowledge that has been given to you they may be valid bit, but may not be true. And so, in deductive reasoning we do not think about the truth values of a statement; truth values is how are whether a statement is true or not. So, what we tend to do is we look at a number of conditions, we look at a number of premises which have been given to you, previous knowledge is given to you and from these previous knowledge we try to arrive at a conclusion and that is what deductive reasoning is all about.

So, deductive reasoning problems involve a large degree of constraint and the conclusion is easily assessed using algorithmic approach. So, in deductive reasoning what we do? Is we are bound by a lot of rules, a lot of constraints are there and then we use the algorithmic approach to arrive at a; at a result. And since you use the algorithmic approach always a result is out there. So, basically what deductive reasoning tend to do is look at previous knowledge's, focus on previous knowledge's; based on that arrive at a

conclusion and how do I arrive at a conclusion? By using an algorithmic approach and using certain kind of hindrances or certain rules which are out there.

Now, there are two primary types of deductive reasoning which are there and Evans in 2002 used two classification systems or deductive reasoning. The first is called the syllogistic reasoning; so, what is syllogistic reasoning? Look at the statements which have been given to you. So, it said there is all students are bright and then all bright people complete assignments on work therefore, these are the premises.

So, I have premise 1 and then I have premise 2 and then I have premise the conclusion C here. So, premise 1 I will say this is valid right and then I will say this is valid and then what I have to do is reason, whether the conclusion that I draw from these two valid conclusions for those two valid premises premise 2 and premise 1; whether this conclusion which I draw from it is valid or not. Now let me explain to you.

All students are bright. Now if I look at the truth condition, if I know the truth value of this it may not be true. So, because all students are not bright and we all know that right. So, the fact is that in deductive reasoning we never look at the truth conditions, we always look at the validity and so, all students are bright is a valid statement right. Similarly, all bright people complete assignment on work may not be true, but then it is valid.

And since both the conditions are valid we try to engage in this kind of a conclusion which says that all students complete assignment on work, how does it conclude? And what we want to check is whether this conclusion comes from these two statements. And so, in this case it does right and so, that is what is did a syllogistic reasoning.

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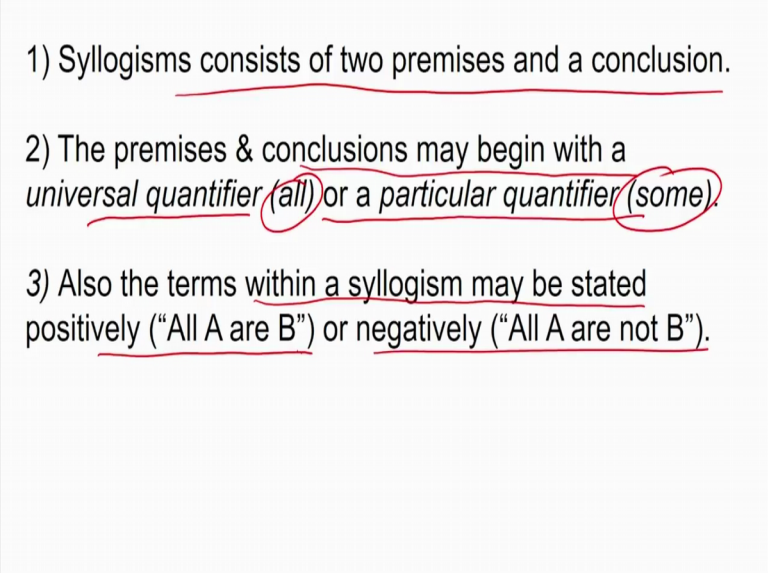

So, then let us dig this up and understand what a syllogistic reasoning. So, syllogisms generally consists of two premises and a conclusion; as I said more syllogistic reason examples will have two premises to start with premise 1 and 2 and these premises are then followed by a certain conclusion.

The promise and conclusions may begin with the universal quantifier all or particular quantifier some. As you saw in these statements it says all students, all students, all students or it could also say some students are bright, all students are bright. So, basically most of these reasoning examples they start up with these kind of quantifiers which are either some or all. Also the terms within a syllogism may be stated positively which is all A are B or negatively all A are not B.

