CHAPTER-I
INTRODUCTION
CHAPTER I
INTRODUCTION

1.0.0 INTRODUCTION

The present study is about Thinking Skill of Identifying Pros and Cons. What is Thinking Skill? What do we mean by Thinking Skill of Identifying Pros and Cons? This chapter deals with the answer of such type of questions. In the present chapter, the introduction of this study is given under captions namely Introduction, Teaching Learning Process, Introduction of Thinking, Definition of Thinking, Kinds of Thinking, Nature of Thinking, Characteristics of Thinking, Elements of Thinking, Types of Thinking, Types of Thinking Skills, Introduction of Thinking Skill of Identifying Pros and Cons, Meaning of Identifying Pros and Cons, Components of Identifying Pros and Cons, Operational steps of Identifying Pros and Cons, Purpose of Identifying Pros and Cons, Instructional Material, Components of Instructional Material, Importance of Instructional Material, Limitations of Instructional Material, Key Terms Used, Rationale, Statement of the Problem, Objectives, Hypothesis and Delimitations of the Study.

Thinking Skills are one of the most important, yet inadequately implemented areas of the curriculum. When preparing lessons, almost without exception, good teachers seek to help pupils acquire Thinking Skills that relate to the content of the lesson and, if possible, extend beyond it. Something to remember is that if your pupils are not thinking about what you are saying or doing, you are not communicating effectively.

So you should involve them in Thinking Process. A thinking process is a relatively complex sequence of Thinking Skills. Some time consuming Cognitive operations such as concept formation, problem solving, and composing, all of which employ one or more core Thinking Skills come under thinking process. Thinking Skills are relatively specific Cognitive operations that can be
Figure 1.1 Thinking Process

The present study is about one of the Thinking Skills among the twenty seven types of Thinking Skills which is Identifying Pros and Cons of any concept. It will be helpful for the development of critical analysis and decision making ability among the students by looking towards all the positive and negative aspects of the concept or problem.

The present study entitled “Effectiveness of Instructional Material based on Thinking Skill of Identifying the Pros/Cons in terms of students’ Cognitive and Affective domain variables at Secondary school level.” is an experimental study. It pertains to the area of Educational Psychology.

Thinking in Cognitive side includes all forms of mental activities sometimes in order to solve problems but sometimes for no apparent purpose at all. Idle day dreaming is one type of thinking and at the other extreme is the purposeful thinking of students, writers, composers and artists. A thinking process is relatively complex and time
consuming Cognitive operation such as concept formation, problem solving and composing of concepts, all of which employ one or more core Thinking Skill.

Many educationists disagree whether Thinking Skills can be taught perhaps they are correct but there is no question, whatsoever Thinking Skills are learnt? In the field of education when preparing lessons good teachers try to help students acquire Thinking Skill that relate to the content of lesson. They use this principle to engage, motivate and sustain the attention of their students for genuine learning. Direct teaching of Thinking Skills can produce more creative thinkers.

1.1.0 TEACHING LEARNING PROCESS

Teaching

According to H. C. Morrison (1934) - “Teaching is an intimate contact between a more mature Personality and less mature one which is designed to further the education of the later.”

According to Gage (1972) - “Teaching is an act of interpersonal influence aimed at changing the ways in which other persons can or will behave”

According to Skinner (1968) - “Teaching is the arrangement of contingencies of reinforcement under which students learn”

The main purpose of teaching is to create conditions in which learning can take place.

Learning

According to Cobb (2009) – “Learning is the life long process of transforming informations and experiences into knowledge, skills, behavior and attitude.”

According to the American Heritage Dictionary of the English language (2003) “Learning is any permanent change in behavior that occurs as a direct result of experience.”

According to Wood worth (1945) - “Any activity can be called learning so far as it develops the individual (In any respect good or bad) and makes his behavior and
experiences different from what that would otherwise have been "Learning is the modification in behavior to meet environmental requirements.

Teaching Learning Process:
When teaching and learning process go together it is called as teaching learning process. Interaction between the teacher and the learner is the core of teaching learning process. It is a three way communication which results in behavior changes in the learners. A learner needs the help of a teacher, when he wants to learn any subject and to solve any problem. The process of guiding the learner involves nine steps.

