

Chapter VI

DATA ANALYSIS AND INTERPRETATION

6.1 Introduction

The objective of the present study has been to determine the effectiveness of the methods and techniques used for enhancing critical thinking in the students of std. XI using the subject psychology as content.

The present study is an intervention program carried on for the period of four months, on a single group, using pre-test post-test design. The criteria for judging the effectiveness of the prepared program was gauged by the difference in the students' performance on the tool measuring critical thinking in the pre-intervention phase and in the post-intervention phase. The data generated were both quantitative and qualitative. A detailed description of the data analysis and the inference drawn in respect to the stated objectives has been provided in this chapter.

6.2 Critical Thinking Tool

Critical thinking in student was measured through Critical Thinking tool prepared by the investigator herself (The development of the tool has been and the scoring procedure for the same is described in the chapter III, section 3.3)

6.3 Quantitative Data Analysis

The Critical Thinking tool was administrated to the group in the pre and post intervention phase. The students' scores in each test (pre-test and post-test) measuring Critical Thinking were summed up and their mean was found out

separately for the pre-test and post-test. The investigator employed Single-Group-Method t-test to find the significance between the initial mean scores of critical thinking, on the Critical thinking tool during the pre-intervention phase and final mean on the same tool during the post intervention phase. The mean scores, standard deviation scores on pre-test and post-test, and t-test value has been displayed in Table 1.

Table 1. Mean, Standard deviation and t-value of the scores on the tool Measuring critical thinking before and after the intervention Program.

Pre Intervention		Post Intervention		df	t-value
Mean	SD	Mean	SD		
68.9	20.5	96.5	20.96	22	3.27

Significant at 0.01 level.

Referring to Table 1. it may be observed that the pre-intervention mean score of the student is 68.9 and post intervention mean score is 96.5, indicating that mean scores are higher after the intervention program. The standard deviation (SD) of the mean score is 20.5 in the pre-intervention phase and 20.96 in the post-intervention phase and the t-value is 3.27. This is indicative of the fact that the difference between the pre-test and post-test score is significant. Thus in the light of the data analysis, the increase on the critical thinking scores on the post-test can be attributed to the intervention program.

For the present study, the quantitative analysis using t-test indicates the difference between pre-test and post-test scores are significant, which points to the effectiveness of teaching-learning strategy employed to develop critical thinking in students of std. X1, using the subject of psychology as content.

Nevertheless, the investigator is of opinion that the quantitative analysis in its self is not adequately intelligible unless substantiated by other relevant supportive data

6.4 Analysis Of Students' Performance on the Critical thinking tool and during the instructional process

Since the pattern of thinking of each individual student is of concern for this study it is important to make known the changes in thinking process experienced in an individual student, if any. In the light of this the investigator has attempted to describe each student's performance on the Critical thinking tool in both pre-test and post-test and also present her reflection on her observations of the students during instructional process under the heading class-room interaction. A student's verbal interaction in the class is indicative of his/her thinking process.

6.4.1 Introduction

The critical thinking tool has 3 sections. The first section deals with the ability to relate and reason, the second section measures critical reading ability in students, and the third section measures various dimensions like analysis, questioning ability, comparing and contrasting, evaluating, independent thinking and so on. The students' test scores (pre and post-tested) on the tool measuring critical thinking displayed in table 1, table 2, table 3, . . . table 13, which in turn will be interpreted. Most of the interpretation of the scores on the Critical Thinking tool is descriptive in nature, using word. Besides the student's performance on the critical thinking tool a glimpse will be given on the thinking process during the intervention phase under the heading classroom interaction. The student's verbal interaction in the class is indicative of his/her thinking process. The similar process will be followed for all the 12 students.

(1) Student no. 1

Table 2. Pre-test and post-test scores on Critical thinking tool for student 1.

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 24	7	20	18	20	15
Post- 30	14	20	18	20	18

It can be observed from the Table 2 that even prior to the intervention program, the candidate's scores on the tool measuring critical thinking were high. This goes to indicate that the candidate already possessed critical thinking ability, especially, on the dimensions considered for the present study like ability to relate, evaluation, justification, questioning ability, comparing and contrasting. Notwithstanding, the candidate has shown an improvement in critical reading ability. This is evident from the difference in the pre-test and post-test scores on the item measuring critical reading (7 marks in the pre-test against 14 marks in the post-test). Like other students, critical reading had been a new concept until the intervention phase. The increase in the scores may be attributed to the intervention.

The investigator had been inquisitive to know how the student possessed good critical writing ability and through classroom interaction. It had been revealed that the candidate had been studying in another school. He had opted for a transfer to the present school in std. XI in order to procure admission to the Arts stream.

The previous school is well known and noted for its innovative and explorative teaching methods. The candidate's already imbibed critical abilities may be attributed to his educational experience in that school

Classroom interactive process

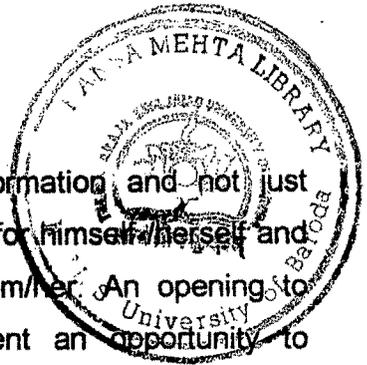
Throughout the intervention phase, the candidate was found enthusiastic and an active participant. Whenever the researcher put forth questions to the class, which called for analysis, justification, reflection etc., the student took the opportunity to answer. The candidate's answers were perceived to be very analytical and meaningful and even sometimes insightful. A few instances can be given - After having taught the meaning of 'Insightful learning', in the chapter on Learning, the researcher asked students to give examples for the same. The candidate was the only student who provided an example. The example provided by the student was that of Sherlock Holmes, the well-known crime investigator, who in the process of various interviews with people and observation insightfully connected the unsuspected person to the crime. This example shows the candidate's own understanding of a difficult concept 'insight' and his ability to relate his previous knowledge (stories of Sherlock Holmes) in a new situation. The investigator was impressed by the student's uncanny insight.

Another instance that is worth mentioning was that when the researcher asked the importance of classical conditioning in training. The candidate pointed out that with the help of classical conditioning retarded persons could be trained, when all the while the focus was on animal training. There have been many more of such kinds of instances and it is not possible to mention all of them.

During the interaction the candidate mentioned that he had found learning enjoyable and found working on the thinking tasks interesting.

Observation

This particular student has a good understanding of the concepts. Here the term understanding encompasses more than just knowing. It is rather an awareness and appreciation of knowing. The critical thinking task facilitates in creating such a learning environment that has enabled the student to become an active learner.



Only when the student is involved in processing information and not just memorizing factual material the student makes meaning for himself/herself and not passively accepts the ideas which are given to him/her. An opening to understand and think on the content gives a student an opportunity to intellectualize on what he/she is suppose to know, thereby the instructional process become interesting and stimulating, as experienced by this student.

(2) Student 2.

Table 3. Pre-test and post-test scores on Critical thinking tool for student 2.

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 19	7	8	8	8	16
Post- 26	15	16	15	20	20

It can be observed from the difference in the pre-test and post-test scores that the candidate has made a quite good progress in all the sections in the tool. In the post-test the candidate has performed better on section 1 that called for the ability to relate. The answers in the pre-test reveal that the candidate was unable to pick out the correct relationship plus failed to show appropriate relationship, this had been improved in the post-test.