So, the terms or the syllogism the statement itself could be both negative and positive; if it is positive it will be all As or Bs; if it is negative it will be all As are not Bs; it could also be some As are Bs, some As are not Bs and so on and so forth. So, depending on the quantifier and depending on the how the conditional syllogisms is or the environmental syllogisms is a particular syllogism statement may be stated in a positive or a negative reference frame.

So, syllogisms are either valid or not that is it the conclusions either does or does not hold given the premise and that is what we that I that I said. So, more syllogisms are tested on their validity; whether the conclusions followed from the statements we do not

test the truth conditions. So, I am repeating again we do not test the truth condition, but this is an error.

Most people try to test this in a truth condition and so, there are errors in making this kind of reasoning, this kind of syllogistic reasoning, deductive reasoning which are all syllogistic reasoning and that is one reason for error which may appear on which may appear to us. And so, that is that error has happened because we were testing the truth condition.

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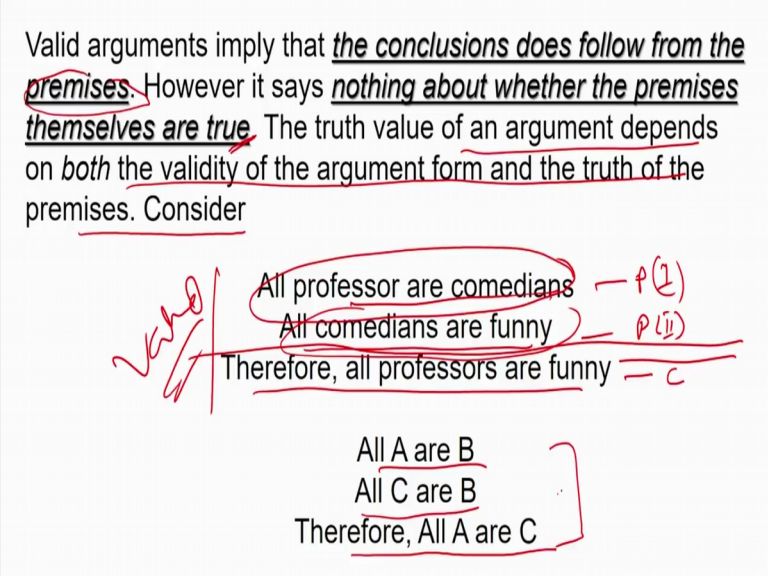

So, valid arguments then imply that the conclusion does not followed from thus follow from the premises. And so, any valid conclusion are basically says that these conclusions are following from the premises; however, it says that nothing about whether the premises are true or not and that is what we have been discussing before that truth it may not be a part of it that the truth value of an argument depends on both the validity of the argument form and the truth of the premises right. So, a condition; a particular syllogistic reasoning may be valid, but may not be truth.

For example look at this all professors are comedians, all comedians are funny. So, I have premise 1 here and then I have premise 2 here; so, premise 1 says that all professors are comedians and similarly all comedians are funny is premise number 2 and therefore, I make the conclusion we generates out if it and so, what is the conclusion that all professors are funny. Now looking at it this is a valid reasoning, but in terms of truth

conditions most professors are not comedians, neither the fact that comedians are all comedians are funny and so, in terms of truth conditions it will fail, but in terms of validity this statement will pass. Similarly all As are Bs, all Cs are Bs; therefore, all As are Cs.

