CHAPTER 7

DISCUSSION OF RESULTS

This chapter is devoted to discuss the results of the study. The results have been discussed to get the insight further into the matter. As the major objective of the study was the effectiveness of training module, the same is discussed in the preceding paragraphs.

Effectiveness of Training Module in PO method

The study has revealed that module of PO method has significant effect on the development of Lateral thinking. The major finding of the study is that there was a significant difference in the post test scores of control group and experimental group. It clearly indicates that the students achieved much higher scores after the exposure to the training module in PO method. Therefore, it can be concluded that the module is very effective in developing the lateral thinking of the student-teachers. These results can be explained from the process of PO method, strategies of PO method, association theory and principles of lateral thinking.

The results may be explained through the findings of researchers like Stein 1975, Vengundy 1981, Feldhusen and Treffignes 1985, Feldhusen and Clinkenbeard 1986, Torrance 1972 & 1987, Parnes 1987, Feldhusen 1988 & 1990, which asserted that some deliberate instruction or training can help people become better creative thinkers and creative problem solvers. Same is the most basic premise in the current thinking skill movement that students CAN learn to think better if schools concentrate on teaching them HOW to do SO (Presseisen). The module constructed by the researcher was an effort in the same direction. It deliberately helped in training students methods and strategies to think laterally and was found to be effective.

Even Ristow, 1988, has asserted that direct teaching of thinking skills can produce better, more creative thinkers. The study gets further support from the study of Rao (1994) that observed that creative abilities can be developed by providing proper experiences i.e. training had a significant positive effect on the performance of experimental group instructions in developing thinking skills. The same results were noted by Bala (2000), who found her package effective in developing lateral thinking.

Another aspect of PO module is that it provides information about the methods to think laterally and the methods were quite flexible in this manner. The deliberate questions and the module as a whole challenged the thinking of student-teachers and so resulted in fostering thinking in
them. These results are at par with the statements of de Bono, the originator of PO method. According to de Bono, “one should be free of constraints, tradition and history in order to be creative. But that freedom is more effectively obtained by using certain deliberate techniques rather than by hoping to be free”. McKim (1986) proposed that the conditions like challenge, information and flexibility can foster thinking that is productive and creative. The module in the present study fulfilled all these conditions. It is perhaps because of this, that the module could effectively develop the lateral thinking of the students.

One more reason for the effectiveness of the module may be that the module provided sufficient opportunities to understand the theory and concept of PO. It required sufficient time which was in consonance with the findings of Pogrow (1987) that it takes an extensive amount of time to produce results—at least 35 minutes a day, four days a week, for several months, for true thinking skills development to occur. Even De Bono, 1970, stated that to set aside a definite period for teaching lateral thinking is much more useful than trying to gently introduce its principles in the course of teaching some other subject; Nevertheless, once knowledge of lateral thinking exists, the act of lateral thinking could cross domains and disciplines while performing problem solving activities. De Bono has even suggested that one hour/week during the educational process may be adequate to infuse Lateral Thinking. Once Lateral Thinking is introduced and cognitively implemented, the emphasis would be to use the theory throughout future work. The same holds true for the present study which introduced the lateral thinking to student teachers and made them implement it through exercises so that they can use it in future works.

Still another plausible reason for enhancement of lateral thinking is that PO deals with creative challenge. Creative challenge is totally different from critical challenge. The creative challenge refuses to accept that the current way is necessarily the best way. The creative challenge assumes that the current way is just one way which happens to be there for a variety of reasons. The creative challenge is usually expressed as “why?” “Why do we think in this way?” After one has made a creative challenge De Bono wants one to move on the next step which is to try to find alternate ways of doing things. Here, in this method he explained three different ways to find alternatives. One way was to block the current path of ways of doing things. This forces student-teachers to find alternate ways. Secondly, one can escape from the dominating idea or from the necessity to satisfy some conditions. This forces the mind to consider new possibilities. The third alternative is to drop any new alternative. If one challenges something and finds it not necessary, he may leave it. Such methods definitely help a person to think laterally.
One more reason for the effectiveness of the module may be that the module helped to remove the errors like partialism, adversary thinking, time scale error, initial judgement, arrogance and conceit which are the major hindrance to lateral thinking. The thinker no more observes the problem through one perspective only. The thinker examines many factors of the problem and avoids partialism by avoiding arriving at a premature solution. As the module trains students to challenge for change thus removing the time scale error. As the module trains a person to withhold the initial judgement so it helps in considering the issue or problem objectively, making the approach of the thinker free of prejudice or bias. Challenge for change helps in removing arrogance and conceit as after training from the module thinker no more believes that there is no better solution other than that he has already found. So the block to creativity as well as lateral thinking is removed. It helped in enhancing lateral thinking skills in the student-teachers.