For the section 11, the candidate's score on posttest has improved. The student's post-test scores on the item measuring critical reading ability reveals that the student has been able to grasp and learn the art of critical reading, until the intervention the student had not known what critical reading was.

In the section 111, the candidate's post-test scores on the item measuring ability to judge/evaluate have improved over the pre-test scores. In the post-test

the candidate has looked into the pros and cons of the two subjects under consideration i.e. 'T.V' and 'Telephone', but the answer should have had more depth and a few illustration to support her point of view, which it did not contain. The candidate had shown the advantages of T.V over telephone and hence it could be inferred that the candidate's has used PMI technique for evaluating process. But the candidate had failed to mention any disadvantages of television therefore the candidate has not been critical enough.

Again in the section 111, in the post-test the question calling for Independent thinking supported by justification was answered well but again lacked depth and completeness. In the post-test the candidate has stated that she firmly believes that censor board in democracy is necessary and provides reasons in support of her point of view. The student had also gone to add that she is in favor of free expression of the press provided they adhere to the moral values. From the student's response it can be inferred that candidate has used OPV (other point of view) technique but has failed to use it effectively, as, in many instances the investigator gets an impression that the answer is incomplete. There are statements that seem paradoxical, conveying inconsistency in candidate's point of view. Further the student's answer is not backed by any illustrations to support her stand.

In section 111, the candidate' post-test performance on the item measuring questioning ability is good. Although, the candidate has put in 3 questions and all these questions are logical, have clarity, very significant and answerable. The student has also given adequate reason as to why she has put down those questions. The student's questions have been presented below.

Q4. An advertisement . by 'Soap & Soap', Our soaps are the best thing that can happen to your skin. It leaves your skin soft and smooth (Students are required to ask questions to find out the genuineness of the claim).

Pre-test questions : What is the proof it?

Have you made experiments on human skin?

Is your company recognized by the govt.?

The first question definitely is relevant, but lacks clarity and answerability. One may not be able to gauge what proof the person wants - in terms of ingredients, sales, approval and so on, plus the question is put forward in a harsh and offending manner. Again second and third question are not relevant, for experimenting on humans is not allowed and no company can operate without a license. More over the candidate did not supply reasons for putting forth the above questions.

Post- test questions : What kind of chemical substance do you use which makes the skin soft?

What is your sale?

Do you have certificate of any doctor who has recommend your soap?

Reasons supplied by the candidate for putting forth these questions were convincing. The candidate exactly knew what her questions intended to ask and what she wanted to probe through her questions.

In section III, The last question based on comparison was done using CAF (considering all factors) i.e. the student has developed standards/criteria for comparing and contrasting and has shown flexibility in doing the same.

Classroom interactive process

Candidate was an extremely active participant and snatched opportunities to express herself. The student could relate very well to the classroom process, which was indicated from her interaction in the class. During one of the classroom discussion, dealing with the chapter 'Attention', a case was given to the students (the detail of the case can be found on the section 5.16.2. Students

were asked to find out from the given situation in the case, if the break in the attention was due to `shift in attention` or due to `distraction`. One of the students was making his own assumptions to prove his point and this candidate immediately pointed out that following assumption was the person's own and had could not be implied from the given case. This points to her critical reading ability that had been taught in the class. During the course of time the student learnt to ask a lot of questions in class that demanded evidence in support of what the researcher was saying, showing constructive skepticism. One such incident that can be stated is, while dealing with the chapter on perception the researcher mentioned that different individuals would perceive the meaning of abstract painting in a different manner. Before the researcher could progress further, the student disapprovingly asked the researcher how could that be possible. The investigator was able to satisfy her query through a demonstration. There were still many more of such instances where this student had raised queries.

During instructional process, there were many times when the student came up with examples from life situation showing her ability to relate, understand the concept. For instance, when the students were asked to explain the concept `Extinction` with help of an illustration, the candidate gave an example of a student who was in a habit of wishing a particular teacher but in the absence of any response from the teacher, her behavior got extinct.

The researcher found the candidate quite sharp and analytical.

The student expressed her joy in being the part of new teaching -learning process and added it would be some time before the art of critical thinking really got ingrained in their personal life and learning process.

Observation

The classroom observation showed that student had enjoyed the instructional process as she actively participated in the classroom discussion. The student was found enthusiastic in working on classroom assignments

(thinking tasks). It was a pleasure to notice that the candidate had used most of critical thinking techniques like PMI, OPV in the post- test. During the classroom interaction the investigator found the candidate quite sharp and analytical whereas the concerned subject teacher regarded the student as a slow learner due to low marks in the tests. The student confessed that she had difficulty in remembering things. The researcher assured the student that she was bright by pointing out various occasions where she was the only one in the class to give an answer that required thinking. Researcher suggested the student should concentrate on understanding the rather than just rote memorizing / mugging up.

The education system has to relinquish the emphasis on memorization of textbook knowledge by students. It has to break free from the usual pattern followed for teaching-learning wherein fixed content gets transmitted from teacher to student. The critical thinking approach in teaching psychology subject has facilitated the student to understand and relate to the concepts under consideration through her own analysis, evaluation and judgement.

3. Student 3.

Table 4. Pre-test and post-test scores on Critical thinking tool for student 3.

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 21	14	13	13	12	20
Post- 30	18	20	20	18	20

The results indicate there is some sort of improvement in the post test for all the section. In the section 1, in the post-test the candidate was able to establish a right relationship and also reason out appropriately. This can certainly be indicated from difference found in the answers in the pre-test and post-test.

(The investigator reports students' answer as it is without much/any editing)

For example - Q2. Water : Thirst

Pre-test choice Book : Ignorance

Reason If we are not thirsty water is of no value similarly if we
if we have a book and we ignore it, the book is
worthless.

Post test Water : Thirst

choice Rain : Drought

reason I think they share a common relationship because in
order to overcome thirst we require water and similarly
in order to overcome drought we require rain.

Example Q3. Dove : Peace

pre-test choice Taj Mahal : love

reason It is related because 'dove' word itself represents
Peace and Taj Mahal to represents as a model of
love and purpose of it.

Post test Taj Mahal : Love

reason In my view they are related because just as dove
symbolizes peace, Taj Mahal symbolizes love.

From the student's above responses, it can be inferred that the student has certainly made an improvement in the ability to relate and analyze. For the question 2, in the pre-test the choice itself was incorrect while in the question 3, although the choice was correct but lacks clarity and relevance in reasoning.

The student has shown some improvement in the section 11, but the investigator can not correctly say to what extent since the student did not complete the last question in the particular section. Although there was not much

difference in the performance in the pre-test and post-test nevertheless the investigator could find more clarity and precision in presentation of the answers in the post-test.

In the section 111, on the post-test, the question on `evaluation` had been answered satisfactorily. The student has shown her preference for a telephone to that of a T.V (independent thinking). The candidate has supported her stand through proper reasoning and justification. The answer had clarity, flow, depth and completeness. The candidate has evaluated the two inventions using PMI While the pre-test answer was marred by lack in clarity, flow and depth.

