



# The Engagement of Critical and Creative Thinking Activities in the Teaching and Learning Process

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## ABSTRACTS

The new challenges of the education process at all levels currently vary in different dimensions and perspectives. One of them is to inculcate the critical and creative thinking ability among the students, specifically for students in the Y, Z, and Alpha generations. Many researchers and scholars indicate that since the beginning of the 21st century and the possession of unique characteristics among the millennial generations, the future education system must be also revolutionized so that it will always be relevant and effective in holistically developing the future generation of a particular nation. One of the ways to do this is by engaging critical and creative thinking activities in the daily teaching and learning process at schools and higher learning institutions. This concept paper discusses the need for such engagement from a Malaysian perspective.

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## 1. INTRODUCTION

For a long time, the emphasis on education is mainly reflected in the cognition of the value of education is knowledge acquisition which is from the perspective of students, and knowledge transferring which is from the perspective of teachers (Putnam & Borko, 2000; Causey *et al.*, 2000). The current exam-oriented education is knowledge-centered because the basic purpose of the exam is to test students' mastery of knowledge (Zhumei, 2018). The student's duty is to learn knowledge, and the teacher's duty is to impart knowledge. These seem to be justified. When children return home, the parents usually ask, "What new knowledge did you learn today?"

"Education is not the learning of facts, but the training of minds to think," Albert Einstein once said about college education during a visit to Boston in 1921. He claimed that a person does not require a school or college education to learn information. The purpose of a school or college education is to teach the mind to think in ways that textbooks cannot; it is to develop the capacity for integrated understanding and the ability to apply knowledge wisely. These are fundamental aspects of the educational culture that we still aspire for today.

The fact that Einstein is talking about here is knowledge. Knowledge is of course important, but knowledge is not the whole content of education. Here he puts forward a new proposition about the value of education, that is, the value of education is not to remember a lot of knowledge, but to train the brain's thinking. This brings up another dimension in which the value of education transcends knowledge—thinking. It is precisely in this dimension that our country's education is weak. The development of students' thinking is the shortcoming of our education.

"You learn from your mistakes," "Adversity is the school of knowledge," and "fail forward" are all phrases that most people have heard. Meanwhile, most people agree that making mistakes is an essential part of the learning process. This is because, rather than avoiding making a mistake or failing to provide ideas for a solution, they should work constructively to understand the mistake and the thinking technique for solving the problem. Hence, in the teaching and learning process at all levels, it is important for teachers to engage in creative and critical thinking activities so that the process will become more challenging and effective.

## 2. METHODS

This study was a literature survey. We collected data from literature, combined them, as well as explained, described, and put them into perspective.

## 3. RESULTS AND DISCUSSION

### 3.1. Critical Thinking Versus Creative Thinking

uspendisse in aliquam est, at consequent quam. Morbi porttitor orci augue. Vestibulum in the 21st-century teaching and learning process, two important skills, critical thinking, and creative thinking are particularly emphasized, pointing out that for 21st-century learners, creative thinking and critical thinking skills are essential to success. Teachers can create an environment of creative expression and use existing resources to assign tasks according to students' interests and learning styles to promote critical thinking and creative thinking skills.

According to current international trends, critical and creative thinking education has become the primary purpose of contemporary international education. The "World Declaration of Higher Education Facing the Twenty-First Century: Concepts and Actions" was published by The United Nations Educational, Scientific and Cultural Organization. One of the purposes of higher education, training, and research, according to Article 9, is to "cultivate a

critical and independent attitude." In addition, Article 9 states that "higher education institutions should educate students to become well-informed and aggressive citizens" using "innovative educational methods: critical thinking and creativity".

Critical thinking is the ability to apply reasoning and logic to new or unfamiliar ideas, opinions, and situations (Wang & Zheng, 2016). Critical thinking entails approaching situations with an open mind and studying a concept or idea from as many perspectives as possible. Effective critical thinking typically begins with a thinker assessing what he or she already knows about a topic and attempting to comprehend what he or she does not. On the other hand, creative thinking means thinking outside of the box. In general, creativity requires lateral thinking, or the capacity to see patterns that are not immediately apparent. Designing creative ways to do activities, solve issues, and meet obstacles is what creative thinking involves.

