

CHAPTER 8

FIESI Model for Productive Thinking

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INTRODUCTION

People today are faced with an increasingly fast changing world where the most important skills are flexibility, innovation, and creativity (NCF, 2005). Creative thinking and critical thinking are the two important thinking skills. These are the components of 21st century skills and life skills too. But somehow this part of human cognition is ignored in the classroom teaching learning process (Patel, 1988). The World Economic Forum (2018) described these thinking skills as important for the future in its report 'future of job'. National Education Policy (2020) also emphasized on creative and critical thinking along with problem-solving but unfortunately our students are not good at higher order thinking skill (Paily, 1999). One of the reasons may be teachers' questioning style that is initiated in a classroom by a fact-based question, then students give a response and then feedback or evaluation by the teacher (Newton, 2017). It will result in rote learning or reproductive thinking only (Newton, 2017). In the name of objectivity teachers sacrifice flexibility and creativity (NCF, 2005). To get rid of this situation teachers need to focus on retention as well as transfer skill both (Mayer, 2002).

If we want to equip our students with these demanding skills then we need a certain program, strategy or teaching model that can help teachers and learners to do in their respective direction. Productive thinking is an effort in this direction. Productive thinking is a cognitive ability that combines creative thinking and critical thinking. For the development of productive thinking among students, a productive thinking model (FIESI) is developed. This model is developed by keeping in mind the components of teaching model viz. focus, syntax, support system, social system, role of teacher/students and application. This model is verified by the experts and class VIII students of Kendriya Vidyalaya (Central Schools) also taught science through this model for one academic session and found effective in developing productive thinking, creative thinking, and critical thinking (Biswal & Raipure, 2020 and Biswal & Raipure, 2021).

THEORETICAL BACKGROUND

Productive thinking process has its foundation in psychological theories. Guilford's structure of intellect model (SOI) describes three-dimensional representation of human intellect. In which there are three components viz. operations, products, and contents. The operation component is the thinking part of our intellect, and it provides evaluation, convergent production, divergent production, memory and cognition to give different products after interaction with contents. It creates the foundation for higher order thinking skills in general and productive thinking in particular. Productive thinking is the cognitive ability which uses memory through cognition and applies higher order thinking operations.

Productive thinking has brought its essence from Bloom's Taxonomy. It provides learning objectives in hierarchical order. It divides thinking skills in two categories: lower and higher thinking skills. For higher order thinking processes lower order thinking creates a foundation. In productive thinking also creative and critical thinking are the higher order thinking skills for which knowledge, understanding and application creates foundation.

It is the process of generating new ideas, but generation of unique ideas may not be productive unless accompanied by an evaluative component which enables the individual to select the ones most appropriate for the particular problem (Hoffman and Hoffman, 1964). We can say that productive thinking includes problem-solving, analytical and logical dimensions, as well as creative thinking (Hoffman and Hoffman, 1964). In the process of productive thinking our past experience may become a hindrance and an obstacle which blocks productive thinking and reduces behavior to stereotyped and fruitless essays (Birch and Rabinowitz, 1951). So, to channelize thought processing we need a step by step guide that can help to think in a particular way. One of the models is the ThinkX model developed by Hurson (2011). According to him, productive thinking is a process of suspending judgment to generate long lists of ideas and then returning to those lists to make choices by judging the ideas against pre-established criteria. The ThinkX model for Productive thinking has six steps to solve a problem through productive thinking as displayed in below figure 1.