In the section 111, The candidate answered the question that required justification of one's stand using the OPV technique. The candidate has argued her point through dialectical thinking. The candidate put two opposing point of views - one in favor of censor board and other against it and argued her way through to defend her own position that was in favor of censor board. The candidate's stand/position was supported by illustration of the film Bandit Queen. The pre-test did not consist of any of these fine arguments. The investigator also noticed flexibility of ideas emerging in the post-test. In the pre-test, the candidate had just dwelled on a single idea that is the censor board's role confined to films only while in the post-test the student extends censor board's scope to book and new besides films.

In section 111, the candidate's performance in the post-test has shown improvement on the question measuring questioning skill. The questions put forth by the candidate were significant, possessed clarity and were answerable while in the pre-test most of the questions were redundant like What is the soap made of ` and ` does it contain any natural herbs. Question like `Does it leave the skin soft and smooth or even has side effects` lacks clarity and answerability.

In section III, the candidate's performance in the post-test has shown flexibility of ideas on the question that measured ability to compare and contrast.

Although the student had learnt CAF technique in order to draw comparison, the candidate did not make use of it.

The subject's overall performance on the post-test suggests that the candidate's thought process has become much more organized, systematic and has clarity than what it had been in the pre-test.

Classroom interactive process

During the intervention process, the candidate was found to be attentive (evident from the eye contact and facial expression), but the candidate was generally laconic. The candidate answered, only when a special reference was made to her. The candidate eagerly waited such an occasion. On one such occasion the investigator had requested the candidate to explain 'Approach - approach conflict' with help of an illustration. The candidate uninhibitedly spoke of her own conflict, experienced, when she had to make a decision between two schools. The candidate had two options before her. The candidate could either join a school that she preferred and loose a year or join another school and save a year.

Although the candidate did not take much initiation in the classroom discussion, she had verbally expressed that she was using critical thinking skills in her personal life and also mentioned that candidate's writing ability had improved. The candidate further added that this had been the first time the candidate was making application of the knowledge and had used her mental capacity to evaluate and think for herself on the thinking tasks, assigned by the investigator.

Observation

Although the student had not been communicative in the classroom discussion, yet from her performance in the critical thinking tool it is evident that the student was very involved in the classroom process. It was a pleasure for the investigator to find positive changes in her writing ability. The student's thought process had become much more organized, systematic and has clarity, this was evident from her writing. The student had been vocal to say that she found the classroom assignments quite interesting as it provoked a lot of thinking on the subject. It was also wonderful to know that the student had started using critical thinking approaches in her personal life too. Any sound education must emerge from a principle- that it should prepare students for life and should not remain confined to merely learning of concepts and principles that are simply memorized and stored. A student ought to be given the opportunity to think, for quality of our students' thinking will govern the decisions that they will make which in turn, will determine the future of our world.

4. Student 4.

Table 5. Pre-test and post-test scores on Critical thinking tool for student 4.

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 11	5	15	8	15	10
Post- 30	8	20	17	20	15

From the above data it is evident that the scores on the post-test in comparison to the pre-test, on all the sections are high. The candidate has especially scored high in the section 1, on the question that measured ability to relate and reason.

Although the candidate has not selected the correct pair that has same relationship as in the original pair of the given words but, the candidate was able to provide reasons in support of his/her choice.

The section 11 of the Critical-thinking tool measures critical reading ability. The student's post-test performance in this section indicate that the candidate has not made the required improvement as the scores on the pre-test and the post-test are almost the same.

As the student's pre-test and post-test answers in the question no 1, in section III happen to be short, the investigator has presented them below. The investigator has reported student's answer without any/much editing.

Q1. Out of the two inventions 'Telephone' and 'Television' according to you which is the most important invention? why?

Student's pre-test answer:

In my view the television is most important because through television we get to know about the events which are occurring in other parts of the world. We can see the events live, sitting at home. It provides entertainment, news, music and so on.

Student's post-test answer:

According to me, both television and telephone are important. But in my view television is more important because through television we can know what is going on in other parts of the world within minutes. Television is also very educating and entertaining. Telephone is useful for getting information but not everyone can afford long distance calls as it is very costly.

On comparing student's pre-test and post-test answers one can find that the student's post-test answer has depth as both the inventions have been evaluated and a comparison has been drawn to some extent. The student's post-test answer indicates the student has made efforts in using the technique PMI. The investigator feels that the student could also have highlighted some of the disadvantages of television, in order to show candidate's evaluation is unbiased.

In the section III, the student's post-test performance is good on question 2 which measures the ability to think independently. The student stand on the issue was supported by categorical arguments for instance the student argues that people who talk of free expression has failed to perceive the negative impact of it on the society and especially the children. The researcher could perceive depth in the arguments and student's own conviction in the answer (in post-test). But sadly the student could not develop his perspective through other point of view (dialectics) because of his firm conviction on the importance of censor board. The student's pre-test response did not display the strength of his conviction than. The arguments laid down in the pre-test lacked ardency and cogency.

On the question measuring questioning skill, the candidate has shown improvement in performance. The questions put forth by the student (post-test) had more clarity, relevance and significance than those in the pre-test, for instance the student's questions in the pre-test reads- 'whether the soap was a new brand or an established brand'. The reason supplied was absolutely vague i.e. 'if a new brand, cannot experiment with it. Most of other questions were on the similar lines.

Similarly the candidate had shown an improvement on the question based on comparison. The post-test showed flexibility in ideas in comparison to the pre-test and in addition the post-test answers were elaborate and had more clarity in comparison to the pre-test.

Classroom interactive process

The candidate was found to be very participative and active. The candidate had been one of the students who took opportunity in answering questions and raising significant queries. For instance the candidate wanted to know the concept of 'figure and ground' in taste. The researcher explained when a person can discriminate between two tastes, for example taste of pizza or a cake is ground and the topping or flavor becomes the figure. After having been convinced the candidate further wanted to know what was the figure and ground in a bland or a raw eatables. The candidate was told in such case figure and ground was merged together. The candidate's particular question indicates the candidate's analytical ability i.e. to look deeply into the matter and to determine the nature of the things.

Another instance that is worth mentioning is when the researcher gave a case of two people engaged in sports, one persuaded sports for the sake of hobby and other as a professional. What would be the difference in the two people's behavior? The student had laid down most of the points and also mentioned that in case of a predicament, say rain, the professional would carry on with the training. There had been many more of such occasions where the student had shown his analytical ability.

The student had articulated his pleasure in being the part of the intervention programs as it gave students the opportunity to actively participate in the learning process.

Observation

The critical thinking approach has enabled the student to analyze, apply, interpret and evaluate the content that was being taught. Student had the opportunity to ask for clarification and draw meaning for himself on the given information and

experience. If it weren't for this approach to the subject the student might have remained passive recipient. The student had voiced out that he enjoyed the classroom assignments as they called for thinking and reflection.

5. Student 5.

Table 6. Pre-test and post-test scores on Critical thinking tool for student 5

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 10	8	15	12	10	10
Post- 22	18	20	15	18	15

One can definitely observe student's post-test performance has improved in comparison to the performance on the pre-test.

On section 1, on the post-test, the candidate has made improvement in the ability to relate and reason. Although the choice in the section of the pair has remained the same both in the pre-test and post-test but the ability to describe that relationship and supply reason has altogether improved. This can be noticed from the examples given below:

(1) pre-test Dove : Peace
 choice Taj Mahal : Love
 reason Dove, bird is for maintaining peace and not for distruction.