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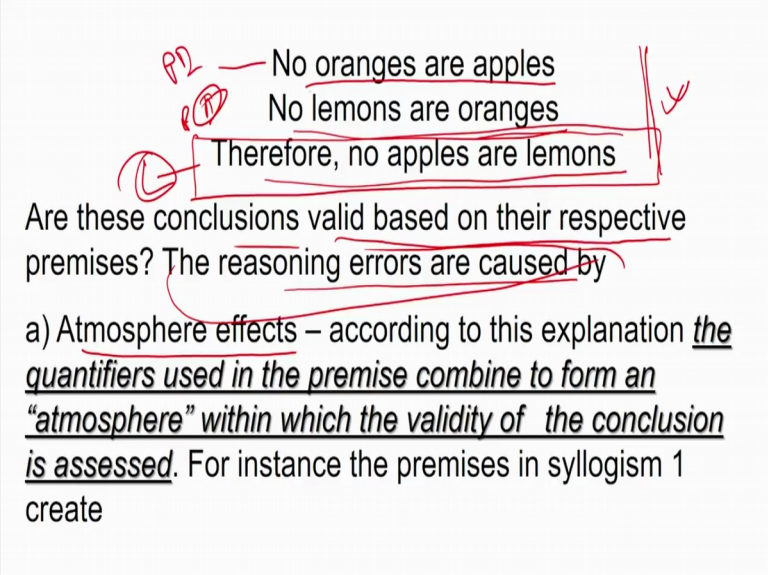

Similarly that kind of a problem may exist for this kind of a reasoning or this kind of reasoning no oranges are apple no lemons or oranges, therefore, no apples are lemons. So, what do you think is this, whether it is valid or not, whether this conclusion is drawn from it or from the premise. So, I have premise 1 and I have premise 2; so, what you need to tell me is whether this conclusion is can be drawn from the particular premises or not?

So, are these conclusions valid based on the respective premises? Then if not then; if you are not able to answer this correctly then it there are certain errors which are making you draw in correct conclusions. And so, what are the reasons or what are those factors which are making you draw incorrect conclusions? One of the first factors is called atmospheric effects. So, what are the atmospheric effects? Atmospheric effects says that the quantifier used in the premise combine to form a atmosphere within which the validity of the conclusion is assessed.

Now, as we looked into it a premise has a quantifier, it starts with a quantifier, the quantifier could be all or some and so, given the fact and we also looked at the

environment right. So, whether a quantifier is positively stated or negatively stated and so, what it says here is that certain quantifiers may have certain kind of positive instance or negative instance. And this positive instances or this positive effect of the quantifiers leads to people over judging or misjudging the conclusion to be falling in line with the environment of the premise.

Let us say if a premise is positively stated, premise 2 is positively stated. So, people are more likely to validate those conclusions which are positively stated, then to validate those statements which are negatively stated. And so, this is the one of the reasons for the kind of error that can happen in syllogistic reasoning. A positive universal atmosphere is produced by a positive instance and this produces in an erroneous tendency to claim that universals universal and positive conclusions are valid that is what we looked at.

So, basically if two premises are stated in a positive way and that leads us to follow that the chances are very high that people will go ahead and validate a conclusion; which is framed in a positive instance, in a positive atmosphere than in a negative atmosphere and so, this negative atmospheres or this kind of errors can exist. The second kind of error which can exist in terms of reasoning in syllogistic reasoning is that belief bias.

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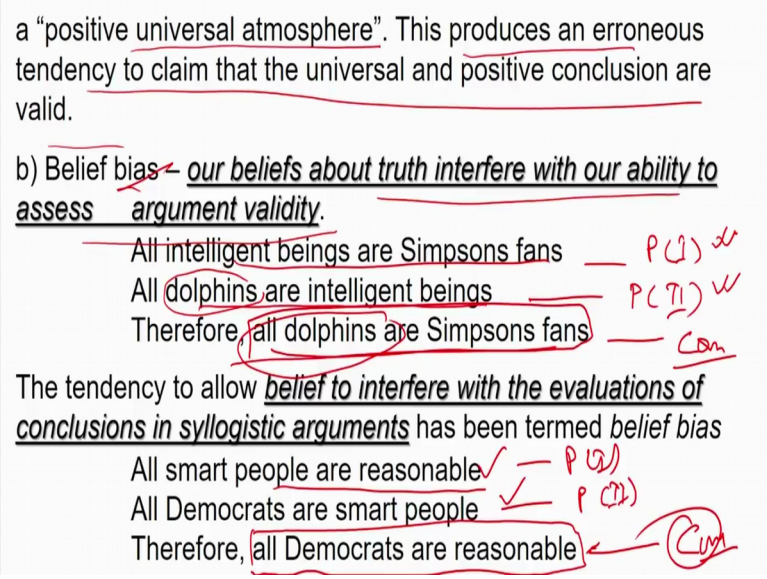

So, what is the belief bias? A believes about truth interfere with the ability to assess the argument for validity and that is what I have been telling you. So, our belief system tells

us that professors are not comedians and so, there itself you make an error. What we need to do in syllogistic reasoning is look at validity and not the truth conditions.