Further, it can be noted that all the tools of thinking are simply the attention directing tools. As a self organizing system mind allows incoming information to organize itself into routine patterns resulting in concept prisons and pattern first introduced by De Bono, 1972. Human brain is habitual of making patterns. It is well trained to adjust new information in relation to the old information and experiences. So a sort of sequence trap or a pattern is formed. This brings continuity in thoughts. So ultimately one ends up thinking in a very similar way. We can however, intervene so that this natural behaviour is used more effectively for our purposes we can develop attention directing tools and structures. PO in general along with its special tools PO-1, PO-2 and PO-3 brings discontinuing in one’s thoughts and channalizes them to a new direction. So the ultimate purpose of PO as a whole is to produce a totally new way of thinking by de-patterning. This could be the plausible reason that after training from the module the students avoided obvious answers. Therefore their score for escape increased tremendously after reading the module.

Another explanation for it can be looked into the way different strategies of lateral thinking are organized under these three broad categories; challenge, alternatives and provocation. These strategies were properly explained in the module and students were trained in ways to use them. The first strategy explained in the module was random juxtaposition or random input. The effectiveness of this strategy of module in PO method lies in the connection making theory. In PO method, students are made to obtain a word that has no connection whatsoever with the problem and holds the problem and this word together. De Bono terms it as PO envelope. One of the functions of PO is to allow one to put together words or ideas in a way that would not be justified on any logical grounds. PO itself is the only justification. Used in this way, PO does
not connect the words in any way. PO just provides an envelope to hold the words together. As some catalyst accelerate reactions just by holding reactants together, thinking also is accelerated by holding an idea and random word together. This random input method works because our brain is quite good at making connections. DE Bono asserts that there seldom is a problem to which that word is too remote. Instead it could often happen that the word is so closely connected to the focus area that there is little provocative effect. To avoid this, the random work should be selected by some method, especially while working alone. This random input technique is very good for producing new lines of thoughts and ideas that would never have been reached by any sort of logical design or analytical process. Mixing in an unrelated concept causes the brain to think in a different direction and come up with new links, combining previously unrelated ideas to form new ones. This must have helped the students in producing more original ideas. Therefore, the module helped in increasing the originality scores of the students. De Bono, 1995 stated “Everyone knows that instant judgment is the enemy of creativity,” It isn’t necessarily that all judgment is wrong; it’s allowing the ideas to emerge without screening them out. It is repeatedly mentioned that there is a need for a quantity of ideas for a good one to emerge. That is what module offered to students. The module gave a flip to their thinking and they were able to use these techniques while solving lateral thinking test problems. It provided a technique to consciously bring about a particular psychological state. New associations and conscious detachment from the immediate situation provided a new outlook to the student-teachers.

Rothenberg (1976, 1976) also identified properties common to creative experience. He had clearly demonstrated the existence of two thought processes which affect creativity, ‘Janusian thinking’ and ‘Homospatial thinking’. Janusian thinking allows the juxtaposition of two contradictory concepts or images to form a single, unique and unified idea. It involved holding two opposing ideas or images in one’s mind at the same time. Homospatial thinking was the visualization in the ‘mind’s eye’ of two separate entities simultaneously occupying the same space producing a new mental image. The latter was frequently associated with verbal and musical metaphor and with visual obstruction. The module prepared in the present research studied the effect of PO method on lateral thinking. Random juxtaposition, the first strategy of PO was very much similar to these thought processes and was called The merging of two totally different ideas to give way to a totally new thinking was in accordance to Rothenberg’s theory.

The effectiveness of the module can also be justified considering the basic principles of lateral thinking. The first principle of lateral thinking is Background i.e. the need for lateral thinking rises from the way the mind behaves as a patterning system which requires discontinuity in
order to change patterns and bring them up to date. As the module in PO method also does the
same so it could easily enhance lateral thinking. The second principle of lateral thinking is
process. Lateral thinking is concerned with change-with escape from old ideas and generation of
new ones. As already mentioned, the module provided escape from the obvious, so it could also
be the possible reason for the effectiveness of the module. Looking at the process of lateral
thinking as given by de Bono, the two basic principles, escape and provocation both were
integral parts of the module. The major stress of the PO method itself is on the conscious use of
provocation. Provocation has everything to do with the experiments in the mind. Experiments in
the mind have everything to do with the lateral thinking. That is why good provocation is so
important for being lateral as well as creative. We all know that a lot of new ideas come from
mistakes, accidents or madness. All these happenings force us from outside the usual boundaries
of reasonableness that has been established through our experience. In provocation we move
from the starting point to an arbitrary provocation. Then we move on from provocation to an
idea or concept. Now looking back we can get the real value of the idea. The method thus helps
to break from straightforward way of thinking. Instead of thinking linear, provocation helps in
taking an altogether different direction of thinking. It is because of this that student-teachers
became capable of escaping from the obvious answers.