To achieve these objectives, new and appropriate approaches for fully reforming the curriculum and going beyond subject knowledge must be used. To help people gain the skills, abilities, and talents of communication, creativity and critical analysis, independent thinking, and teamwork in a multicultural setting, new teaching, and education techniques must be grasped or upgraded. Among these, creativity entails fusing traditional or local knowledge with advanced science and technology. As a result, critical thinking and creative thinking skills are vitally important in current education.

### **3.2. Teaching and Learning Theories on Critical and Creative Thinking**

According to Gagne's Hierarchy of Learning Theory, learning is the mechanism that enables individuals to become capable members of society. Learning enables people to acquire skills, knowledge, attitudes, and values. Therefore, learning leads to various types of behaviors, and ability is the result of learning. These abilities are acquired by humans from the stimuli in the environment and the cognitive process of the learner. In other words, learning is a cognitive process that transforms stimuli in the external environment into a stage of information processing, from which new knowledge and abilities can be obtained.

Gagne further subdivided the cognitive, affective, and skill goals advocated by Bloom et al. into five learning outcomes, including cognitive strategies, verbal information, motor skills, intellectual skills, and attitude. Gagne emphasized the practice of task analysis. The learner's internal conditions and external conditions are an inseparable whole. Based on the above recognition, Gagne proposed his learning structure model, further applying the concept of information processing to the analysis of learning, and referring to this model to develop the internal process of learning.

It has become the leading model when considering critical thinking skills. This classification system sees each tier build upon the previous one, with progress only being made in terms of cognitive skills once there has been a mastery of the lower levels. Each of these levels describes a particular means of thinking, although it is important to point out that each classification carries equally complex skills, making the lower end of the tier just as challenging as any of the others.

Besides that, learners demonstrate this when they write a different ending to a story, and offer innovative solutions to a specific issue such as global warming, which allows them to be creative in their thinking processes and their use of information. One way in which this can be shown is through the demonstration of creative thinking to find innovative solutions to different problems. These strategies are sometimes referred to as executive control processes which allow learners to manage the learning process for themselves.

Gagne contributed a few important implications for the domains of learning. First, the theory provides instructional design from simplicity to complexity. Define instruction as a set of external events designed to support the internal learning process, and do not emphasize giving students too many opportunities for self-learning. On the contrary, it is advocated that teachers should play an active teaching role, and fully arrange and guide students "what to learn" and "how to learn".

Next, it defines the psychological process of progressive learning, explains the diversity of human learning, and links the teaching phase with the specific phase of information processing. He focused more on the overall and systematic teaching design, including analysis of expected learning results, corresponding behaviouristic goals, learners' internal and external conditions, and evaluation of learning results.

In contrast, Jean Piaget researched children from infancy to adolescence to figure out how they learned to think logically. According to Piaget's Theory of Learning, it is a process of acquiring and storing information, an internal process that can store the information in short and long-term memory. Piaget essentially claimed that humans create their view of the world. He chooses to believe that learning is the product of a combination of assimilation and accommodation.

To grasp a new idea, children must first focus on their previous experiences and then change their perceptions to include the new experience (Piaget, 2020). Piaget discovered that cognitive growth occurs in four phases during childhood as a result of his research. The stages are sequential. The children did not miss any stages but rather went through them all. From one level to the next, there are noticeable differences. Each stage is built on top of the previous one, with parts from the previous stage being reused (Piaget, 2020).

Furthermore, through his observations of his children, Piaget developed a stage theory of intellectual development that included four distinct stages, namely, (a) birth-nearly 2 years (Sensorimotor Intelligence), (b) about 2-6 years (Preoperational Thinking), (c) about 7-11 years (Concrete Operational Thinking), and (d) about 12 through adulthood (Formal Operational Thinking). During this period, children will develop their skills, such as scientific and mathematical thinking, research and inquiry skills, independent thinking, language skills, and literacy skills (Piaget, 2020).