Post-test Dove : Peace
 choice Taj Mahal : Love
 reason Dove marks peace, similarly Taj Mahal marks love.

In some of the items although the choice of pair remains faulty nevertheless there is a marked difference in the reasoning. For instance the choice is **Book: Knowledge** on the item **Pen: Nip** and the reason given is *there is a relation to*

pen and nib, as nib helps to write in the same way book contains knowledge that we get'. On the post-test there is a similar choice but the reason is different, it reads as both are related because nib is used for writing and book is used for gaining knowledge.

On item measuring critical reading ability the student has improved. According to the researcher, the candidate is the only one who has performed very well. The student has correctly identified conclusions, assumption and implications from the statements, but at the same time has given reasons for identifying the same.

In section 111, on question 1 which calls for evaluation, the candidate has used the technique PMI for evaluating between the two inventions namely T.V and Telephone (in the post-testing). Both pre-test and post-test results shows clarity and relevance i.e. logical relationship and importance to the matter under consideration.

On the question 2, in the section 111 the candidate's pre-test and post-test answers were quite similar. Answers on both the tests lacked flexibility in ideas. The researcher expected the candidate to use OPV technique as it had been focused in the intervention program but it was not done. Therefore the post-test answer lacked dialectical thinking. As a result candidate's answer appeared to be biased just like in the pre-test.

On the item measuring questioning skills, the candidate had done well in the post-testing. The questions had clarity, were answerable and relevant, though not significant, they were supported by adequate reasoning. While in the

pre-test the question were absolute irrelevant i.e. had no bearing to the matter under consideration.

For example -*'What would you do if the soaps are unavailable in the market'*; *'What is the color of the soap to make it attractive'* and so forth.

On the question based on comparison, the candidate has laid down criteria for making comparison, indicating that the student has used CAF technique. The CAF technique therefore has enabled the student to generate more ideas, but the candidate has failed to elaborate them (in post-testing).

Classroom interactive process

The candidate was not an active participant during the intervention program. The candidate was found to be quiet and reacted only when referred to. Notwithstanding, the researcher was ensured that the candidate was able to comprehend whatever was being done in the class from the thinking tasks assigned to students. The investigator now and then had looked into the candidate's performance on the thinking tasks allotted in class.

Observation

The student had remained quiet during the classroom discussion but had worked on the classroom assignments. The student's performance in the critical thinking test reveals that student has been not only been attentive but also involved.

6 **Student 6**

Table 7. Pre-test and post-test scores on Critical thinking tool for student 6.

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 6	5	10	5	5	Not ans.
Post- 8	6	20	20	15	Not ans.

From the post-test it can be inferred the candidate has not made an essential progress on the dimensions- `ability to relate` and `critical reading`. One can observe that there is a marginal improvement on the dimensions- `evaluation` and `questioning` and there is a definite improvement on the dimension justification. The candidate has not answered a question on comparison.

The investigator noted the candidate's difficulty in English language, which was evident from the candidate's composition. Looking into the candidate's language problem, the candidate then decided to focus only on the essence of what was expressed and become oblivious to grammatical flaws.

On the question 1, in section III, the investigator noted that the candidate's judgment i.e. preference for television had been based on her evaluation. The candidate had pointed out the advantages and disadvantages of both the inventions. The candidate was one of the very few students to point the disadvantages of the preferred item i.e. television. The student has highlighted the adverse effect of television on the eyesight and the impediment it caused to children's study. This indicates that the candidate has used PMI technique.

Although the essay lacked clarity, the investigator perceives candidate's essay the only essay that was critically written.

On question 2, of the same section, the investigator was once again impressed by the candidate's essay. The candidate was the only student who had maintained a neutral stand on her essay. The candidate was neither completely in favor of censor board nor completely against it. By this the investigator was able to see that the candidate had withheld from taking any stand. This ability to withhold a judgment is also an important dimension of critical thinking that is inferred from the candidate's essay. The candidate had critically judged the worth (evaluated) the role of censor board by stating both its advantages and disadvantages (none of this was evident in the pre-testing).

Despite the candidate had not used a good language and had many flaws in the sentence construction, the researcher has given full marks for question 1 and 2 in the section 111.

Classroom interactive process

Inspite of the persuasive efforts from the investigator, the candidate had remained taciturn and uncommunicative through out the intervention program. The researcher found that the candidate was shy, soft spoken and relatively quiet even amongst her classmates.

The candidate has expressed that the investigator had made learning interesting and that the candidate was given extra attention in the class. The candidate also communicated that she has been using critical thinking even in her personal life. But the investigator has no knowledge as to how the candidate was using the art of critical thinking in her personal life. Nevertheless, the candidate feels ensured that the candidate must have been using a few dimensions of critical thinking namely art of analyzing and evaluating as it is evident from her various essays.

Observation

Education based on critical thinking has given an opportunity to the student to express herself on the content matter, this was evident from the thinking task assignments. Despite the language barrier, the student has demonstrated analytical abilities- the ability to examine, relate, evaluate and judge. When the student is provided with such an opening the student has power to work through content and apply. Education should not be defined in relation to a fixed quantum of information which has to be assimilated, but must be conceived as a process whereby students learn to discriminate, question and communicate their world of experience.

7 Student 7

Table 8. Pre-test and post-test scores on Critical thinking tool for student 7

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 25	6	6	11	10	15
Post- 25	4	20	11	17	15

From the results it is evident that the candidate has made some improvement on the dimension of critical thinking such as 'evaluation', and 'questioning'. But there is no difference between the pre-test and post-test scores on the other dimensions of critical thinking.

The researcher is certain that the candidate has not earnestly performed on the test. The candidate had voiced her declination to redo the test again. She complained of boredom and fatigue. The investigator's cajolery eventually led her

to complete the test. It has been discovered that essays in the pre-testing and post-testing were almost the same, except on question 1, in section 111.

Since the candidate's essay on question 1 (section 111) has found to be short, both in the pre-test and post-test, the researcher has decided on presenting pre-test, post-test essay which are as follows:

Pre-test answer

I think television is the most important invention because through television we get entertainment, news, etc. Even these days you can send messages through television. Important and urgent messages can be telecast.

Post-test answer

Telephone and television are both important invention but in my view television is more important because it provides information and entertainment. Of course the telephone also help us in getting information but one can only hear where as on a television one can hear and see. If there is no electricity we may be unable to watch television but can use telephone. But I still find television more important.

On comparing both the answers on the pre-test and post-test, one can observe that the student's answer on the post-test is relatively more critical. The candidate has highlighted on the merits and the demerits of both the inventions, indicating the student has used PMI technique. There answer on the post-testing has much more clarity on the pre-test. It is difficult to comprehend what the candidate means by 'these days you can send messages through television'. The candidate could have supported the particular statement with an illustration. Further there is verbosity in the ideas.

On the question measuring questioning skill, some of the candidate's post-test questions were relatively more clear, relevant and answerable than they were in the pre-test.

Classroom interactive process

The candidate was noticed taking initiative in the classroom process. The candidate would be often found abreast on the topic that the researcher was going to teach in the class. On being inquired the student articulated that she had been reading her sister's First year B.A Psychology textbook.

The candidate on a few occasions took opportunity to answer in the class but it was always confined to the questions that required recall answers or on some things that the candidate had already read.