But most people get stuck with the truth condition of it and then decide that professors are not funny and so, this statement cannot be valid. And so, this cannot be true and if it is not true the conclusions can never be true and so, that is the problem which is out there and so, this kind of error is called the belief bias.

For example look at these statements; so, all intelligence beings are Simpsons fans, all dolphins are intelligent beings therefore, so, this is premise 1; positively stated, this is premise 2 positively stated and this is my conclusion which is again positively stated. But the moment you give this conclusion to people; they will say that this is not valid why? For statement 1, they look at the validity, for statement 2, they look at the validity, but as soon as they look at this dolphins are intelligent beings it is valid and it is true too but when they conclude dolphins are Simpsons fans, they use their knowledge of truth condition.

They believe that dolphins do not get a chance to look at Simpsons and so, there is no way a dolphins is actually going to be a Simpsons fan and so, that leads them to say that this is invalid whereas, this is a perfectly valid statement because this statement here somehow interferes with peoples belief systems. Now, the tendency to allow believes to interfere with the evaluation of conclusion in syllogistic the arguments has been termed as belief bias.

So, this kind of problem that arise is called the belief bias for example, look at these statements; all smart people are reasonable. Now premise 1 positively stated; all democrats are smart people positively stated, this is the conclusion. And so, we are looking at statement 1 and 2; we look at the validity of the statement, but when looking at all democrats are reasonable and so, given the fact that you are not a democrat. you will never believe it and so, you the interfere your belief interferes with the idea or shakes or basically goes ahead and monitors this statement, this conclusion in terms of what you believe in what you do not.

And based on that it evaluates this statement not on terms of validity, but it the terms are truth and so, it says it is not true which is wrong.

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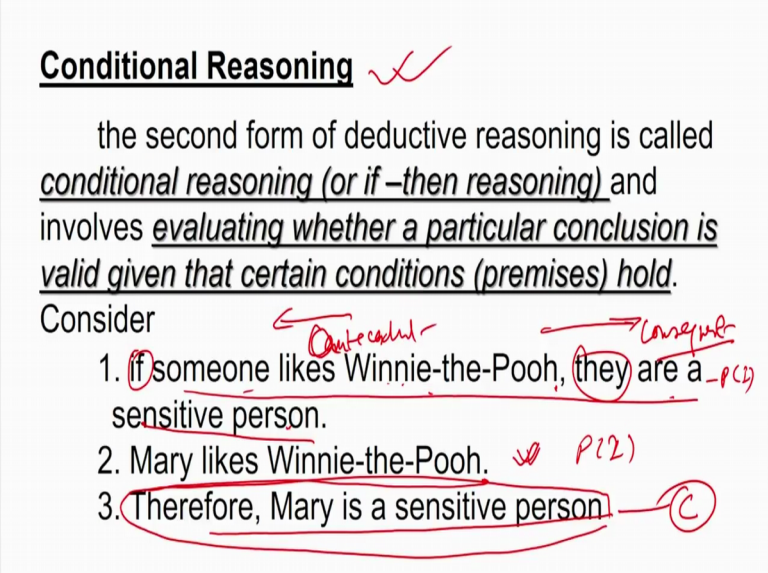

This is the first kind of reasoning out there. The second kind of deductive reasoning which is available to us or which has been shown by events or in 2002 is something called conditional reasoning. So, what is conditional reasoning? In the second form of deductive reasoning called conditional reasoning it is called the if and then reasoning; this kind of reasoning is called if and then reasoning. And involves evaluating whether a particular conclusion is valid given a certain condition or premises hold.

Basically it you have a statement to start with which has an antecedent and which has a consequent and following that as a another premise. So, you have a scenario where you have even then statement and again it is about validity and truth conditions. And from there you are given a premise and you have to look at the premise, look at the statement which has been given to you which is in the if then format if antecedent and consequent and then you have to conclude whether the premise which follows after the if then statement, whether it leads to the right conclusion or a valid conclusion.