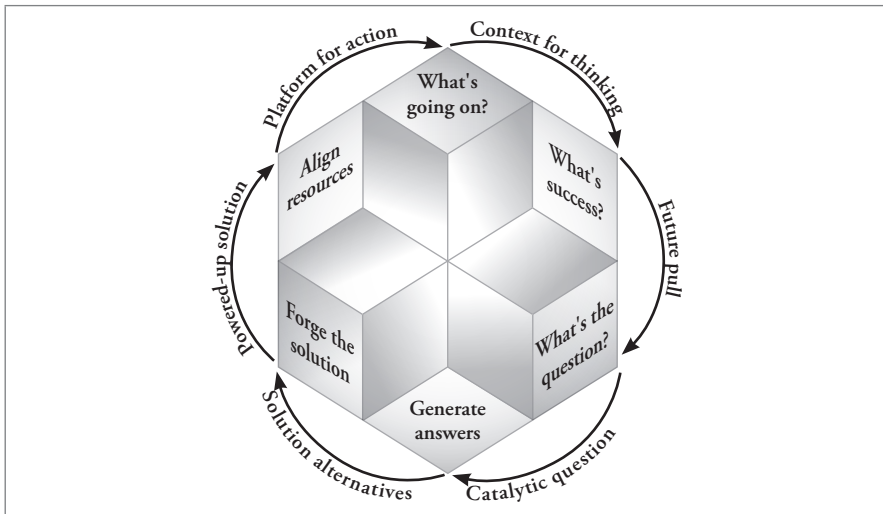


Figure 1 - ThinkX model

In this line, Newton (2007) also gave a model of Productive thought. She mentioned decision making, critical thinking, creative thinking, understanding and memory as the components of productive thought. In this model, memory is creating the foundation for higher order thinking abilities. It can be understood by the figure 2.

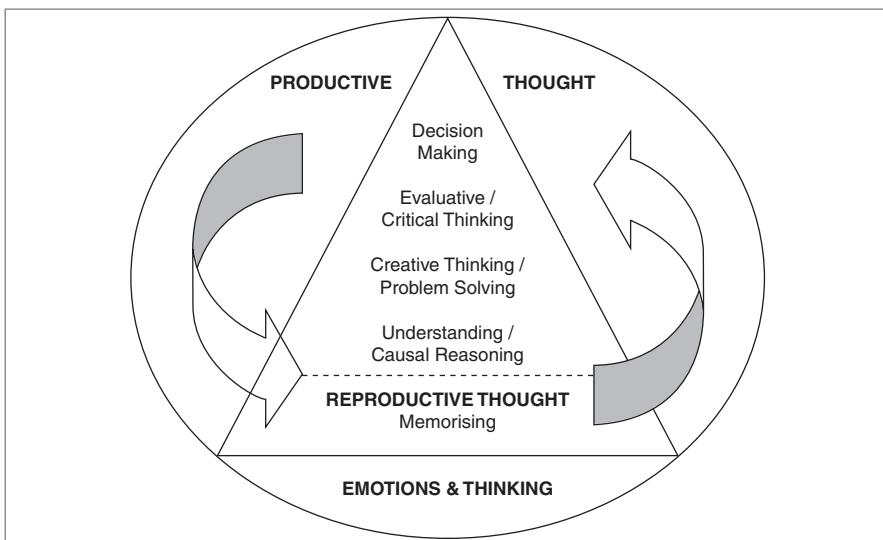


Figure 2 - Model of Productive Thought

Our memory and past experience are re-patterned and restructured to meet current demands in a productive thinking process (Birch and Rabinowitz, 1951). It is the combination of memory, motivation, creative thinking, and critical thinking (Rusbult, 1997). Patel (1988) described productive thinkers as who through their creation are able to make their lives more comfortable, meaningful and of healthy understanding. Davis and Scott (1971) (cited in Patel, 1988) define productive thinking as consisting in those divergent, convergent, and evaluating operations. It includes both creative and critical analysis dimensions of reasoning. According to Wertheimer (1945) reproductive thinking is associated with chained behavior or repetition and ultimately leads to rote learning whereas productive thinking is an insight based logical reasoning (Wertheimer, 2020). Gallagher and Aschner (1963) cited in (Aranda et al., 2020) considered productive thinking as the combination of creative and critical thinking skills where memory creates the base for higher cognitive activity. For this there are certain programs also to show the students how to proceed in an organized and systematic way when attacking a problem, and how to pay attention to relevant facts and conditions of the problem in evaluating one's ideas (Olton, 1969).