The researcher on a few occasions had gone through the candidate's work on the thinking task assigned by the investigator. Performance of the thinking task does not reveal exactly to what extent the person was using critical thinking, as students were in habit of consulting, discussing and working in a group on the given tasks. In short the investigator has no idea to what extent the student had grappled the concept of critical thinking.

Observation

The student did not show interest in the thinking task. Her interest lay in displaying concepts that she had memorized/read before hand. The present education system sadly seems to have conditioned her to merely gather and remember knowledge, where content is treated as something to be repeated rather than something to think on. Critical thinking as an educational ideal needs to gain momentum before it turns most of our students into parrot like.

8 **Student 8.**

Table 9. Pre-test and post-test scores on Critical thinking tool for student 8

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 6	4	20	15	20	5
Post- 6	12	20	20	13	10

It can be observed that the candidate has shown improvement on the dimensions like critical reading, justification and comparing. Where as there no improvement on the dimensions- ability to relate and evaluation. On the other hand the score reveal that candidate has shown better performance on the item measuring questioning skills in the pre-test.

The candidate answers on the critical reading indicated that the student could draw implication, assumptions and conclusions from the statement and provide adequate reasons. But for a few items the candidate had not provided any reasons, as a result no marks were allotted for such items. The pre-testing performance on critical reading shows that the student had made efforts to answer but it was perceived to be absolutely inaccurate.

The question on evaluation (section 111), the candidate's answer on the pre-test and post-test were almost similar. In both pre and post test the candidate had evaluated the two inventions namely the television and telephone by mentioning each ones' pros and cons. The essay on both the tests had clarity, flow and sound reasoning. This indicates that even before the intervention program, the candidate already had the knack of evaluating and presenting her essay well.

On the question measuring the ability to justify, the candidate has shown some improvement on the critical thinking tool during the post-testing. The candidate's pre-test and post-test essays were almost the same except on the post-test the candidate's reflection on the topic had more conviction, cogency and good presentation.

Since the post-test essay is brief and to the point, it is possible to present it here and the essay on the post-test reads as follows:

*"One thing the censor board can't do is change the way people think. Moral values is more a state of mind and once the foundation is built it is hard to break, what ever is shown and said. On the other hand we have right to public decency. It is good that the censor board keep a watch on what people watch and how the general public will perceive it.
I feel I can not arrive at a final decision since every thing has its pros and cons."*

From the above essay it may be observed that the essay could have had little more clarity. From the essay it also becomes evident that the candidate is unable to taken any firm stand on the issue under consideration. Refraining from taking a stand also reflects an important dimension of critical thinking namely 'the ability to suspend judgments'. The investigator perceives that the candidate has developed her perspective through other points of view (one in favor of censor board and one against) and therefore has used dialectical thinking.

The answer in the pre-testing in this section had lacked all this fine arguments.

On the question measuring questioning skill, the students post-test performance was low as compared to the pre-testing and the investigator was at a loss to understand the reason for this. The investigator found candidates pre-test questions to be very significant s and the candidate had also provided adequate reasons for the same in the pre-test. On the post-test the candidate had not put

even a single question that would be perceived as significant. This is made evident from the following answers:

Pre-test questions

What are the ingredients?

Would it suit my skin? (The candidate wanted to find if the soap would suit all skin types.)

How would it change my skin from the present?

What is the price of the soap?

Post-test questions

What is the size and cost of the soap?

Where is it available?

What fragrances are they available in?

Does it have any side effects?

Classroom interactive process

The candidate was found very chatty and chippy. The candidate took active participation in discussion. The candidate worked very enthusiastically on the thinking tasks and actively participated in the discussion that followed the thinking tasks. On a few occasions the candidate would debate her way through to drive home the point. The candidate's arguments were well reasoned, analyzed and with evidence. There had been many instances where candidate had laid down questions and if the investigator's answer was not convincing, the candidate would persist on with arguments. This indicated that the candidate looked for evidence and did not take whatever said in the class for granted. Looking for and providing evidence, making queries and need to understand are some of the dimensions of critical thinking. One such instance that comes to the investigator's mind was when explaining the concept 'Illusion in perception', an example of a movie camera was mentioned. The candidate had no previous knowledge on the working of the movie camera and was absolutely baffled on hearing the motion perceived was an apparent motion and that each shot was a

still. All explanation from the investigator went deaf and having failed, The candidate requested the concerned teacher, if possible, to give a demonstration on the working of the movie camera. The candidate was also amongst the many who enjoyed being the participant in the intervention program and more over enjoyed working on the thinking tasks.

Observation

This student is a bundle of charged energy, very active and enthusiastic. The critical approach to teaching Psychology has provided her with an ample opportunity to have a positive interaction in the classroom and in particularly on the subject matter. The student had the freedom to relate on the content through her own reflection and understanding. Students are basically active learners and they should be involved in processing information than to be a passive spectator to what the teacher is doing and saying. Education needs to be conceived on a critical thinking paradigm which believes that all knowledge or content is generated, organized, applied, analyzed, synthesized and assessed by thinking and that gaining knowledge is unintelligible without engagement in thinking (Richard Paul et.al, 1989).

9 Student 9.

Table 10. Pre-test and post-test scores on Critical thinking tool for student 9

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 23	9	20	Not ans.	20	20
Post- 30	15	20	Not ans.	20	20

The results indicate that there is no difference between the pre-test and post-test for the section III and a relatively a good amount of difference can be found in section 1 and a some improvement can be observed in section 11. It can

be observed that even prior to the intervention program, the candidate's scores on the tool measuring critical thinking were high. This goes to indicate that the candidate already possessed some critical thinking ability, especially, on the dimensions considered for the present study like ability to relate, evaluation, questioning ability, comparing and contrasting. Notwithstanding, the candidate has definitely shown a improvement in critical reading and ability to relate. Candidate has not attempted a question measuring ability to justify. The candidate had voiced out that the question 2, in section 111 was boring and had no inclination to answer. The candidate also admitted that the same question was left unanswered even in the pre-testing tool. The investigator respecting the student decision did not coax her further.

Classroom interactive process

From the very beginning the candidate was introduced as one of the brightest student's in the class by the regular teacher. Most of the time candidate remained passive in the classroom. On being inquired into, the reasons for her lack of participation in the classroom, the candidate mentioned that she disliked talking in the class and preferred to listen to others. It was after a lot of persuasion and cajoling that the student finally made an effort to open up and interact. The candidate on few occasions took the opportunity to answer in the class and began to put forward questions, which demanded for more clarification and explanation from the researcher. The candidate's answers and queries were found to be significant.

Although the candidate was not as participative as many others, the candidate articulated that the intervention program was interesting and learning was made easy and enjoyable because of the interactive process in the class.

10 Student 10.

Table 11. Pre-test and post-test scores on Critical thinking tool for student 10

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 6	4	10	8	15	15
Post- 6	10	20	18	20	20

The above results indicate that although the student has made nil improvement on section I i.e. 'ability to relate' there is a considerable improvement on other sections.

The candidate's essay on the question 1(section III) indicates that the candidate has used PMI technique on the post-testing. The candidate's preference for television is based on critical evaluation. The candidate has spelt out the advantage and the disadvantages of a telephone. In light of this argument the candidate has taken her stand. The candidate's pre-test essay insinuates no evaluation of any kind. The candidate has confined to giving importance to television alone.