For example let us look at this; if someone likes Winnie-the-Pooh, they are sensitive person. So, this part of the statement is called the antecedent and this part is called the consequent; antecedent because it starts before consequent is this. So, this is someone likes Winnie-the-Pooh is the antecedent it is the first statement right and then because of that they are sensitive person is the consequence.

So, someone likes Winnie-the-Pooh makes them a sensitive person this is what the statement is. So, if this then this right and then there is a second statement; there is a second premise which says that Mary likes Winnie-the-Pooh. Now given the fact that this is premise 1, this is premise 2 whether this conclusion is valid or not? So, therefore, Mary is a sensitive person what do you think?

And so, what you would realize is that this is true this kind of conclusion is true because someone liking Winnie-the-Pooh, they are sensitive person and Mary likes Winnie-the-Pooh. So, she has to be sensitive because most people who like Winnie-the-Pooh a sensitive person and so, this kind of reasoning is called conditional reasoning.

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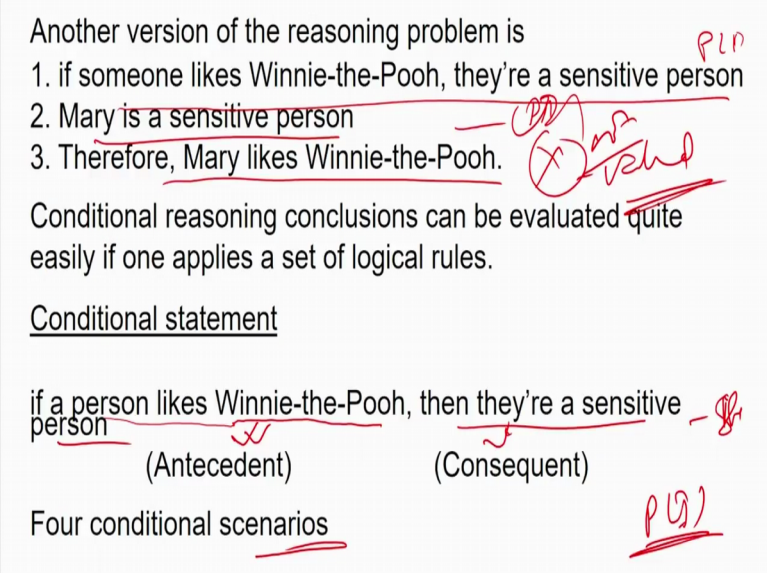

Now, another version of the reasoning problem is; if someone likes Winnie-the-Pooh, they are sensitive person; Mary is a sensitive person. Now in the first case I have affirmed the antecedent which means that I have validated or I have my premises validated the antecedent.

In the second statement, I am validating the consequent, I am validating the reason then part of the statement; the consequent part of the statement. And then it follows therefore, Mary likes Winnie-the-Pooh; what do you think? Whether this conclusion is drawn from or is a correct conclusion. And so, what you will come to know is that this is not the correct conclusion.

So, this is my premise 1 this is my premise 2 this is not valid; so, not valid right conditional reasoning conclusions can be evaluated quite easily even applies a set of logical rules. So, how do we go ahead and then know which statements is correct and which statements and not; how to go ahead and look at particular conditional statement or find out which conditional statements are valid or not.

So, most conditional statements; so, if let us take this conditional statement if someone likes Winnie-the-Pooh which is the antecedent; then they are a sensitive person which is the consequent four scenarios can develop out of it right. The from this four scenarios from any other this is the first statement which is there and then any premised that I draw from it a second premise can go any of the way.

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	Affirm	Deny
Antecedent	Mary like Winnie-the-Pooh Therefore, Mary is a sensitive person (*Modus Ponens*)	Mary does not like Winnie-the Pooh Therefore, Mary is not a sensitive person
Consequent	Mary is a sensitive person. Therefore, Mary likes Winnie-the-Pooh	Mary is not a sensitive person. Therefore, Mary does not like Winnie-the-Pooh (*Modus Tollens*)

What do I mean by this? I can have the premise then stated in two different; my second premise what does Mary do? Or if somebody likes Winnie-the-Pooh and so, he should be a sensitive person is the statement and then Mary is either sensitive person or likes Winnie-the-Pooh both of these conclusions most of these can be put into four scenarios.