By keeping in mind, the available programs and models for productive thinking the present productive thinking model (FIESI) is developed to help the teachers, researchers and students to think in a particular way.

LITERATURE REVIEW

Review of related literature helps a researcher to develop an insight about the problem. Similarly, here also literature review helped the researcher to develop an insight about the teaching models and its components, productive thinking and its components, available models on creative thinking, critical thinking and productive thinking and strategy and techniques for the development of specific thinking processes.

We are living in the 21st century which is witnessing regular scientific advancements and challenges. As creative and critical thinking skills have a big contribution towards cognitive learning results therefore researchers and educators should have their focus over these skills (Siburian et al., 2019). As reported by Saido et al. (2015) students are not good at synthesis and evaluation skills which is one of the major concerns of education. Hence, teachers need to improve higher order thinking skills of students in the classroom by using appropriate teaching methods for active participation of students in the learning process. For the development of creative and critical thinking skills in students an opportunity should be given to exercise their own minds, to engage in critical appraisal, to risk opinions in a sympathetic atmosphere and then have the opinions challenged in a rational but respectful manner (Adey, 1999). Teachers can create a teaching and learning environment that is more conducive to foster creativity (Lee, 2001). We should provide the opportunity to the

learners to think like a scientist by engaging them in the process of thinking instead of merely ingesting the product of the scientists' disciplines (Saido et al., 2015). One of the ways can be collaborative learning as it provides room for negotiation of meaning, sharing of multiple views and changing the internal representation of the external reality (NCF, 2005). For the development of thinking skills among students it is required from the part of the teacher that the teacher should learn to listen to the students with empathy and without judgment, and to enable children to listen to each other (NCF, 2005). The obstacle of creativity is the passive unmotivated students with the tendency to rote learning, pressure to complete the syllabus and preparing students for examinations (Sarsani, 1999). We also need to change the atmosphere of objectivity and quizzing. Rather schools must provide opportunities to question, enquire, debate, reflect and arrive at concepts or create new ideas (NCF, 2005). In this direction, the Productive thinking program developed by Covington, Crutchfield and Davis (1966) (cited in Olton, 1969) teaches students how to generate many ideas, and how to look at them in different ways. Similarly, CoRT thinking program developed by Edward DeBono was also reported effective in developing thinking skills, Patel (1988) developed program for productive thinking to teach Geography was found effective. Brainstorming is an effective technique to develop creative thinking (Pandit, 2006 and George, 2016). Similarly, the Synectic model approach is an effective approach for creative thinking (Paltasingh, 1998). Use of open-ended questioning is evident for the training of problem-solving skills (Lee, 2001 and Chin, 2008). So, by having the review of literature researchers developed an understanding about productive thinking, its components, productive thinking model and techniques to be used in models for specific types of thinking.

EXPLANATION OF THE MODEL

Productive thinking model (FIESI) has a foundation in cognitive theories. It is based on other teaching models given for creative thinking, critical thinking, and productive thinking development. This model provides direction to the teachers to develop productive thinking skills among students. This model provides specific roles to the teacher as facilitator and student as creative problem solver. Productive thinking model creates space in the classroom where teachers can develop productive thinking skills among students through a subject content i.e., in an integrated way or it can also be done in a separate way. This model has its own focus, syntax, Social system, Support system, Setting/Place layout, Role of students/teacher and Assessment pattern. These components of the model are discussed here as follows:

- **Focus**

Productive thinking model (FIESI) is a teaching model which is developed with an aim to develop productive thinking among students. This model is designed to give enough space to creative thinking and critical thinking. Both thinking processes have opposite characteristics and therefore hinders the outcome of one another if applied at one place. To avoid this situation, the FIESI model provides a separate place to both types of thinking process such that they will support each other to refine the product.