Figure 1.2 Teaching Learning Process

Step 1: Teacher sets educational objectives and selects content.
Step 2: Teacher processes information.
Step 3: Communication from the teacher to the learner.
Step 4: Informations are received by learner.
Step 5: Information processing in learner.
Step 6: Communication from learner to teacher by responding.
Step 7: Teacher diagnoses learner's response.
Step 8: Evaluation of learner by teacher.
Step 9: Communication again from teacher to learner.

The teachers set some educational objectives and select content according to them. Teacher processes the information related with it and presents the information in front of the students. Students receive and process information according to them. After processing they respond to the teacher, the teacher diagnoses and evaluates the response. On the basis of evaluation, teacher again presents the information to the students.

In beginning teacher communicates to the learner by presenting information, then students communicate to the teacher through responding, then again teacher communicates with students by presenting information after evaluation that is why it is called as three way communication.

Presently at all levels, traditional method of teaching that is lecture method dominates the teaching learning process. Lectures are more useful to communicate the information. One finds either the teacher is delivering the information or one of the students is reading textbook and other students are silently following him. In traditional method the students study in classroom in groups. During the process of traditional method teachers are more active but students are passive listeners and are not motivated to think independently.

Such a scenario does not help to strengthen the Cognitive structure of students. With the help of the lecture method the Cognitive domain especially the knowledge aspect gets developed. It is difficult to develop fully Cognitive, Affective and Psychomotor domains. It is an age old teaching method and has lost much of efficiency now. The lecture method does not help in developing the higher mental abilities of students.
There is a need to develop interest, curiosity, scientific attitude, analytical abilities and self-study habit etc., among the students. These are not developed through the use of traditional methods. To develop all these in proper proportion it is essential to use different methods of teaching in an integrated fashion. Developing these qualities in individuals would be considered the major responsibilities of education so self-learning and critical thinking must be given a place in the teaching-learning process.

1.2.0 INTRODUCTION OF THINKING

Thinking is behavior which is often implicit and hidden and in which symbols (images, ideas and concepts) are ordinarily employed.

Thinking is a series of symbolic processes. It makes use of symbols, percepts, images and concepts. The symbols either represent or stand for objects or events in the environment. Images are either sensory or verbal. Therefore thinking involves representative process.

1.2.1 Definitions of Thinking

Garrett (1968) "Thinking is a behavior which is often implicit and hidden in which symbols (images, ideas and concepts) are ordinary employed."

Mohsin (1967) "Thinking is an implication of problem-solving behavior."

Gilmer (1970) "Thinking is a problem-solving process in which we use ideas or symbols in place of overt activity."

Eyesneck (1972) "Thinking is defined operationally as the establishing of orders in the apprehended world. This ordering is related to objects as well as to representatives of the world of objects. Thinking is also ordering the relation between representations of objects."
1.2.2 Kinds of Thinking
Thinking may be of many kinds such as reveries, controlled, association, reasoning, conceptual thinking, imagination, divergent, convergent, problem solving, day dreams, night dreams, creative thoughts and so on. These various kinds of thinking are not separate and distinct but related with one another.

1.2.3 Nature of Thinking
➢ Thinking is a symbiotic activity.
➢ In thinking there is mental exploration rather than motor exploration.
➢ Thinking is essentially a Cognitive activity.
➢ Thinking can shift instantaneously over a span of time and space.
➢ Thinking is described as a problem solving behavior.
➢ It is always directed towards achieving some purpose. In genuine thinking we can’t let our thoughts wonder aimlessly as happens in the case of day dreaming and fantasizing.

1.2.4 Characteristics of Thinking
➢ Thinking is a complex mental phenomenon in which Cognitive aspect appears to be highly developed.
➢ Thinking starts from general to specific.
➢ Analysis and synthesis play important role in thinking.
➢ Concepts and languages are of great importance in thinking.
➢ Thinking arises with the rise of problem.
➢ Man is active while thinking.
➢ Thinking is purposeful.
➢ Thinking is affected by motivation.

