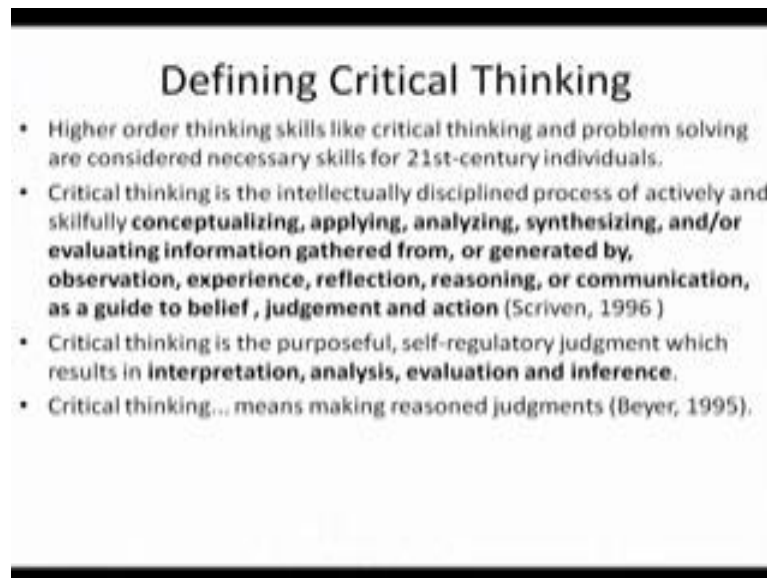


**Soft Skills Development**  
**Prof. D. Suar**  
**Department of Humanities and Social Sciences**  
**Indian Institute of Technology, Kharagpur**

**Lecture - 30**  
**Creativity, Critical Thinking and Problem Solving**

Friends in this session will be discussing about critical thinking and problems solving. Here will speak about what is critical thinking and problem solving and the process of critical thinking and a problem solving and how you can improve your critical thinking and problem solving.

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Coming to critical thinking, critical thinking and problem solving is considered necessary skills for 21st century individuals because in the everywhere you require in the professional life as well as in personal life we require critical thinking and problems solving skills.

Critical thinking is the intellectually, disciplined process of actively and skillfully conceptualizing, applying, analyzing, synthesizing and or evaluating information gathered from observation, experience, reflection, reasoning or communication, as a guide your belief judgment, decision and action. Critical thinking is the purposeful, self regulatory judgment which results in interpretation, analysis, evaluation and inference. Critical thinking means making reasoned judgments or reasoned decisions.

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In the book, *Critical Thinking*, Beyer (1995) elaborately explains what he sees as essential aspects of critical thinking. These are:

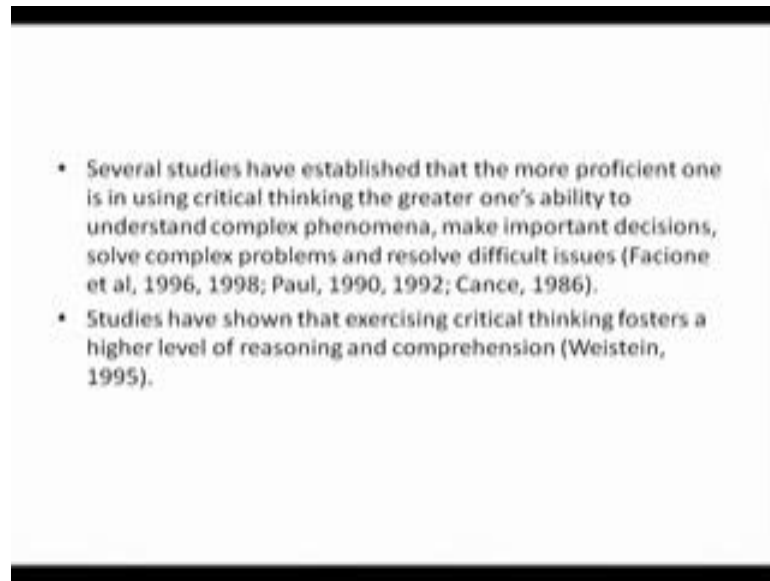
- Dispositions: Critical thinkers are sceptical, open-minded, value fair-mindedness, respect evidence and reasoning, respect clarity and precision, look at different points of view.
- Criteria: Apply criteria. Need to have conditions that must be met for something to be judged as believable.
- Argument: Is a statement or proposition with a supporting evidence. Critical thinking involves identifying, evaluating, and constructing arguments.
- Reasoning: The ability to infer a conclusion from one or multiple premises. To do so requires examining logical relationships among statements or data.
- Point of View: The way one views the world, which shapes one's construction of meaning. In a search for understanding, critical thinkers view phenomena from many different points of view.
- Procedures for Applying Criteria: Other types of thinking use a general procedure. Critical thinking makes use of many procedures. These procedures include asking questions, making judgments, and identifying assumptions. Compared to rote memory tasks, critical thinking takes time.