The candidate's pre and post essays (question 2, section 111) have been provided as follows -

Pre-test answer

"In my opinion the scope of censor board in a democratic set up should have some limit. Every one should be given at least a freedom what they think, what they want to do and feel."

Post-test answer

“ According to me censor board should pay attention to both the public opinion (one that believes that censorship in democratic set up is necessary for the sake of public decency. The other believes that censorship goes against principle of free expression.). Both the opinions have meaning. There are certain things that must not be allowed for public viewing and also people can not have right to express everything. But the fact also remains that one should be given the opportunity to express one’s thought, belief, likes and dislikes in public.”

On the pre-test there a vagueness in the idea (censor board should have some limit.). The candidate has made no efforts to adequately explain her stand, indicating her inability to make inferences (fails to reason). The essay lacks arguments, the act of holding a belief or an opinion in accord with the reasons (fails to analyze and justify) and there is a sense of incompleteness.

Although on the post test the essay looks incomplete because of the candidate’s inability make her inference based on justification and reasons, nonetheless the candidate has argued from the two opposing both of views (dialectical thinking). The candidate mentions that both opposing point of views have meaning (some truth in them), this indicates that candidate’s arguments are fair and unbiased. From the essay it is easy implied that the candidate wants to suspend judgment (neither favor censor board nor reject) but the investigator feels that the candidate could have explicitly conveyed.

On the question 3 (section 111), the post-test questions forwarded by the candidate were more in number than on the pre-test. The post test questions were more significant in comparison to the pre-test. The investigator also noticed an improvement in the reasoning, on the post-test.

On the post-test the candidate has shown flexibility in the ideas on the question measuring comparing skill (question 4, section 111). Although the candidate had not used CAF deliberately, the candidate was able to lay down more points for drawing comparisons. The candidate has also reason out well unlike in the pre-test.

Classroom interactive process

The candidate was not very loquacious in the class but sincerely worked on the thinking tasks. It had been observed on a few instances that the candidate had difficulty in justifying and reasoning out her stand on the issues under consideration. The investigator requested the candidate to focus her attention to the on-going classroom discussion, and notice how other students were arguing out their point of view. Latter from the candidate's performance on the post-test, the investigator observes improvement on student's reasoning.

Observation

Although the student had not been actively vocal in the classroom discussion had shown a lot of involvement, which is evident from the manner in which she proceeded with the classroom assignments. During the initial stages it had been observed and the student herself felt that she had a problem reasoning out her point of view but latter improved with the passage of time. This improvement is also evident by the post-test performance in the section III of the critical thinking tool.

11 **Student 11.**

Table 12. Pre-test and post-test scores on Critical thinking tool for student 11

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 21	6	10	5	10	15
Post- 30	6	15	10	10	15

Accept on the critical thinking dimension - the ability to relate and reason the candidate has not shown much change on other dimensions.

In the section 1, on the post-test the candidate not only gave a correct choice of pair of words, which had a relationship to the given pair but also reasoned well in support of the choice. This is evident from the instances given below.

- (1) *pre test* *Pen : Nib*
choice *Book : Knowledge*
reason *Nib is the main part of a pen and knowledge is the main part of a book.*
- Post test* *Pen : Nib*
choice *Nut : Bolt*
reason *The pen is of no use without a nib similarly a nut is of no use without a bolt.*

(The researcher does not perceive nut and bolt as an absolutely correct choice from the other four pairs. Nonetheless the manner in which the candidate has justified, has rendered, the selected choice as right.)

- (2) *Pre test* *Curtain : Window*
choice *Bird : Cage*
reason *A window looks incomplete without a curtain, even a cage*

looks incomplete without a bird.

Post test *Curtain : Window*
choice *wrapper : Chocolate*
reason *The curtains cover the window and make it look attractive*
similarly the wrappers cover the chocolate and make it look
attractive

The student's pre-test and post-test essays on question 1, section III.

Pre-test answer

" I think that the telephone is a better invention because through phone important messages can be sent to a person without going to the concerned person. It saves lot of time and energy." Television is just for entertainment"

post-test answer

" Telephone is more important invention because television is just another source of entertainment where as telephone has become a necessity. With help of telephone we can talk to people who stay far way without going to their place. Letters are only one sided conversation and it takes a lot of time too. Where as on telephone two people can talk even if they are oceans apart. Any important messages can be conveyed to a person in less than a minutes time no matter where that person is."

From the above student's pre-test and post-test essays it can be observed that in the pre-test essay the student had not critical evaluated i.e. her judgment was not based on examination of pros and cons of inventions under consideration. But the post test essay had far more clarity and was supported by student's explanation and justification, thus it added a little more depth to the essay. Both pretest and post essays are as follows:

In section III, question 3 measuring the ability to think independently the candidate had simply paraphrased the given question in the pre-testing while candidate's post-test composition on the critical thinking tool reveals that the candidate has made an effort to worked on the question.

The investigator has provided student's post-test essay, which is as follows:-

Post -test essay

" Censor board is necessary because there are things that should not be shown to the public because it can harm the society. But we have a fundamental right to freedom of expression. Thus there should not be a censor board."

Although the candidate's post-test essay is far from being satisfactory, the investigator was pleased at the candidate's effort to pen down her thoughts. From the essay, the investigator perceives the candidate line of thinking to be paradoxical. There is absence of clarity in reasoning and analysis, resulting from inadequate explanation. The candidate has failed to indicate her stand/opinion on the issue under consideration.

On the question 3 and 4 (section 111) The pre and the post test answers were analogous and far from satisfactory. Most of the candidate's questions (on question 3) were irrelevant to the issue. The questions put forward by the candidate were - *Is you company popular one? Where is the head office of your company? And besides these, there were a few significant questions like what are the ingredients in your soap? What is its TFM value?.*

Classroom interactive process

The candidate had remained taciturn through out the intervention program. There was absolutely no participation of any kind except that the candidate had worked on the thinking tasks.

Observation

Although student had not been an active participant in the classroom discussion, continued to work on the assignments with a concentrated effort. The student's efforts and interest in the thinking task has had an impact on her post-test performance on the critical thinking tool. The candidate's post-test answers especially, in the sections I and III on the critical thinking tool shows there is a marked improvement in her ability to analyze and communicate. Education based on teaching thinking has enabled the student to achieve this on her own with no direct involvement of the teacher. One of the main imperative intentions of education is to help student move from thinking dependence to independence; from inability to ability; from reliance on authority to autonomy.

12 Student 12.

Table 13. Pre-test and post-test scores on Critical thinking tool for student 12

Section I	Section II	Section III			
Ability to relate (marks 30)	Critical reading (marks 20)	Evaluation (mark 20)	Justification (marks 25)	Questioning (marks 20)	Comparing (marks 20)
Pre- 6	6	10	5	10	5
Post- 13	5	10	10	10	10

It can be observed that there has been not much difference between the pre-test scores and post-test scores on the critical thinking tool. This indicates that there has been not been much improvement on the dimensions of critical thinking measured by the tool. Of course a marginal improvement on the post-test scores in section I and also on the question 2 and question 4, in the section III.