1.2.5 Elements of Thinking
The elements of thinking are as follows:
Objects: The objects of thinking may be of perceived by senses, recollected as information or imagined mentally.

Concepts: Concepts are the most important elements. They have been described as general contexts; they are segregated as a class and named by the subject. The steps in the formation of concept are:
1. Observation of particular subject.
2. Analysis of each of them.
3. Comparison of them with one another.
4. Generalization.
5. Naming

Concepts may be found about object, abstract qualities or relations. People differ widely as regard their concepts of different objects, qualities and relations.

Importance of Concept

Concepts are of great importance and value as they-

1. Simplify the process of thinking.
   If a person understands the concept properly then he/she can understand other related concepts also. So, it simplifies the process of thinking.

2. Economize mental labor.
   For understanding anything person has to go through so many mental processes like analyzing, thinking, putting logics etc. if person knows the concept the mental processes related with that concept gets reduced, thus it economizes mental labor.

3. Retain continuity of knowledge and culture.
   One concept can form the base for so many other concepts. Other concepts use the knowledge and culture of basic concept, so it retains the continuity of knowledge and culture.

4. Make reasoning, inventing, discovering and researching possible.
   A concept can form the reasoning for other concept, can give direction for other invention and discoveries and thus make so many research possibilities.
1.2.6 Types of Thinking:
Thinking is an intellectually disciplined process. There are generally three types of thinking-

- Analytical Thinking
  This thinking involves analysis of the concept before accepting it. Analytical thinkers work in one field. They are described as left brain thinkers. The left brain possesses information in a mode that is verbal, analytical, reductive into parts, sequential, time oriented, rational, logical and linear.

- Global Thinking
  It is associated with right hemisphere of the brain. Global thinkers work in multidisciplinary environment with the ability to draw analogies and synthesize in seemingly unrelated field. They think ‘holistically’ recognizing complete pattern rather than parts.

- Strategic Thinking
  It involves both right brain and left brain thinking. Strategic thinkers are able to design process to find solution whether the problem is general or specific. They are able to think temporarily and spatially suggesting an integration of “right brain” and “left brain” thinking.

1.2.7 Types of Thinking Skills
There are twenty seven types of Thinking Skills. These are as follows.

1. Comparing: Comparing Thinking Skill deals with the employing of skills of finding, relating and balancing of similar attributes of the elements through the Principle of Isomorphism.

2. Translating: Translating Thinking Skill deals with the simplification of a concept, word or phenomenon from one language to the other.
3. **Using Analogies:** This skill involves the process of finding out equivalent / parallel elements, words, concepts and phenomenon taken from another domain.

4. **Classifying:** Classifying Thinking Skill deals with the grouping and categorizing of the elements according to certain criterion on the basis of common attributes.

5. **Recognizing:** Recognizing Thinking Skill deals with the rearranging of elements according to specific principles and attributes.

6. **Imaging:** Imaging Thinking Skill deals with the process of calculating and evaluating appropriate value position of an element.

7. **Setting Priorities:** Setting priorities Thinking Skill deals with the processes of selecting and ranking the preferences according to their chosen criterion.

8. **Estimating:** Estimating Thinking Skill involves process of calculating and evaluating appropriate value position of an element.

9. **Logical Deducing:** It deals with the drawing of conclusions with the application of special rules of syllogism.

10. **Summarizing:** Summarizing Thinking Skill deals with the summing of the details of objects matter and putting it in a nutshell in a synopsized form.

11. **Setting Criterion:** Setting criterion Thinking Skill is the process of selecting the parameters for the formulation of guidelines for the elements.
12. **Identifying Pros/Cons**: This Thinking Skill deals with the recognizing and analyzing the strengths and weaknesses of an element and finding arguments in favor and against of the elements.

13. **Hypothesizing**: This Thinking Skill is the process of guessing intelligently about the probable results of a problem.

14. **Goal Setting**: Goal setting is the skill of establishing ultimate aims and objectives of the end purpose.

15. **Identifying Propaganda**: This Thinking Skill distinguishes the actual elements from the exaggerated elements.