And in the book, you will find that there are different essential aspects of critical thinking. These are the personality dispositions, critical thinkers are skeptical. At the same time, they are open minded, value fair mindedness, respect evidence and reasoning, respect clarity and precision, and look at different points of view on the same problem. And they apply the criteria to critical thinking task. That means there must be some conditions that must be met for something to be judged as believable.

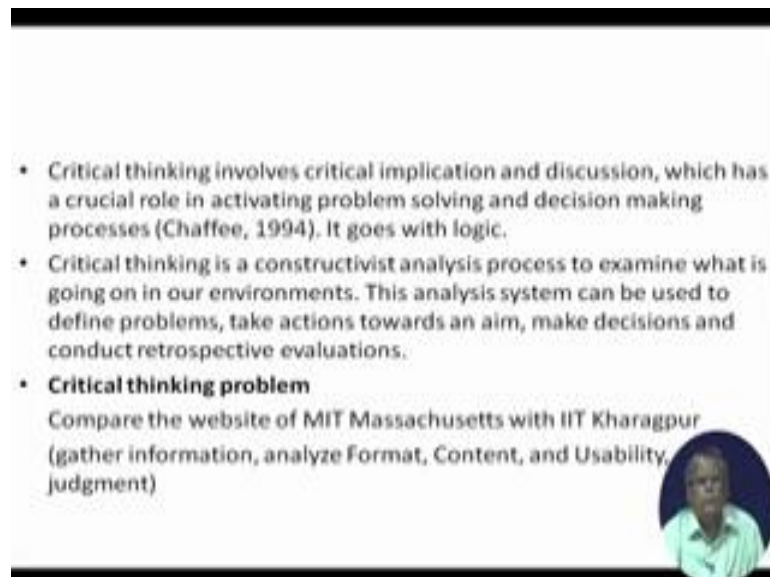
Arguments, it is a proposition or a statement with a supporting evidence and argument if the essential part for supplying reasoning to identify for identifying, evaluating and constructing judgments and also we apply the logical reasoning to examine the relationship among different statements or data and the critical thinker is the one who accepts the multiple points of view and he or she sees the problem, on different points of view and he procedures other type of thinking you the general procedure. Critical thinkers huge as many procedures, the procedures include asking questions, making judgments and identifying assumptions. Compared to rote memory if the question is asked it takes certain times, but when the question is asked from a critical think prospective it next time therefore, compared to rote memory tasks the critical thinking tasks time, takes more time.

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Several studies have established that more proficient is one is in using critical thinking; the greater is once ability to understand the complex phenomena. Make important decisions, solve complex problems and resolve difficult issues. Studies have shown that exercising critical thinking fosters a higher level of reasoning and comprehension.

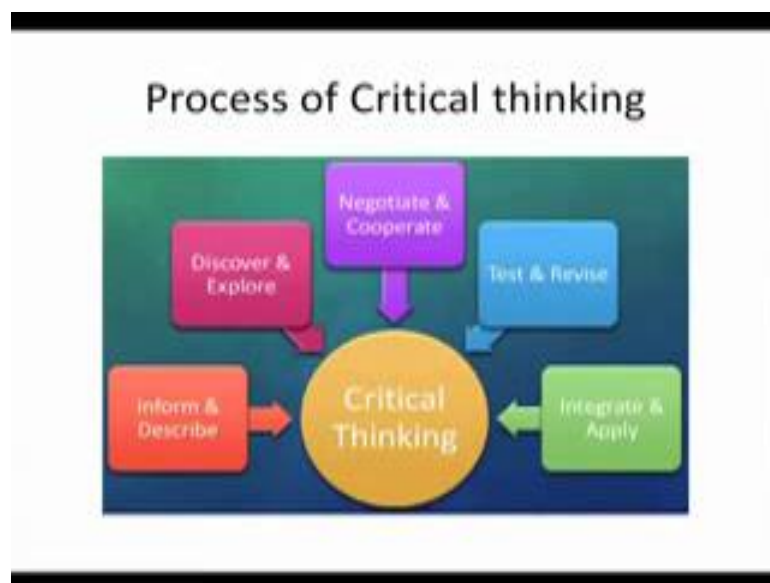
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Critical thinking involves critical implication, critical discussions. Looking into the both positive and negative sides of the problem and the individual who is the critical thinker, he constructs he does the analysis and construct the solutions and critical thinking can