The third principle is method which means the use of lateral thinking consisting an awareness of
the patterning nature of mind, an appreciation of the difference between the rules of lateral
thinking, the application of special settings as techniques and of a new operational work. As the
module was developed keeping in mind all the principle of lateral thinking, that may also be the
reason behind its effectiveness.

It can further be explained by two methods of provocation as advocated by de Bono. The first
method is called the escape method and the other is stepping stone method. Escape method is a
simple method where the first step is to spell out something that we take for granted. The next
step is to escape from what we have taken for granted. This is the provocation that helps the
students to escape from obvious/granted answer. Second method of making provocation explain
by de Bono is called the stepping stone method. The main idea behind this is to carry out some
mechanical operation on something that already exists. One can make stepping stone
provocation by exaggeration, wishful thinking. For this one simply puts forward a fantasy
knowing that it is impossible to achieve, which helped the student teachers to escape from the
obvious answers and in other words helped in increased scores in escape factor of lateral
thinking.
Another explanation for it can be looked into the way the provocation is organized in the provocative operation method. De Bono describes two broad ways of using movement to generate provocation: general attitude and systematic techniques. The general attitude is a general willingness to move from a statement or provocation. If it does not work there are some techniques that can be used systematically to get movement. The most important ways to get movement described by De Bono are called “extract a principal” and “movement to movement”. When a principal is extracted, it helps to look at the provocation and seek to extract a principle from it. To take this principle, ignore the rest and start working with it. Working moment to moment, the provocation can be visualized in the brain and thus in the action. In this way students are no more interested in the result but in the moment to moment happenings. This could also be the reason that the student-teachers were able to extract principle which lead them to seek to develop some new idea or concept helping them to escape from the given ideas.

One of the strategy in the module was intermediate impossible i.e. PO-1. This strategy discusses the general tendency of a human being. Faced with an idea one rushes to judge whether it is correct or incorrect. If it is correct, one accepts it and proceeds. If it is incorrect, one discards it and proceeds in a different direction. PO allows one to keep an idea under consideration a little while longer after it has been rejected. There is a shift of attention from what is wrong with the idea to what is right with the idea. The idea is neither accepted nor rejected but is held as stepping stone to further ideas. That is why an intermediate impossible leads to many outrageous ideas. This along with the increase in the tendency to escape from the obvious, as discussed earlier, may have resulted in tremendous increase in the outrageousness score of the student-teachers.

It may be noted that there was a major decrease in the vertical thinking score of the student-teachers after the exposure to the module. It does not imply that student-teachers stopped thinking vertically. Rather the reason for the decrease in score was because of the increased tendencies of the student-teachers for original and outrageous ideas over obvious ideas. Student-teachers after the exposure with the module must be having plenty of ideas, vertical as well as lateral. But the module trains them to choose more of unorthodox ideas resulting in decrease in the score of vertical thinking.

The results in the present study, about the effectiveness of module in lateral thinking are also in consonance with the researchers like Sheridan (1990) who found brain research based writing programs to be very useful and appealing in developing lateral thinking skills and Weiss (1977) who studied techniques to improve thinking and suggested that the problem solving has some
positive effect when implemented under typical classroom situation. Further, the module gave exposure to different problems in a teaching learning environment. The module was followed by an exercise-sheet. The two in combination gave many opportunities to students to play with various ideas that they mostly neglected in regular classes. Therefore, they could create new solutions to the problem. It was in accordance to Wenger (1999), who indicated that students when engaged in problem solving expanded their thinking skills.