- **Syntax**

The productive thinking model has its syntax with five phases FIESI i.e., Foundation, Ideation, Evaluation, Stabilization and Implication in the process of productive thinking. These phases are in one sequence starting from Foundation and ending at Implication. The Productive thinking process can be represented by figure 3.

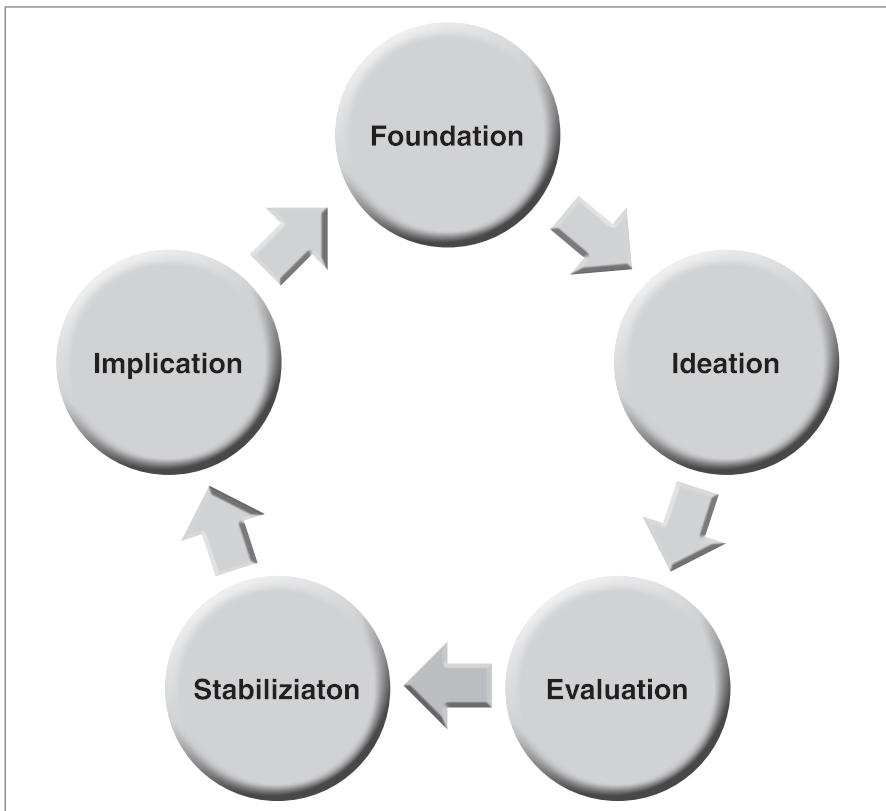


Fig 3 - Productive thinking process

a. **Foundation**

This is the first phase of this model. As its name indicates, it create a sound knowledge foundation among students with the help of learner centered techniques like using technology, activity, demonstration, discussion, and many more to engage learners in the teaching learning process. This step is based on the principle that creativity can never come in vacuum. For applying higher order thinking skills, a person must have a required level of knowledge to apply or transfer it in the new situation. After the explanation of the content, the teacher initiates the discussion also to clear the doubts among the students. The main objective of this phase is to create a knowledge foundation among the students for further proceedings.

b. **Ideation**

This is the second phase of the productive thinking model where students get a chance to draw their creative potential. Here, the teacher puts some situation in front of the students as the problem or question. Students analyze the problem carefully and think in an imaginative way to generate as many ideas as possible.

For this, teachers can use various creative thinking strategies like; creative writing, SCAMPER (Substitute, Combine, Adopt, Modify, Put to another use, Eliminate, Rearrange), cognitive question, brainstorming and many more... This is the phase where criticism by the teacher or by the peer group is not allowed. Because here the focus is on the quantity of ideas rather than quality. So, the students are allowed to think in many directions to generate the ideas without considering the quality of ideas.