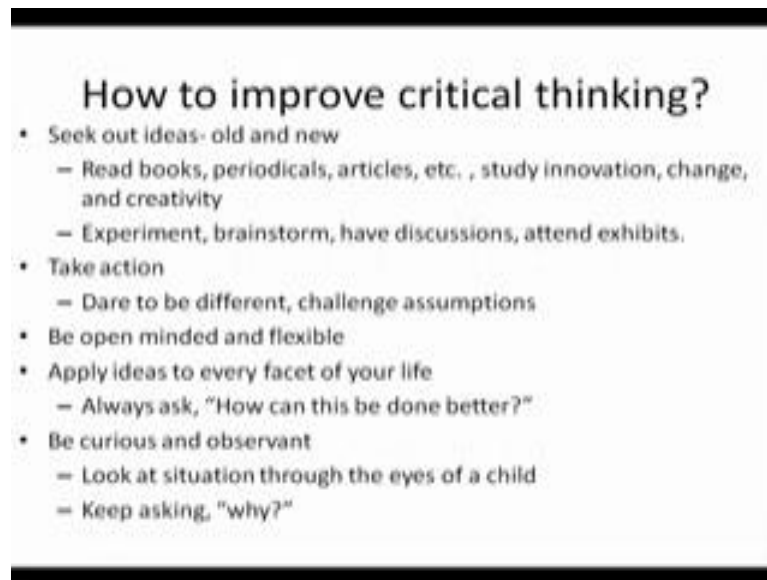
used to define a problem, take the actions towards an aim, make decisions and conduct retrospective evaluation. Suppose I give you a problem compare the website of MIT Massachusetts with IIT Kharagpur. So what will do your job first is to gather the information, then analyze the formation, on the basis of the format, content, usability. Then in the process of bench marking you can nationalized on which aspect which website is better or which website is lacking and then you can finally conclude by applying the logic and listening that the website of a particular insured is better than that of the other.

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And the process of critical thinking that it involves, who he informs first of all we collect the information and describe the particular issue. Discover and explore the different possibilities, negotiate and cooperate with different aspects of the issue, then we test and revise and finally integrate and apply what makes of the critical thinking on a particular issue. Then the question comes being a student how you can improve your critical thinking.

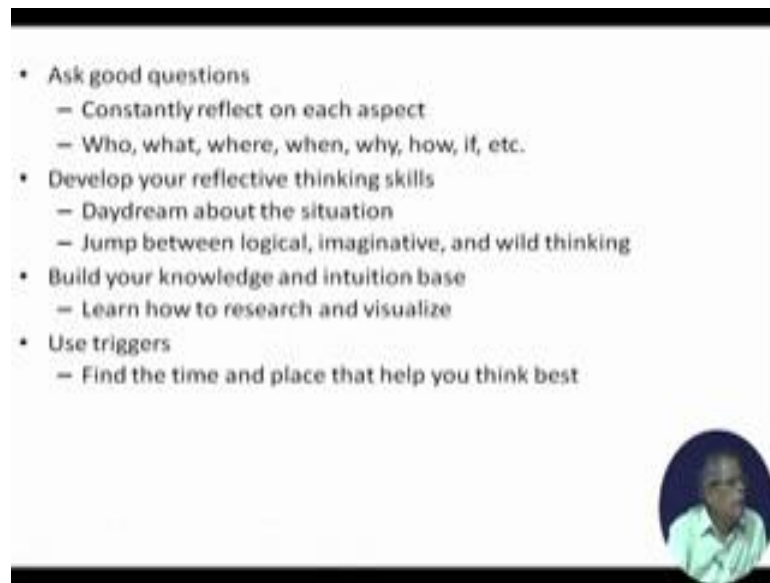
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First is that seek out ideas for that is old or new, get the ideas read books periodicals, articles, study, innovation, change, creativity and at the same time you brainstorm mixing with the others. What can be the possible solutions or what can be the possible decision or a judgment on that particular issue. Have discuss on with others, those were involved with issue because a person who experiences issue, he has more insight on that particular issue, compare to a person who does not experience that particular issue.