Variety of instructional materials and programs, both short term and long term have been developed for training creative thinking, critical thinking, problem solving in educational settings though mostly in the west. One study was obtained which sought to apply the work of Edward de Bono to five kindergarten classes in Malta (Dimech and Pace, 2003). This work is based on the idea of ‘lateral thinking’, that divergent and creative approaches to problem-solving can be more successful than linear reasoning. The children took part in age-appropriate exercises in creative problem-solving and the kindergarten staff considered that the intervention increased pupils’ self-expression and confidence. So we can say the result of the present study fall in consonance with all these findings. Similar (positive) results were recorded in report of thinking skill instructional activities (Mid-Continent Regional Educational Laboratory, 1985) while examining the effects of training teachers in how to foster in their students 18 higher-order thinking sub skills in the three areas of learning-to-learn skills, content thinking skills, and basic reasoning skills. Alexandria also reviewed studies of the effects thinking skills instruction on test performance and on the transfer of cognitive skills to new and different situations and found that thinking skills instruction both improves academic performance and enables students to become better problem solvers in other situations, both in and outside of school. Research shows that different techniques enhance the development of critical and creative thinking skills (Cotton 1988; Pearson 1982; Robinson 1987; Tenenbaum 1986). Baum 1990; Cotton 1988; Herrnstein, 1986; Matthews 1989; Robinson 1987; Sternberg and Bhana 1986 found Redirection/Probing/Reinforcement to effectively enhance the high order thinking. In the present research also, methods are adopted to redirect thinking in a new direction. Focusing directly on 'thinking' sharpens perceptions and lateral thinking. For the same reason various techniques like generation of alternative, brain storming, finding analogies etc. have been explored in the recent times by different researchers and found to be effective. Cotton 1988; Hudgins and Edelman 1986; Pogrow 1988 found that asking higher-order questions enhanced critical and creative thinking. Same was true for lateral thinking. It justifies multiple increases in lateral thinking skills after the exposure to the exercise sheets.
The efficacy of direct instruction in a variety of thinking skills is demonstrated in the work of Freseman (1990); Herrnstein, et al. (1986); Pearson (1982); and Wong (1985), among others. The present study also adopted the direct instruction to teach lateral thinking skills instead of inferential method and found it effective. The present study involved a module based on a special technique, PO method that mainly focuses on de-patterning our thought system so as to shift our thinking in a totally new direction. The module explained the simple methods to escape from the concept prisons, which are the main cause why we all end up thinking in nearly same way every time.

As it was being asserted that to improve student performance on critical thinking tests, schools of education must improve teacher training. They must teach cognitive skills to pre-service teachers before training them to teach these skills in the classroom (Ashton 1980). They must integrate critical thinking skills into all aspects of teacher preparation and train future teachers to be models of effective thinking strategies (Walsh and Paul 1988). Schools of education have several obstacles to overcome before accomplishing these goals, including an inadequate knowledge base on teaching critical thinking; a lack of consensus on methods of evaluating critical thinking programs; conditions that require classroom management at the expense of academic instruction; and a lack of support for collaboration between liberal arts and teacher education faculty (Ashton 1988). Elementary and secondary schools considering a critical thinking skills emphasis must make a long-term commitment to programs fostering the critical thinking process; provide in-service training; assign mentors to new teachers; allot time for teachers to share effective strategies for instruction; involve experienced teachers in the selection of instructional materials and testing programs (Joint Committee on Standards 1988); and appoint a committee to guide curriculum development (Walsh and Paul, 1988). The same holds true for the other high order skills like lateral thinking skills and problem solving. To teach students how to think laterally, the teachers must be trained in some latest techniques and programs need to be devised to train teachers.

Further de Bono (1972) asserted that our thinking has a unique pattern. It consists of two phases. Phase-I is the perception stage. Perception gives us a way to look at the things or situation. Second stage comes after perception stage. It is called the processing stage. Generally we are concerned with only the thinking that comes after perception. We don’t pay heed to perception as we believe that there could be only one way to look at things. We are habitual of recognizing patterns and reacting to them. These reactions come from our past experiences and logical extensions to those experiences. The module helps in changing the perceptions of the students and teaches them to look at the things with a new perspective. Therefore, it helps in providing
them different ways to look at the problems. It also must be the reason for increase in the scores of lateral thinking after the training by module.

One more finding was about the effect of intelligence on the lateral thinking test scores. A significant effect of intelligence on the lateral thinking scores was noted in the study. The result is explained through Skinner (1958) who found that the active participation was necessary for effective learning. These results are at par with those of Pathak (1962), Dhailwal and Saini (1976), Dey (1984) who reported positive and significant relationship between intelligence and creativity. Researches by Sharma (1974), Joshi, (1974) and Chaudhary (1983) also reported positive and significant correlation between intelligence and creativity. Further the difference in the mean scores of middle and low intelligence group was very small. So we may conclude that although the high intelligence students tend to score better in lateral thinking test yet intelligence is not a determinant of lateral thinking.

Techniques that apply lateral thinking to problems are characterized by the shifting of thinking patterns, away from entrenched or predictable thinking to new or unexpected ideas. A new idea that is the result of lateral thinking is not always a helpful one, but when a good idea is discovered in this way it is usually obvious in hindsight, which is a feature lateral thinking shares with a joke. This feature of lateral thinking makes it interesting just like a joke. It justifies the high degree of interest shown by the student-teachers in the training module.