The first is affirming the antecedent, affirming the consequent and I can go denying the antecedent and denying the consequent. So, four truth basically this is in terms of tautology in terms of a truth table; so, since this is not a logic class I am not bringing in that logic but this is these are the four scenarios or four conclusions which can be drawn from it.

So, given the fact that if I have a statement like this; this statement leads to four different scenarios out of that; Mary likes Winnie-the-Pooh therefore, Mary is sensitive person right and so, this is correct, this is valid; why it is and in terms of logic though this is called the Modus Ponens and what is this? Basically affirming the incident antecedent is always giving valid statement. So, if I if I have a if then reasoning and in that if then reasoning; my premise validates the antecedent or affirms the antecedent, it will always be true.

Let us look at that statement in which my premise affirms the consequent; Mary is a sensitive person therefore, Mary likes Winnie-the-Pooh and so, this conclusion is not valid. Because all sensitive persons do not like Winnie-the-Pooh; it is the other way around. If somebody likes Winnie-the-Pooh only then they are sensitive persons, but then there will be 100s of people who are sensitive and may not like Winnie-the-Pooh and that is why it is not valid.

And so, a firming the consequent is never valid and so, these are mental shortcuts that we need to use or that we need to basically apply to these kinds of reasoning to come up with certain conclusions. The third is denying the antecedent; Mary does not like Winnie-the-Pooh therefore, Mary is not a sensitive person.

Again this is not valid because denying the antecedent does not really mean. So, if somebody does not like Winnie-the-Pooh; it necessary does not mean that they are not sensitive. Because all sensitive people do not like Winnie-the-Pooh; it is the other way around most people who like Winnie-the-Pooh are sensitive, but it does not say anything about whether how sensitive people believe or the fact that whether all sensitive people like Winnie-the-Pooh.

So, that kind of statement conclusions cannot be drawn and so, denying the consequent is always a not valid thing, but then denying the consequent always leads to a valid conclusion. And so, if Mary is not a sensitive person and of course, she is or he this person Mary is not going to like Winnie-the-Pooh because people who like the Winnie-the-Pooh are always sensitive. And so, somebody does not like Winnie-the-Pooh; so, they are not too sensitive and so, this is called the Modus Tollens and therefore, Mary does not like Winnie-the-Pooh.

So, two conditions affirming the antecedent or denying the consequent in a; if then reasoning in a conditional reasoning will always lead to those conclusions to valid conclusions, anything other than that will lead to invalid conclusions in conditional reasoning.

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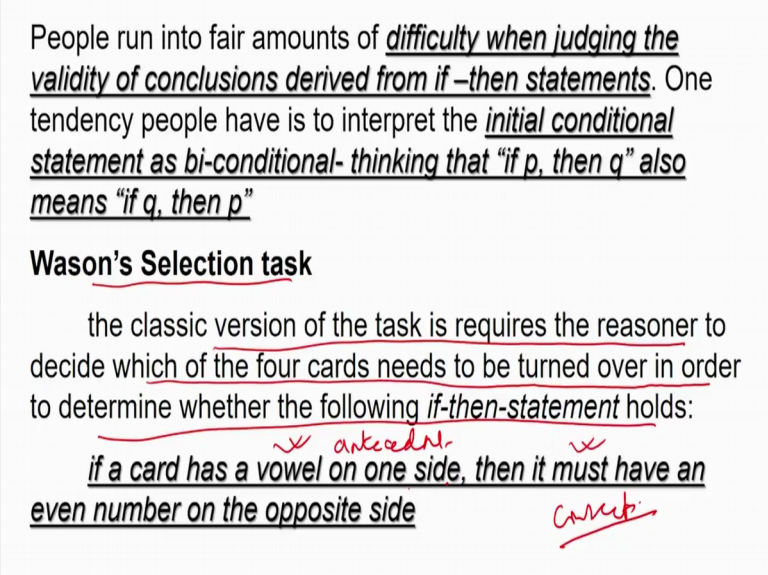

So, people run into a lot of problem of difficulty when judging the validity of conclusions derived from if then statements.