Similarly, take action. In critical thinking there to be different compared to others. Challenge the assumptions be different and at the same time be open minded and flexible. Applied ideas to every facet to of your life or of your problem always ask how this can be done better. Be curious and observant just like a child, keep on asking why? Look to the situation through the eyes of a child.

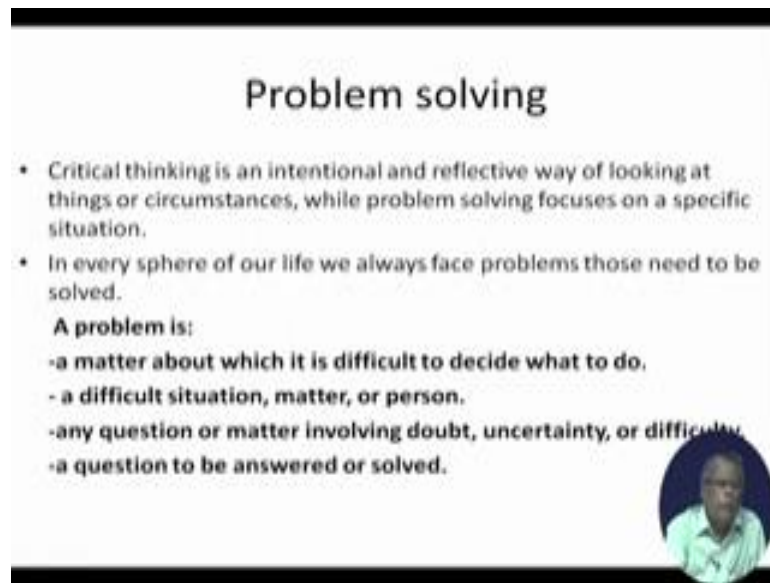
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- Ask good questions
  - Constantly reflect on each aspect
  - Who, what, where, when, why, how, if, etc.
- Develop your reflective thinking skills
  - Daydream about the situation
  - Jump between logical, imaginative, and wild thinking
- Build your knowledge and intuition base
  - Learn how to research and visualize
- Use triggers
  - Find the time and place that help you think best

Ask good questions constantly reflect on the issue, who is responsible for these issue, where is the issue is occurring, what is the issue, what are the silent features of the issue, like these are some of the helpers you take who, what, where, when, why, how, in how to analyze, in how to ask questions to understand the issue critically. Develop reflective thinking skills, daydream about the situations if this is the situation in the reality, what can be the possible solution and you jump between logic and imagination and wild thinking. 1 side, there is a left when logical thinking on the other side there is imaginative wild thinking of the right view to jump between the two and build your knowledge and intuition base. Learn more how to research and visualize and find the time and place, where you can think best. There by you can find out a regulation for the solutions.

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## Problem solving

- Critical thinking is an intentional and reflective way of looking at things or circumstances, while problem solving focuses on a specific situation.
- In every sphere of our life we always face problems those need to be solved.

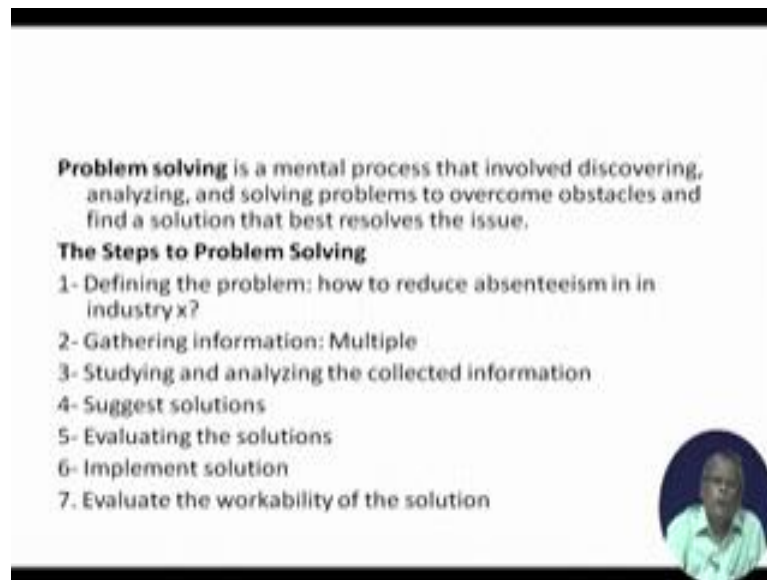
**A problem is:**

- a matter about which it is difficult to decide what to do.
- a difficult situation, matter, or person.
- any question or matter involving doubt, uncertainty, or difficulty.
- a question to be answered or solved.