In the section 1, the candidate has shown some difference in the ability to relate and reason. This could be indicated from the following student's answers-

(1) *pre-test* *Water : Thirst*

choice *Rain : Drought*

reason *As we need water when we are thirsty in the same way we need rain and drought.*

Post-test *Water : Thirst*

choice *Rain : Drought*

reason *As when we are thirsty we need water, in the same way when there is drought we need rain.*

(2) *pre-test* *Calendar : Date*

choice *Dictionary : Words*

reason *Because when we have calendar there is to have a date otherwise it has no meaning. Dictionary has words and it is important to see words.*

post-test *Calendar : Date*

choice *Dictionary : Words*

reason *There are words in the dictionary and similarly calendar will have dates.*

In the section III, on the question 2, The candidate although with not much clarity, was fairly able to her stand based on her reasoning. The candidate had pointed out the adverse effect on small children in absence of centerboard (post-test answer). The candidate's pre-test answer was the paraphrase of the given question.

On the question 4, in the section III, the candidate's post-test scores had improved as the candidate was relatively in better position to compare and contrast. On comparing the answers on the pre-test and post-test, the investigator could find relatively better clarity in the presentation of ideas in the post-testing.

Classroom interactive process

Although the candidate was attentive to the classroom process, never participated even on being referred to. It was discovered that the candidate experienced some difficulty in understanding English language, which was evident from the flaws in the sentence construction. The student had articulated that she did not think intervention program was any different from regular instructional process.

Observation

The student had not taken any initiative either in the classroom discussion or in the assignments. The investigator can not affirmatively give reasons of student's indifference but this could have been because the student had difficulty in understanding the medium of instruction.

6.3 Qualitative Analysis of Students' Performance - Dimension Vice

The present study is to enhance critical thinking in students and hence in the light of this the investigator has tried to study the extent to which she had been able to induct critical thinking in students. The investigator had selected 13 dimension of critical thinking and improvement on each dimension of critical thinking will be discussed separately.

Analyzing, Logical reasoning and Justification (of arguments, beliefs, themes, interpretation, concept etc)- analysis and logical reasoning are the foundations on which thinking is based on. All thinking begins with some analysis based on logical reasoning. They are the hubs around which all thinking process revolves around. The key objective of this intervention is to initiate students' into thinking what are they were being taught. Hence the investigator had laid down ample of opportunities where students could analyze and reason out on the content they had or required to study. Almost all investigator- prepared questions were such that required analysis and reasoning. The various thinking tasks (chapter V) have enabled students to make analysis and reason out on their own. The investigator also had given opportunity to students to explore the meaning of various concepts through their own analysis (refer unit III on learning) and had been successful in doing the same. With the progression of the intervention and once again looking at the students (post-test) performance on the critical thinking tool, it can be noticed that there is a considerable improvement in terms of students' ability to reason, analyze and structure their essays.

Evaluation of arguments, belief, opinion, themes, propositions etc: Critical evaluation has logic and could be carefully distinguished from mere preference. Students were taught to critically evaluate various theories based on the technique PMI. With the help PMI technique the students scan the positive and negative aspects of the theory and based on their scanning arrive at a conclusion. The investigator had prepared various thinking tasks that would

require students to evaluate (refer unit II and III- Theories of forgetting and learning theories). The task certainly enabled students to analyze theories on their own right. A few responses of the students under individual thinking task presented in section 5.8 under the heading 'Observation' shows that students were in position to evaluate using the technique PMI. The students' (post-test) performance on the critical thinking tool on question 2, in section III also divulges that majority (10 out of 12 students) had critically evaluated using the technique PMI.

Comparing and contrasting analogies: is to compare and contrast alternatives, to integrate their understanding of different situation, and to find fruitful ways to conceptualize novel situations. It is to encourage students to apply what they have just learned to different but analogous contexts by asking students to name or find analogous situations. The investigator had introduced CAF (Considering All Factors) technique to compare and contrast. Although students were given adequate illustrations of developing criteria for comparing and contrasting (Unit III, learning theories) except for 3 students no body else had shown inclination to use CAF technique while comparing and contrasting. The disinclination was also observed on the post-tested answers of the students in section III, question 4 on the Critical Thinking tool. The question on the tool reads as- **How is the term 'Revolution' similar to and different from the term 'Earthquake'. Also how is the term 'Switch' similar and different from the term key'?**

Dialectical thinking and Intellectual Empathy- dialectical thinking refers to dialogical thinking conducted in order to test the strengths and weakness of opposing points of view. The investigator tried to induct dialectical thinking through the technique OPV (Other People's Point of View). In using OPV, the thinker tries to put himself in other person's shoes in order to look at the world from that position. The investigator had under thinking task had placed an issue before the students "Should tuition classes be banned" (Unit 4, page no.). The students were allowed to debate from both the points of views. The investigator

facilitated discussion and on the basis of discussion the students were asked to take a stand, arguing from both the points of views.

The investigator would like to bring to notice that dialectical thinking cannot really take place without intellectual empathy. In other words dialectical thinking and intellectual empathy go hand in hand. Although the investigator has not deliberately tried to induct intellectual empathy but students had developed intellectual empathy on their own in their efforts to think dialectically.

The question no. 2 in section III of critical thinking tool, which reads as “**Censor board has an official responsibility to examine book, letter, news, plays, films etc. before it is allowed for public viewing. There are two main public opinions: one that believes that censorship in a democratic set up is necessary for the sake of upholding moral values and public decency. The other believes that censorship goes against the principle of free expression. In your own opinion, what should be the scope of censor board in a democratic setup?**” Demands from students to think dialectically. The post-test scores on Critical thinking tool reveals that around 7 students out of 12 students had taken a stand, arguing from two opposite points of view (think dialectically) using OPV technique.

Questioning: Although there had been no deliberate attempt of teach students the art of critical questioning, notwithstanding it can be observed from the post-tested performance of half of the students that their questioning ability is the had considerably improved in terms of relevance, clarity, and answerability. This is made evident from a few sample (post-test) responses of students presented in his chapter. In the process of teaching- learning critical thinking, especially the dimensions of critical thinking like reasoning, justification and analysis, students' must have imbibed the skill of questioning.

Thinking about thinking- was an opening lesson. The investigator introduced critical vocabulary such as implication, assumption, inference etc. to the student and thereby gave students various thinking tasks whereby they had the opportunity to learning to draw implications, assumptions and inferences from the

authors' statements (reference chapter V, unit 1.) From the various thinking tasks it can be observed that as the tasks on thinking about thinking progressed, the students not only learnt the critical vocabulary but were in position to draw assumption, implications from the statements. Further, in the chapter V, unit 4, section 5.18, on question no. 4 student had demonstrated critical reading ability. Once again almost all students' post-tested scores on the critical thinking tool show improvement over the pre-tested scores on the same tool, suggesting that students had developed the art of critical reading.

Intellectual autonomy Intellectual courage and Intellectual humility fall under the affective dimensions of critical thinking. There has been no deliberate attempt to induct affective dimensions of critical thinking in students. The investigator had presupposed that these dimensions would develop on their own as an aftermath of developing cognitive dimensions of critical thinking and the classroom climate. There had been a continuous efforts on the part of the investigator to keep the classroom climate cordial, an attempt was directed towards creating a more permissible, nurturing, open, non-censorious and non-threatening atmosphere allowing students to examine and reflect on issues under consideration. As a result students did demonstrate intellectual autonomy and courage in putting forth questions, assertively taking a stand for themselves, clarifying doubts and debating without hesitation. There have been instances where students had demanded that the investigator provide them with an empirical evidence for what she was suggesting to the class (refer unit 4: Sensory attentional and perceptual process, page. 116).

