The Thinking Map

by Wong Yew Leong

Major developments and trends in the 21st century indicate an urgent need for schools to focus on thinking skills throughout their curricula. Paraphrasing Arthur L. Costa, educators need to move towards a more "thought-full" curriculum so as to create a more thought-filled world.

Think Across Disciplinary Boundaries

The key to innovation in academic inquiry lies in translating ideas across disciplinary boundaries. Those who are able to move past disciplinary boundaries and work in the intermediate zones between two or more different disciplines are more likely to achieve breakthroughs in these disciplines, because they are able to see possibilities that others cannot.

Think Like An Expert

Different academic disciplines approach the same subject-matter differently. They make different assumptions about the world and use different cognitive categories to organise the sensory data they have obtained. They ask different questions and use different observation techniques, research methods, thinking processes and standards of truth and justification when making inquires and constructing knowledge. Teaching students to think like experts is an important step in helping students a deeper understanding and mastery of the subjects they are taking.

Handle New Ethical Situations

Dealing with unfamiliar ethical situations requires us to recognise crucial similarities and differences between these situations and those that we are familiar with and use our reasoning, problem-solving and creative thinking skills and abilities to work out the appropriate moral responses.

Resolve Dilemmas

What should a doctor who is on his way to fulfil his promise to speak at a medical conference do when he sees a motor accident victim lying on the road? What should a policeman do when his superior orders him to torture an uncooperating suspect who might possess information about the exact location of a bomb in the city centre? An important application of critical reasoning, problem-solving and creative thinking in ethics is in the resolution of ethical dilemmas.

Know Why

A good moral education programme must not only cultivate strong moral values in students, but also teach them how to critically examine and evaluate competing moral values and beliefs, and construct they own set of moral values and beliefs on the basis of sound reasons. This involves introducing students to major ethical principles, such as utilitarianism, deontology, virtue ethics, double-effect principle, etc., helping them to recognise and understand the roles these principles play in their own value systems, and guiding them to apply and evaluate the strengths and limitations of these principles in practice

Ethical reasoning is an application of critical reasoning, problem-solving and creative thinking to ethical issues.

Generate Ideas

Idea generation is an important aspect, not only of creative projects, but also of critical reasoning and problem-solving - both argument construction and solutioning are creative endeavours. "Idea generation" refers to a set of skills and strategies for brainstorming ideas, as well as the adoption of an appropriate mindset to facilitate the brainstorming process, namely the suspension of judgment to increase the fluency of ideas.

Create Prototype

The creative process is biased towards action. By making representations of ideas, problems in the ideas can be identified and resolved early in the creative process. Tangible objects or simulated experiences allow creators to obtain more informed feedback from users before committing the time and resources to a final version,

There are many factors that go into a person's response to an item or an experience. Creators bring an open mind and a beginner's mindset of "not knowing" in order to gather both positive and negative feedback to improve their solutions. Experimentation and failures are valued for their information and because they contribute to future success.

Creators evaluate all the feedback they have obtained about their prototypes, combine this information with additional research and brainstorming, and then decide how best to proceed.

The creative process includes a strong ethical element, because the success of the project depends on whether or not the solution actually solves the user's problem.

Collaborate

Real-world creative projects are complex: they involve multiple skills and areas of expertise; they are also ill-defined. Consequently, creators frequently prefer to work in teams made up of members with diverse backgrounds, knowledge and skills. Working in teams, monitoring the motivation of a team and knowing how to inspire and lead a team are important qualities of an effective creative thinker.

Understanding and researching the creative problem is a very important part of the creative process.

Both critical reasoning and problem-solving involve deductive reasoning, inductive reasoning and abductive reasoning.

Evaluate

The quality of a piece of reasoning depends on the acceptability of the grounds offered in support of the reasoning, the credibility of the sources of information used to construct the reasoning and whether the grounds offered provide sufficient justification to accept the view put forward.

Construct

When we put forward a point of view and offer reasons for it, we are constructing a piece of reasoning. We reason about what we should believe, what we should do and the causes of events.

Understand the Reasoning

An important aspect of critical reasoning is understanding the views of others and their reasons for holding those views. This involves identifying the reasons and conclusion(s) of a piece of reasoning, understanding the structure of the reasoning, the assumptions made, the context within which the reasoning was constructed, and clarifying and interpreting the expressions and ideas used in the reasoning. We should also achieve this level of understanding of our own views.

Understand/Research the Problem

Understanding the problem is a crucial step in problem-solving. This involves figuring out what the unknown we are trying to find is, and understanding the data that is currently available to us and the conditions we have to satisfy when solving the problem. Solving complex, real-world problems will often also require us to conduct detailed research to understand the problem.

Devise a Plan

Devising a solution to a problem often starts with exploring the connection between the unknown we need to find and the data we have on our hands. Our past experiences with similar problems may also suggest a possible way of solving the problem. We may also find inspiration from the solutions to problems related to our own. Sometimes, dropping one of the conditions we have to satisfy may allow us to gain some headway to solving the problem.

Carry Out the Plan

This is where we carry out our plan and check whether the solution we have come up with works. Each step must be checked, and we must be able to demonstrate to ourselves and to others that the solution is correct.

Reflect and Extend

Often, a problem can be solved in more than one way. It is a useful exercise to explore whether there are alternative solutions to a problem, because we may not want just a solution to the problem but the most elegant solution. The solution to a problem may also provide us with the means to solve other problems.

*(*The segment on problem-solving is adapted from G. Polya's heuristic for solving mathematical problems.)*