Now, one tendency that people run into is called bi conditional which basically means that if p then q is wrongly interpreted by people as if q then p. So, if Winnie likes somebody likes Winnie-the-Pooh they are sensitive person; if p then q people also judge a backward conditioning or a backward linkage to it which basically means that all sensitive persons like Winnie-the-Pooh, where as this that my statement does not at all say that people who are sensitive like Winnie-the-Pooh; it is a forward direction of statement it says that; if p then q it never says that if q then p. And so, when people would tend to do make errors is because they go ahead and judge it in a backward sense saying that if q then p.

Now, to test how people to about or get caught into this kind of structure; Wason design a selection task and so, what I did was the classic question of the task requires the reasoner to decide which of the four cards need to be turned over in order to determine the following if then statement. And so, what is the statement? If a card has a vowel on one

side; so, if then statement this is the antecedent and this is the consequent. If a card has a vowel on one side then it must have a even number on the opposite side. So, this is the statement I need to test; if a card has a vowel on one side then it must have an even number on the opposite side.

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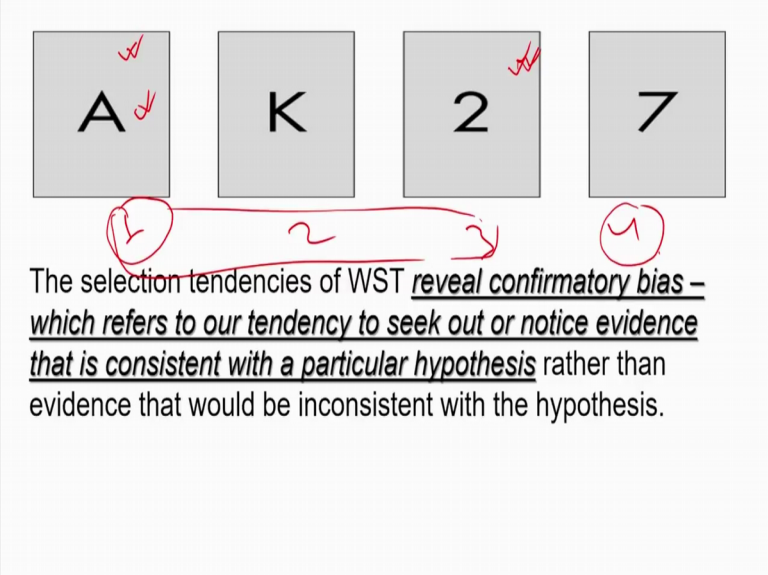

And so, these are the four cards which are there 1, 2, 3, 4. Now, my question to you is which of these statements, which of these cards two cards do I need to flip over and check for finding out whether this statements holds or not. And the statement is if a card has a vowel on one side, then it must have a even number on the opposite side.

If I want to check this rule what should I do? What should most people do or what will you do to test this? So, the error here appears is that most people tend to flip the A card and the 2 card and this is where the problem is. Remember what I said? You have to either affirm the antecedent or denying the consequent.

And so, if you want to come with this, if you want to come up with this solution you have to turn card number 1 which is affirming the antecedent or card number 4 which is denying the consequent; the consequent is an even number; so, deny that and denying that will move the card or turn the card which is an odd number and check whether it has a vowel on to it or not and so, this is the right solution, but as you will find out and as you would have done; you would have turned the even number card and the vowel card and so, that is the problem if p then q kind of a thing.

So, the selection tendency or WST Wason Selection Test is called revealed something called a confirmatory bias and people generally do this error because this is called the confirmatory bias which refers to a tendency to seek out or notice evidences that that is constraint with a particular hypothesis. And so, over testing this hypothesis we believe that if we let us check the vowel thing and the let us check the card with the vowel on to it and the even number on to it and this is what is called the confirmatory bias; rather than evidence that would be inconsistent.