Critical some thinking when you say it is the intentional and reflective way of looking at the things or circumstances while problem solving focuses on a specific situation. In every sphere of our life we always face problems that need to be solved. The problem is about a matter, which it is difficult to decide what to do or about issue where it is difficult to decide what to do a problem is a difficult, situation or issue or a person or any question or issue involving doubt uncertainty or difficulty. And a question need to be answer or solved.

And in problem solving there is a mental process. The mental process finds out the problem, analyze the problem, and then solve the problem to overcome the obstacles and to mark, what is the best solution in particular issue? We are giving a problem. First of all you define the problem. The problem you are working in industry or finding that absenteeism is high in the industry X. Then what you do, you have to validate it by checking the attendance register of the employees, checking in and checking out type.

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**Problem solving** is a mental process that involved discovering, analyzing, and solving problems to overcome obstacles and find a solution that best resolves the issue.

**The Steps to Problem Solving**

- 1- Defining the problem: how to reduce absenteeism in industry x?
- 2- Gathering information: Multiple
- 3- Studying and analyzing the collected information
- 4- Suggest solutions
- 5- Evaluating the solutions
- 6- Implement solution
7. Evaluate the workability of the solution

And then you gather the information once you validate that it is a problem and the absenteeism is hindering the production, then you have to nationalize it is a problem, which is a countable for the declining productivity of the industry then you gather the information. While you are gathering the information, you can talk with the multiple stake holders, you can talk with the supervisor of the employees, you can talk with the hospitals of that particular industry, you can talk with the doctors in the hospital of that particular industry, you can talk with the employees themselves, you can talk with the top management people, multiple source of information is all the time better then the single source of information to nationalize why absenteeism is occurring.

And the people those who are experiencing absenteeism, they will also tell why there is a absenteeism and studying and analyzing they collected information because you have to see that whether the information is constituent across the stake holders or whether the information is contradictory and whether the information is validated through data and information, hard data and information that is available. Then there can be possible solutions. One possible solution is that absenteeism there because the people are working in extreme hit conditions which are causing some problem to their body.

And another cause may be like that because of the emission of different gasses during the production process, they are employees are experiencing in more joint pains. So there are frequently reporting to the hospitals. That information you can find out and it the same



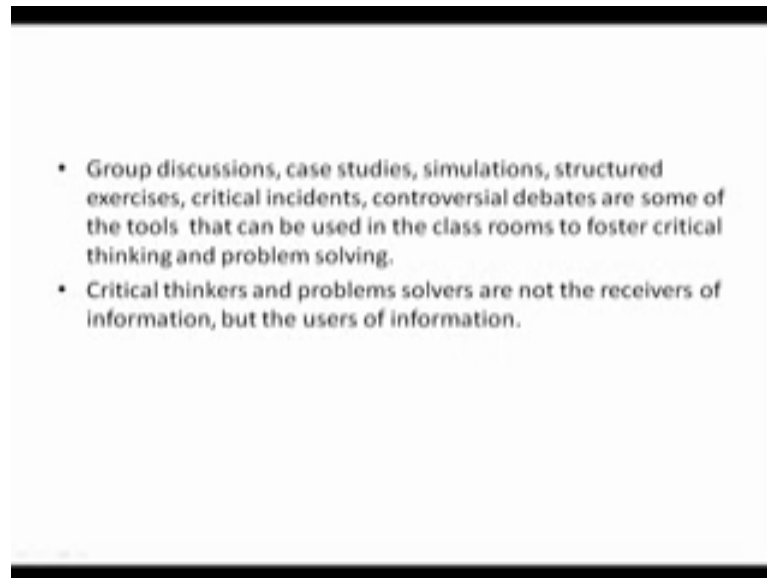
time because of working in industry and they are also experiencing the other health problems. So therefore, one solution may be that that we have to check that the health facility they improve to address the health problem of the employees. Another solution maybe that the employees are remaining absent, so that they are will pending jobs and in order to pending in order to clear the pending jobs they themselves will do the overtime that maybe another possibility.

