THINKING SKILLS

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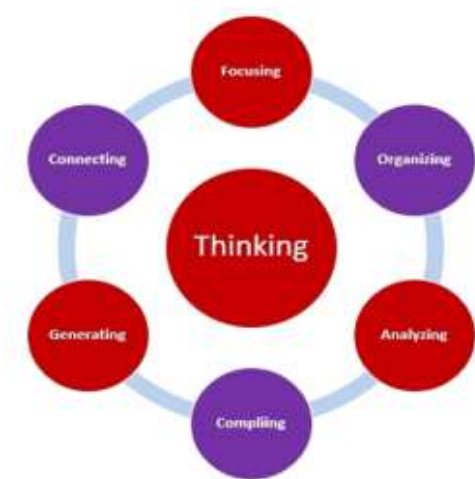**Dr. T. Jagannadha Swamy**
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We use **thinking skills** every day. They help us to make good decisions, understand the consequences of our actions and solve problems. These incredibly important **thinking skills** are used in everything from putting together puzzles to mapping out the best route to work.

What Are Thinking Skills?

Focus: Focus helps your child start a task without procrastinating and then maintain his attention and effort until it's done. Children with executive functioning difficulties have problems in getting started and sustaining their attention and effort to a variety of tasks.

Working Memory: Working Memory helps your child to recall and retain information in his mind while working. Difficulty in Working Memory impairs the capacity to follow directions and learn new activities both at home and school.
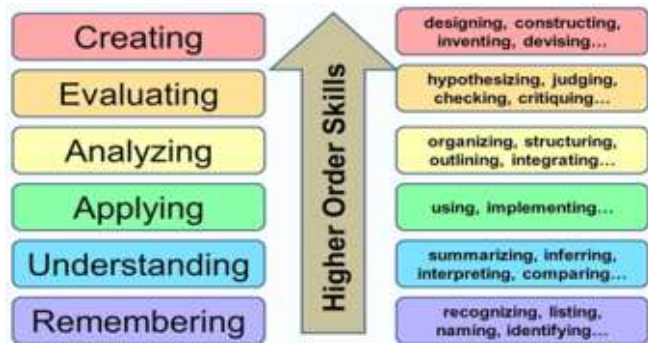
Self-Control: Self-Control helps your child to manage her feelings and behaviors, and stop herself from acting inappropriately. Difficulties in regulating feelings and behavior are often present. Moodiness, impulsivity, and unpredictable behavior are observed.

Time Management: Time Management helps your child to be aware of her use of time and to manage her schedule and tasks efficiently. Children may have difficulty managing their lives at age appropriate levels. Time management difficulties can manifest themselves as the 10-year-old who is unable to get ready for school in the morning independently, or as the teen who cannot manage more than two competing activities.

Planning: Planning helps your child to develop a systematic approach for setting and achieving goals by understanding step-by-step processes. Children may experience difficulties in completing step-by-step procedures and may often struggle in setting any type of future goals.

Organization: Organization helps your child to arrange and coordinate materials and activities in order to complete a task. Children may have problems with keeping track of their material and may frequently will lose things necessary at home or at school.

Self-Awareness: Self-Awareness helps your child to understand and articulate his own thoughts and feelings as well as the thoughts and feelings of others. Children may have difficulty understanding the feelings and experiences of others and struggle to express themselves effectively.

Flexibility: Flexibility helps your child to adapt and adjust to changing conditions and expectations without becoming frustrated. Children may have difficulty adapting to new situations. These children struggle to learn from their mistakes.

1. STOP	STOP	• Stop what I am doing.
2. THINK	💡	• What do I need to do? • Do I have a checklist that I can use?
3. PLAN	📋	• Plan the steps needed to finish the task. • Fill out the checklist that I can use.
4. DO	✏️	• Sit down and start working!

Thinking Skills:

Productive, purposeful and intentional thinking underpins effective learning in Science and Technology. Students are provided with opportunities to apply thinking skills, develop an understanding of the processes they can use as they encounter problems, unfamiliar information and new ideas.

Thinking skills are coded throughout the syllabus content. Where appropriate, teachers are encouraged to identify further opportunities to develop these skills in their students.