So, we always look at two positives into it, two consistence in into it or to consistent statements into it and so, the consistent way a statement is since if then says a vowel and the even number we will go ahead and check the vowel and the event number. But what we should be doing is checking the vowel and checking an odd number denied and accepting the afferent; affirming the antecedent and denying the consequent.

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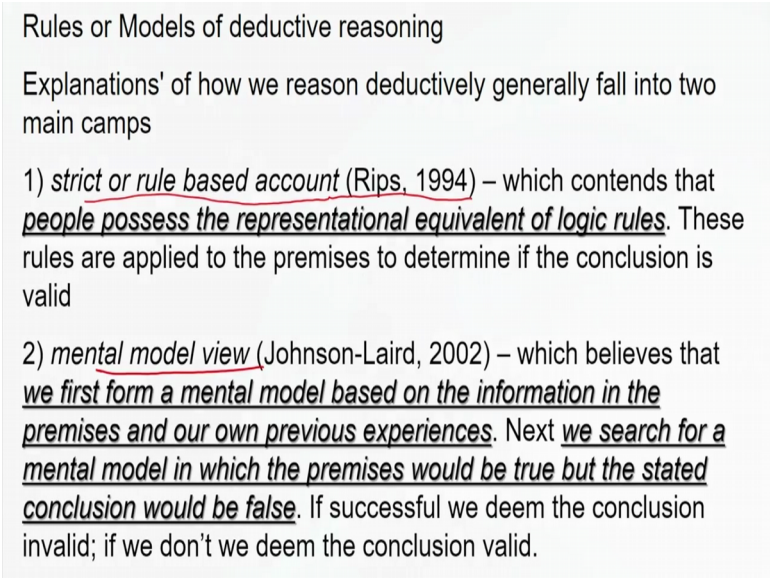

So, there are several rules or models of deductive reasoning; explanations of how we reason deductively generally fall into two different caps. One say is that there are strict or rule based accounts; now what does it say? It says that people possess certain representations equivalent of logical rules. So, people in their mind they have these certain logical rules or representations of logical rules in their head and that makes them think or that make them go ahead and perform on the reasoning task or come up with solutions on to the reasoning task. So, if a conclusion is valid; we use these logical rules.

There is another format or there is another way into look into it, there is another rule to it or another model which is out there which says how people go ahead and reason and that is called the mental model view by Johnson and Laird. And what does it say? It says that we first form mental model based on information that premises and our own previous experiences have. So, looking at the information which is given in the premise and looking at our own personal experiences we form mental models.

Next, we search for a mental model in which the premises would be true, but the stated conclusion would be false. So, what we do is once we make a model out of it from the information from the premises which is given in our past experiences, we then look at our memory for all those models which are available to us in which the premises is true, but the conclusion is false.

Now if successful if you find a model where the premises are true and the conclusion is false which is given in front of you; then we select that model otherwise we do not need to. So, what we tend to do is? We use a mental model approach; we look at the information which is given to use our past experiences, create mental model and then go ahead and validate or non validate a particular statement.

So, what we did in this class is we looked at what is thinking, what is the process of thinking, how does thinking really work? And all the details about the thinking process the nature of thinking process and why should we focusing on error for unto it? And after that we looked at a particular kind of reasoning which is called deductive reasoning.

So, we looked at what is deductive reasoning, what causes errors in deductive reasoning and specifically we looked at two types of deductive reasoning which is out there one is the syllogistic reasoning. So, we look at what is a syllogistic reasoning, how does it function, what are the chances of error into it and then we looked at something called conditional reasoning in which we looked at how does the conditional reasoning work and what are the solutions to conditional reasoning, what is the most valid way to come up with conclusions in conditional reasoning and the errors to it. And then to end it up we saw how or what models are used for reasoning or what are the different models which are available out there which people tend to use for reasoning to progress or for people to reason.

So, in the upcoming lecture we will discuss another format of reasoning which is out there which is called inductive reasoning. And in addition to that we will look at certain judgment procedures how does judgment really work? So, given the fact that we have reasoned how does judgment progress and bring up valid conclusions and from then on we look into the process of decision making which actually helps you choose among the various judgments which are out there.

Thank you.