c. **Evaluation**

This is the third phase where critical thinking has its role in refining creatively generated ideas of the ideation phase. Here, constructive criticism is allowed to increase the quality of ideas and add value to the budding ideas. This phase helps in selecting the best idea out of the generated list of ideas from phase 2. Teachers can use evaluation as one of the techniques to select the best possible idea. At this phase, ideas are evaluated on the basis of feasibility criteria and efficiency of ideas to solve the present problem. After this, students will have the best idea that can solve the problem.

d. **Stabilization**

This is the fourth phase of the productive thinking process. At this phase, teachers clear the doubts of the students if they have. Then students stabilize the concept by using techniques like concept map and summary. By doing this, students stabilize the concept in a systematic manner that will last for longer days.

e. **Implication**

This is the fifth phase of the productive thinking model which makes the difference between creative ideas and productive ideas. After evaluation the next phase is to imply the idea in some real-life situation to give a value to the idea. The idea that can be implied to the real-life situation is the productive idea or we can say the idea which is able to solve the problem in the present situation will be a productive idea.

After the five phases of the productive thinking process students will have a productive idea that can solve the problem.

- **Social system**

The model provides the central position to the students, or we can say the teacher used learner centric methods to teach the students. In the first phase, teachers focus on discussion and give equal importance to the child's experience to construct the knowledge. In this model, teachers set a collaborative learning atmosphere in the classroom where students feel free to share their new ideas with teachers and with their peers especially in ideation phase. Since criticism is not allowed, students share their ideas freely in the class.

- **Support system**

The productive thinking process requires a good mastery over the content and specific skills from the teachers' side. It can also be possible that the teachers can take specific training in this regard from the experts in this field.

SETTING/PLACE LAYOUT

This model creates a platform for cooperative learning. The process of this model can be done at individual student level, but it will be good if it is in a group. As the groups are formed by group dynamics principles so a variety of ideas can be the result of group process. For the activities in the group, classroom settings need to be changed according to the requirement.

ROLE OF STUDENTS AND TEACHERS

In the process of productive thinking, the role of a teacher is as a facilitator who facilitates the learning of the students. Teachers should act as a constant motivator who is always ready to accept students' responses without any personal comment of restrictive criticism. This type of behavior of the teacher stimulates students to think out of the box rather than sticking to the fixed answers. Here, the role of a student is as a creative thinker who can imagine in all the possible directions without considering the feasibility of the ideas. It can be said that students act as creative thinkers and teachers act as a constant motivator.

ASSESSMENT

Assessment of this teaching model can be done with the help of a Productive thinking scale which is developed by researchers (Biswal & Raipure, 2020 and Biswal & Raipure, 2021). This scale consists of 20 thinking situations and each thinking situation has 4 options. The 4 options represent the 4 types of thinking process viz. reproductive thinking, critical thinking, creative thinking, and productive thinking but not in the same order in the scale. Here the order of thinking starts from reproductive thinking and productive thinking is the highest order therefore 1 mark is allotted to option representing reproductive thinking and 4 for option representing productive thinking through critical thinking and creative thinking in the order.

The similar tool can be developed for different cognitive levels. This tool is generic in nature, it can be developed for a specific subject also.

Since, productive thinking is the combination of creative thinking and critical thinking, it can also be assessed through the standardized creative and critical thinking tools.

EXPECTED OUTCOME

After the completion of the training through the productive thinking model (FIESI) students will be equipped with productive thinking. As we know that productive thinking is the combination of creative thinking and critical thinking, so by the end of the training students will be able to think creatively and critically also. It can be said that this model will equip students with higher order thinking skills like analysis, synthesis and evaluation. This model helps students to become a creative problem solver.

CONCLUSION

Productive thinking model (FIESI) is a teaching model. It has its syntax, focus, social system, support system, role of students/teacher and place layout. It helps the teachers to train the students for productive thinking processes. It provides a platform to combine creative and critical thinking at one place. It can be generic as well as can be used in an integrated manner. It can be used for a wide range of age groups also i.e., for school education as well as higher education. It is a complete package for higher order thinking skills and can be used for creative thinking, critical thinking and other 21st century skills also.

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