The study involved training in PO method by modular method, which has a unique characteristic of overt responding and immediate feedback. That calls for active participation from the students which also may be the reason for the effectiveness of the module. These results can be explained through Holand and Skinner (1961) who found that active participation was necessary for effective learning to take place.

When the effect of intelligence was studied in relation to the effect of testing occasions, no significant difference in the test scores of different groups with respect to intelligence was reported. It may be observed that all experimental groups fared much better than their counterparts in control group irrespective of their intelligence. It is also to be noted that the mean scores of all three groups in experimental group were equivalent to their counterparts in control group. So it can be concluded that the module was equally effective for all the student-teachers irrespective of their intelligence.

The trend of improvement on different occasions in case of all the three strategies was linear and the direction of the trend was upwards. It thereby means that the gain scores of student-
teachers increased linearly with each activity and thus with each strategy of the module. The result is very much obvious, as the module discusses PO technique in general along with its three tools PO-1, PO-2 and PO-3. These tools along with the exercise sheets provide ample opportunity to the student-teachers to learn how to de-pattern their thinking. The growth in lateral thinking was maximum at the end i.e. after the presentation of exercise sheet. It was probably due to the exposure and opportunities to solve the lateral thinking exercises that helped student-teachers to channelize their thought pattern in different directions. The interactive approach of module with provision of immediate feedback keeps students engrossed all the time. Further most of the examples given in all the strategies were in form of student and teacher interaction just like a real classroom. The student-teachers can easily identify with this situation, which further enhanced their learning about the method. The examples presented in the module were quite interesting and close to day to day life, making them more understandable. The explanation and reason cited above show that the module on lateral thinking helps in developing lateral thinking skills in the student-teachers.

**Effectiveness of training module in terms of student teachers’ reactions towards the module.**

The findings regarding the effectiveness of training module in term of student teachers’ reactions towards module indicate that the student teachers belonging to experimental group had quite favorable reactions towards the module. Its explanation lies in different aspects of module, the method and process. The student-teachers showed favourable reactions towards the method that is modular method. One of the most plausible reasons for the same is that the module was divided in small activities where method was described in very simple language along with a lot of illustration the illustrations and graphical presentations made the content interesting and kept student motivated. Further there was a provision of immediate feedback which further keeps student motivated the exercise sheet presented in the end of module further provided student teachers an opportunity of exposure to the problematic situation. In this way, learning of concepts, no more remains a boring task for the students. Further the motivation does not allow the students to be inattentive while being trained by the modules. Skinner (1958) and Skinner (1961) also found that the active participation is necessary for effective learning to take place. Regarding the study it may be inferred that the provision of active participation by the learner might have contributed in the active learning and thus the overall effectiveness of the module.

The other aspect of module was the theory or process behind it. The student-teachers reactions towards the process were also found to be quite favourable. The reasons behind that was

1) Novelty of method- The method was quite novel to most of the student and they all found it very interesting.
2) Utilitarian value - The student teachers found the method to have lot of utilization in personal as well as professional life. As an idea generating tool the method can provide a big scope for innovations, improvisation and creativity

3) Simplicity - The techniques of the module were quite simple, so could be assimilated very easily. Once learned, the techniques proved to be unforgettable

4) Related to life - Examples presented in the module were also simple and related to daily life, which could be another reason for the favourable reactions of the student teachers toward the module.

**Effectiveness of training module in terms of student teachers’ willingness for the implementation of the module.**

The results revealed that the willingness of student teachers of experimental group to implement the module in PO method in real classroom situation was very high. This means that student-teachers felt that the module can be used in the classroom and no special instrumental material is required to implement the module. The student-teachers further felt that the module could improve the quality of the teacher education. The first reason for the high willingness of the student teachers was that the module was in form of a self-instructional package and required no extra apparatus, instrument or material. So the student-teachers found it feasible to be applied in general class room. Further, the student teachers felt that the module could bring improvement in teacher education program without adding to any extra burden on the staff as well as students. The method also was not time consuming. The student teachers were also willing to implement the method as they found it highly effective in developing lateral thinking in the students.

On the basis of above explanation and reason given in the preceding paragraphs show that the group training module on PO method presented by the researchers proved to be highly effective due to active participation of students, simplicity, figural illustrations and day to day examples, interesting explanation and above all the novelty of the method. On the basis of this discussion, it can be said that provocative operation (PO) method itself is such a process that provokes to develop thinking skills among the students that leads one for enhancing lateral thinking that’s in other words creative thinking.