According to Piaget, a younger child starting at the age of two years old can understand what items are, they may know the names and what they look like. They do this by critically thinking about each object. They are starting to develop conversational skills; these skills take time to develop which is why their skills change over time. We watched two children performing the same task, we watched the younger child communicate in a different more egocentric way, while the older child communicated in a non-egocentric way. This is because the way they have critically thought about their response has become more developed over time.

Besides that, once a child has fulfilled the Concrete Operational Stage of Piaget's theory, they then begin to control more ideas at one time. They do this when they can think creatively, use abstract reasoning, explain the outcome of problems, and make mathematical calculations. By the end of this stage children also have the ability to think logically and critically think about more than one part of the problem at a time. They are able to use critically thinking skills to perform reverse thinking.

Finally, when a child has reached the Formal Operational Stage, thinking processes such as inferential reasoning occurs and they no longer need to use objects or draw pictures to solve problems. We can see the connection between critical thinking throughout this stage of cognitive development as well. By the time children enter the Formal Operational Stage, they

are using everything they know about problem-solving to solve problems. They use different techniques which they have learned over time, they solve problems as if the skills are second nature to them. Children and adults who are in this final stage of development use critical thinking skills to think back on how to solve problems to find solutions.

Therefore, learning should be student-centered and done by successful discovery learning in the classroom. Rather than offering direct guidance, the teacher's function is to encourage learning. Discovery learning is the philosophy that children learn best by doing and actively experimenting, and it has often been regarded as a core component of the primary school curriculum transformation.

So, the teachers should concentrate on the teaching and learning process rather than the finished product. Next, teachers may utilize all collaborative and individual tasks, so children can learn from each other. Besides that, the teacher can use appropriate questioning techniques to bring out the misconception and create circumstances that present useful challenges and disequilibrium in the child. Last but not least, evaluate the child's developmental stage such that appropriate tasks may be assigned.

### **3.3. Engagement of Critical and Creative Thinking Activities in the Teaching and Learning Process**

Since critical and creative thinking has become an era theme in the comprehensive deepening of education reform in our country, we must not only understand the meaning of critical thinking and creative thinking but more importantly, clarify the relationship between critical thinking and creative thinking. The critical and creative functions of the mind are so intertwined that neither can exist without the other. Critical thinking involves attempting to perceive something clearly and honestly so that not only the excellent from the terrible and the perfect from the imperfect can be identified, but also the complete thing can be fairly judged and appreciated. Although critical thinking is more left-brain and creative thinking is more right brain.

Creative thinking, in general, is divergent thinking, which encourages the use of many approaches to fulfil tasks, usually in problems and challenges. When dealing with knowledge and facts, on the other hand, critical thinking is gathered and in-depth comprehension is fostered. Though the two are not interchangeable, they are inextricably linked, bringing to thinking and learning complementary dimensions. Most intellectual activity involves students learning to recognize or build an argument, use evidence to support that argument, draw reasoned conclusions, and apply information to solve problems. Critical thinking is at the heart of most intellectual activity. Interpreting, analyzing, assessing, explaining, sequencing, reasoning, comparing, questioning, inferring, hypothesizing, appraising, testing, and generalizing are examples of critical thinking skills.

Besides that, students learn to produce and apply new ideas in specific circumstances, understand current situations in new ways, uncover alternative explanations, and see or make new relationships that lead to a beneficial end through creative thinking. Combining elements to create something unique, sifting and refining thoughts to uncover possibilities, developing theories and objects, and acting on intuition are all examples of this.

Complex representations and pictures, investigations and performances, digital and computer-generated output, and virtual reality are all examples of creative output. To put it another way round, it does not need a special type of individual to come up with new ways of perceiving and thinking. Creative thinking is less ordered, structured, and predictable than critical thinking because it takes a more relaxed, open, and fun approach. As a result, it

necessitates some risk-taking because there is a potential, we will make mistakes or come up with no answer at all. We must be prepared to deal with the resulting danger, confusion, and chaos. This may take some getting used to if we are normally orderly and organized. Attitude and self-confidence are just as important as aptitude when it comes to creative thinking.