Another aspect that is worth mentioning is that students had ingrained intellectual humility i.e. awareness of the limits of one's knowledge. Intellectual humility is based on the recognition that no one should claim more than he or she actually knows. There had been plenty of instances where students had changed their stand/opinion in light of new evidence provided by the investigator. It was encouraging to know that in section III, question 2 on Critical Thinking tool, one of the students (student 8) had shown intellectual humility. The particular student in

the pre-testing had shown no problem in taking sides in favor of an issue, while in the post-test answer she had voiced out " I feel I can not arrive at a final decision since every thing has its pros and cons". This indicates that student has shown intellectual humility.

Application: Students are truly critical thinkers when they are in a position to apply knowledge in a new situation. When students relate to a concept and provide original examples either real or fictitious, it may be said students are applying knowledge in a new situation. This is evident from the Unit III on learning, where students provided adequate illustrations to explain various concepts of learning. Further, in unit IV and unit V (section 5.18, 5.20 and 5.23), students has shown knowledge application on the critical thinking task.

6.6 Overall Observation

The quantitative and qualitative analysis of data goes to reveal that the strategy to develop critical thinking in students of standard XI using the subject of Psychology as content has been successful.

From students' active participation in the intervention program, their improved post-test scores on critical thinking tool goes to say that students had learnt the art of critical thinking. Scanning through students post-test answers makes known that many had also imbibed critical thinking techniques, as their critical thinking was based on the techniques like PMI, OPV and CAF.

Looking back at students' level of interaction, involvement and visible enthusiasm in the instructional process, it would not be considered vainglorious to state that almost all students found the instruction process very interesting and exciting. Might be for the first time, many students had the opportunity to think on the content for themselves and examine what they were to learn and understand. Many students had expressed that working on thinking tasks had been a novel

experience. It was through these tasks that the students had the opportunity to debate, reflect, relate, analyze, evaluate, judge and apply what they were being taught.

A lot of student had voiced that learning by thinking not only helped in easy comprehension of the subject but also made the instructional process lively and interesting. Learning by thinking certainly creates a sense of knowing. Here 'knowing' is not merely retention, a storing up for possible recall which is the ability to define learning/motivation or simply mentioning various theories on learning/motivation. This knowing by itself is useless knowledge unless meanings cluster around these theories. Only when a student find a theory meaningful in terms of its knowledge, relevance, and application, student may experience and appreciate an awareness of knowing. It is this 'knowing' that endows the object of previous knowing with a value that comes almost entirely from self. This kind of knowing was definitely made possible for students during the instructional process, as students were given the opportunity to relate to, explore, analyze and evaluate concepts on their own and draw meaning for themselves. This opportunity was availed by almost all students, which is evident from their classroom participation, assignments, and their post-test performance on the critical thinking tool.

A true education is that which brings the learner to a personal association with knowledge that he or she can make a sound decision. This kind of education lays emphasis on thinking operations such as comparing, contrasting, hypothesizing, verifying, evaluating, decision making, generating new ideas and problem solving. We need to formulate a comprehensive philosophy of education focused on critical thinking, one that makes clear that knowledge can be achieved only through thinking and hence it is important to infuse critical thinking into the curriculum rather than treating it as a separate subject.

Teaching of Psychology based on critical thinking paradigm was not only challenging but also very gratifying for the investigator. It was an experience by itself to see students grappling the content through their own questioning, analysis, and judgment.

Making critical thinking the essential mode of instruction for all subjects, all students and all grade levels is not a task that requires a mastermind nor it requires Herculean efforts. All that is required from a teacher is little more of interest, coupled with a bit of creativity and right intention.

For the present study the main important components for facilitating thinking in classroom included-

- Classroom climate: a classroom plays an important role either in facilitating or impeding thinking process in students. The investigator's attempt was directed towards creating a more permissible, nurturing, open, non-censorious and non-threatening atmosphere allowing students to examine and reflect on issues under consideration. The investigator had also worked towards providing students latitude where they can gain insight into their own prejudices and resolve them on their own. The investigator's task was to play an important role in propelling students to think for themselves.
- Method of teaching thinking: Lecture method at its best can only provide students with information and infuse rote learning and memorization. On the other hand methods like Socratic questioning, Discussion method, Case study method, Role-play method and many more assist in thinking process.
- Techniques of teaching thinking: Numerous techniques of teaching have been and are being developed which facilitates teaching thinking. For this study the investigator had used a combination of techniques.

6.7 Conclusion

Teaching-learning process can and ought to be on critical thinking paradigm, not only to make learning process interesting but to make it more meaningful and relevant to the learners.

Any sound education must emerge from a principle that teaching-learning process should not confine to mere learning of concepts and principles that are memorized and stored, but must lead instead to an understanding, which a student can and must intellectualize to create in them a sense of "knowing". 'Knowing' in this context is not retention but where one may be able to experience and appreciate an awareness of knowing. This can be made possible when students are allowed to reflect, to think, and to draw meaning for themselves on the given information and experience. This has been the approach taken in this study and has been shown to be effective.

6.8 Suggestions

Today's education system has come under severe criticism for its undue emphasis on memorization of textbook knowledge by the students. Education, which is a process of making an all-round development of the human being, has been unfortunately reduced to a mere process of information gathering. In the process students just learn the ways and means to store the information and to reproduce as it is on demand to get good scores in examination. On the other hand 'Critical thinking' as a model of teaching-learning is an alternative to present educational shortcomings. Only when the student is involved in processing information and not just memorizing factual material the student makes meaning for himself /herself and not passively accepts the ideas which are given to him/her. An opening to understand and think on the content gives a student an opportunity to intellectualize on what he/she is suppose to know, thereby the instructional process become interesting and stimulating, as experienced by this student.

The education system has to relinquish the emphasis on memorization of textbook knowledge by students. It has to break free from the usual pattern followed for teaching-learning wherein fixed content gets transmitted from teacher to student. The critical thinking approach in teaching psychology subject has facilitated the student to understand and relate to the concepts under consideration through her own analysis, evaluation and judgement.

According to NCERT (1988) suggestion, appropriate method and techniques which would facilitate interactive process of teaching and learning needs to be evolved. This implies replacement of existing teaching methods which predominantly based on rote learning, lectures and reproduction of information by interactive modes of teaching which would focus on 'learning' and which would stimulate curiosity and independent thinking, develop problem solving skills and self learning. The teacher's role will be one of helping the pupil to develop skill in collecting information, their verification and evaluation for further processing for drawing inferences. In other words to develop critical thinking of students.

In light of this the investigator has endeavored to conduct a study that aims at inducting critical thinking in students. Based on her study, the investigator has rendered a few recommendations for further researches.

- ❖ The realm of teaching thinking has remained highly unexplored, especially in India education system and hence this area needs to be explored and researched.
- ❖ Present study is confined to teaching thinking using Psychology subject to std. XI. Studies need to be carried out using other subjects and at all levels.

- ❖ For the present study only a certain dimensions of critical thinking have been taken into consideration. A lot many other dimensions of critical thinking need to be explored and incorporated into future studies.

- ❖ Teaching thinking course could be given to teacher trainees so they may make a transition from a didactic paradigm of education to teaching thinking paradigm.

- ❖ Preparation and standardization of thinking tool is another area that needs research.