The possibility is that they are because overtime rate is more than that of the state time or normal time. Therefore, in order to, are more they maybe they are doing the overtime and you have evidence for that. The persons those were remaining absent, they are frequently doing the same persons are frequently doing the overtime. So therefore, one solution maybe a resting of overtime like that you has many possible solutions to tackle the problem of overtime.

Tackle the problem of absenteeism. So once you evaluate the solutions critically by taking the plus and minus of every issue and then you think which can be a solution that can be more beneficial to the industry and less harmful to the industry X and understanding that with information and logic, with evidence in data you can come to a particular solutions that if you improve the health facilities in the in the industry then more likely the people more likely the people are there to attend their duty.

There will be no failure to do the, failure to this is absenteeism is basically failure to report to work is absenteeism and then we implement the solution. Execute the solutions, expand the hospital facilities, and provide the health services to the employees, then after three months again or 4 months he evaluate the workability of the solutions. By implementing the solution, is the absenteeism of the employees reducing if the answer is yes then your solution is working well. If the answer is no; that means, the solution is not appropriate, there must be some other solutions to this problem. Again you start from the step 1 to the step 7 that is shown in the shown here.

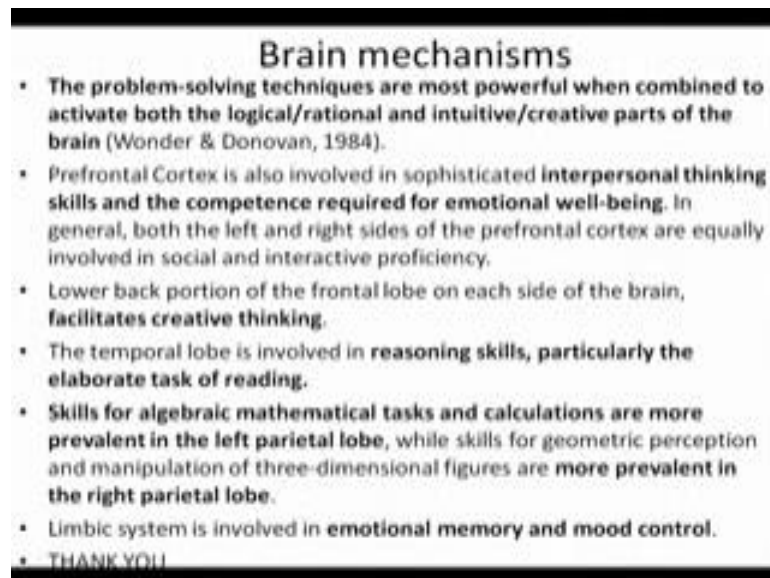
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And in order foster this problem solving critical thinking and problem solving in many of the class room situations, we need to train our students on that. Therefore, different (Refer Time: 18:55) are there or methods of teaching are there, so which this critical problems critical thinking and problem solving can be talk to students. Business schools you will find the group discussions, case studies, simulations, structured exercises, critical incidents and controversial debates. These are some of the tools that can be used in the class rooms to foster the critical thinking and problem solving skills in them. The 1 important point is that, critical thinkers and problem solvers are not the receiver of information, but they are the users of information to solve the problems.

1 point I like to mention at the end, that earlier you have studied about problem solving techniques and the critical thinking tools, but here you require in problem solving and in critical thinking, both left and right (Refer Time: 20:30) are involved. Sometimes require logical and national information and other times you require intuitive and creative information. Both the parts of the brain are involved in critical thinking and problem solving and the different areas that are involved in different activities are shown here.

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### Brain mechanisms

- The problem-solving techniques are most powerful when combined to activate both the logical/rational and intuitive/creative parts of the brain (Wonder & Donovan, 1984).
- Prefrontal Cortex is also involved in sophisticated interpersonal thinking skills and the competence required for emotional well-being. In general, both the left and right sides of the prefrontal cortex are equally involved in social and interactive proficiency.
- Lower back portion of the frontal lobe on each side of the brain, facilitates creative thinking.
- The temporal lobe is involved in reasoning skills, particularly the elaborate task of reading.
- Skills for algebraic mathematical tasks and calculations are more prevalent in the left parietal lobe, while skills for geometric perception and manipulation of three-dimensional figures are more prevalent in the right parietal lobe.
- Limbic system is involved in emotional memory and mood control.
- THANK YOU

Thank you.