So, the original and flexible task can be performed through activities in the classroom that encourage students to produce ideas by considering existing ideas and establishing connections between previously learned and newly learned topics. Critical and creative thinkers explore, think through analogies and metaphors, examine concepts in new ways, observe, elaborate, infer, extrapolate, and generate remote linkages to determine these relationships.

We will never surpass our current level of achievement if we approach all challenges in a completely rational deductive manner. On the other, if we approach all problems creatively, we will never be able to figure out why something is just not working and deal with it accordingly. Many problems necessitate the use of both strategies. Focusing on one while disregarding the other would not only result in a failure to successfully handle the problem, but it will also stifle forward-thinking or progressive solutions and responses.

In recent years, Science, Technology, Engineering, and Mathematics (STEM) education has been the focus of many conversations among policymakers, educators, and corporations. It is a required building block for STEM education. Subjects in the STEM curriculum teach students how to think critically and how to solve problems — skills that can be used throughout life to help them get through tough times and take advantage of opportunities whenever they appear. STEM has been identified as a main priority in the Malaysia Education Blueprint 2015-2025.

The Ministry of Higher Education (MOHE) has been doing its part by actively reaching out to researchers and industries, organizing research and development exhibitions, publication of books, and technology competitions. Schools are also trying their best to supply more STEM students by creating interest in Science and Mathematics among them through creative learning methods, equipping their teachers with improved skills and knowledge, as well as educating parents and the public on the urgent need for STEM (Calabrese Barton & Tan, 2019).

A study conducted by Bahrum *et al.* (2017) explained the advancement of STEM disciplines to include art, making pupils more holistic while employing the right and left brains. As a result, kids will be more creative, critical thinkers, and better able to solve issues, communicate and interact. This is an opportunity to shift the focus of learning from passive knowledge receivers to active, creative students in activity design and implementation. Moreover, according to Calabrese Barton & Tan (2019), STEM also helps young people to shape a critical and creative thinking mindset.

It instills in our children intrinsic problem-solving abilities, critical thinking skills, and a sense of curiosity – qualities that are of the utmost importance to readily take on the future. To break it down, STEM is a lens to the world. As children, Science became an interest to us when we realized that inquiry and critical thinking can explain various phenomena in our environment. STEM is neither a body of knowledge nor a professional engagement; it is a way of thinking. If teachers can emphasize the competency of STEM more than knowledge, we stand a better chance of grooming a generation of great leaders who can bring Malaysia forward.

Since children learn in a variety of ways and come from different backgrounds, it is critical that future school teachers receive training that will enable them to effectively reach a variety

of students so that they can learn to think critically and creatively to overcome the challenges of living in a diverse and complex world.

#### 4. CONCLUSION

All in all, it is necessary to cultivate students' critical and creative thinking ability as a necessary part of education. Critical and creative thinking education must first be reflected in the key construction of several courses, such as writing, communication, logic, statistics, ethics, and moral courses, but also all courses and all training links. Critical thinking education requires a relaxed and tolerant atmosphere. Both school and society must create space and conditions that are conducive to the free development and personality development of students. It is necessary to allow students to make mistakes and failures and allow them to develop unique development paths and growth methods. Besides that, to encourage creative thinking education, it is necessary to change the knowledge structure of students, increase students' cross-field knowledge, and enable students to integrate the knowledge of different subjects and fields. Moreover, it is necessary to consciously protect the curiosity of students and stimulate their imagination. Curiosity is a stronger driving force for innovation than material and spiritual incentives. Students should be given plenty of room for imagination, and they should not easily crackdown on "crank thinking" that does not conform to the current norms. After all, the 21st century is an era that requires thinking and innovation. Only rich and creative ideas, critical analysis, cautious skepticism, and a spirit of adventure and fearlessness are the necessary skills to solve problems and can bring mankind. New opportunities, innovations, and changes in civilization will be successful in the future.

#### 5. AUTHORS' NOTE

The authors declare that there is no conflict of interest regarding the publication of this article. Authors confirmed that the paper was free of plagiarism.

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