Computational thinking – ComT

Computational thinking is a process where a problem is analyzed and solved so that a human, machine or computer can effectively implement the solution. It involves using strategies to organize data logically, break down problems into parts, interpret patterns and design and implement algorithms to solve problems.

EXERCISES IN OBSERVATION, DEDUCTION, AND FLEXIBLE THINKING
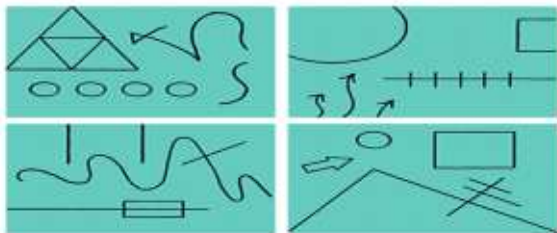
Design thinking – DesT

Design thinking is a process where a need or opportunity is identified and a design solution is developed. The consideration of economic, environmental and social impacts that result from designed solutions are core to design thinking. Design thinking methods can be used when trying to understand a problem, generate ideas and refine a design based on evaluation and testing.

Empathise   Define   Ideate   Prototype   Test

Scientific thinking – SciT

Scientific thinking is purposeful thinking that has the objective to enhance knowledge. A scientific thinker raises questions and problems, observes and gathers data, draws conclusions based on evidence, tests conclusions, thinks with an open mind and communicates research findings appropriately.

Systems thinking – SysT

Systems thinking is an understanding of how related objects or components interact to influence how a system functions. Students are provided with opportunities to recognize the connectedness of, and interactions between phenomena, people, places and events in local and wider contexts and consider the impact of their decisions. Understanding the complexity of systems and the interdependence of components is important for scientific research and for the creation of solutions to technical, economic and social issues.

Various Technical Thinking Skills

There are different thinking skills. Many researchers are working worldwide to build technology enhanced learning environment to develop various thinking skills in students.

Engineering Design Thinking: This thinking skill is a combination of complex cognitive process such as ill-structured problem solving, inquiry learning and systematic decision making. It is taught in many universities and institutes as a separate course and mainly based on project-based learning (PBL), which is resource intensive in terms of faculty time, infrastructure and cost.

Micro-Macro Thinking: It is defined as the ability to establish a link between invisible/theoretical variables in a micro world and its corresponding manipulable variables in a macro world in order to predict the functionality for any given system. It is an important thinking skill required for tertiary education.

Divergent Convergent Thinking: Divergent and convergent thinking skills are the important cognitive processes involved in solving problems. Divergent thinking seeks understanding the problem from multiple perspectives and generating multiple solutions.

Engineering Estimation Skill: Engineering estimation is the process of determining approximate values for a physical quantity with incomplete information and knowledge and without tools such as

computing resources. Engineering practitioners and students have to routinely solve ill-structured problems, which require estimation skill.

Knowledge Integration: Knowledge integration (KI) is defined as the process by which learners sort out connections between new and existing ideas to reach more normative and coherent understanding in science. The thinking skill of doing richer knowledge integrations results in a more organized understanding of the concepts and lead to deeper understanding.

Troubleshooting Skill: Troubleshooting is a process which ranges from the identification of problem symptoms to determining and implementing the actions required to fix that problem. Troubleshooting skill can be contextualized in various domains like electrical circuits, computer programs (where it is called debugging) and mechanical systems.

Hypothetic-Deductive Reasoning: It is a series of reasoning steps to explain any phenomenon, which includes steps like formation of hypothesis, checking of individual hypothesis by experimentation, designing of experiment, predicting the outcome based on experiment, collecting the observed outcome and comparing predicted and observed outcome.

Computational Thinking: Computational thinking is a term which was coined by Jeannete Wing in 2006 . It is loosely defined as a tool set for solving problems that combines the use of abstractions, automation, and symbolic and logical reasoning that have been primarily developed in the computer sciences and general mathematical primitives to build and analyze computational models of processes. Since 2006, many in the education community have echoed Wing's call about the importance of teaching students how to think computationally.

It was a great lesson that really changed the way I think about problems.

1. Analyzing a Situation. When presented with loads of information, you need to be able to break it down into its parts.
2. Communicating with Others.
3. Being Creative & 'Thinking Outside the Box'
4. Keeping Your Options Open.
5. Solving Problems.

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