16. **Synthesizing**: Synthesizing Thinking Skill is the integration or merging of two or more substances for harmonizing the elements.

17. **Problem Solving**: Problem solving Thinking Skill is the process of logically analyzing, synthesizing and evaluating.

18. **Identifying Consequence**: This skill deals with the process of recognizing the long term effects of an element.

19. **Sequencing**: This means the arranging of the elements in the desired order of their occurrence.

20. **Decision Making**: Decision making Thinking Skill helps in reaching the conclusion through the process of analysis, synthesis and evaluation.

21. **Justifying**: This skill works for the exploring and defending.
22. Observing: Observing skill deals with the keen watching of the functioning of the elements.

23. Predicting: Predicting Thinking Skill deals with the forecasting of the strengths and weaknesses of the final outcomes of the elements.

24. Creating /Designing: This Thinking Skill deals with the process of generating or inventing original ideas, things and elements.

25. Evaluating: Evaluating Thinking Skill deals with the process of giving value to an element according to a certain criterion.

26. Making assumptions: Making assumption Thinking Skill is the gathering of data for arriving at any unapproved theory/ conclusion.

27. Interpreting: Interpreting Thinking Skill helps in the explanation of element for clarity. It may also involve the process of translating a concept from one language to another.

1.3.0 INTRODUCTION TO THINKING SKILL OF IDENTIFYING PROS/CONS (IPC)
This is a micro Thinking Skill out of the total twenty seven Thinking Skills. This skill helps the children to identify good and bad or positive and negative features of a given concept, element, idea, situation, phrase or a statement.

1.3.1 Meaning of Identifying Pros/Cons
This skill is entitled as Identifying the Pros/Cons (IPC). It is a skill to judge the positive and negative attributes of a given concept or idea. IPC has 3 words involved in its body.
They are (a) Identifying (b) Pros and (c) Cons. The details about them are given here under abbreviation of IPC.

1.3.2 Components of Identifying Pros/Cons:
- The word ‘Identifying’ carries connotation like recognizing, labeling, discriminating, demarcating and so on. These have their special meaning but we have derived the use of all other terms accept the one chosen for the same.

- The word ‘Pros’ is not actually a dictionary word. As a matter of fact pros and cons are used as proverb or one phrase. Here the clarity of the meaning of pros is carried out by the words like strength, favor, profit, positivity, inside, goodness etc. Actually speaking these words have their own meanings, but the list of all these words will be able to make the sense clear.

- The word ‘Cons’ also is not a dictionary word. It is always used with the pros to make a phrase pros and cons. To get an overall impression we can use the words like weakness, loss, against, negatives, badness, limitations and outside. Of course these words have their own meaning but here we avoid the use of other terms accept the one chosen for the purpose. ‘Cons’ is also used for consequences.

1.3.3 Operational Steps of Identifying Pros/Cons
The above approach is called a ‘component approach’ to understand the micro skill called Identifying Pros/Cons. Another approach is called ‘operational approach’ to understand the micro skill in a better way. This micro skill is a process having a series of steps for the mental development of a child. A series of steps necessary for this procedure are presented. These steps are specific. Generally the sequence of these operational steps does not change. Practically sometimes they may alter the temporal sequence. These steps can be listed as follows.
i. **Identification of the statement/concept:** This step is the beginning of thinking skill of IPC. The teacher will give the statement or the topic selected to debate.

ii. **Listing the statements showing strengths and opportunities of the concept:** In this stage the teacher will ask his students to think about all the positivity present in the concept. The teacher will allow his students to think about good ideas, to list them out mentally and then they will be allowed to write them down into their notebooks without any discussion.

iii. **Listing the statements showing weaknesses and threats of the concept:** This step is similar to the above step but here the teacher asks the students to make a list of weaknesses present in the concept. Students arrange them in the list in their notebooks.

iv. **Selecting the more applicable sentences for the statement/concept:** Now students select the more applicable sentences from the list which are having heavy impact or the sentences showing more strength.

v. **Selecting the more harmful sentences for the statement/concept:** After the strong positive sentences, students are asked to select most hazardous sentences from the second list of negative sentences in the same way as previous step.

vi. **Finding arguments for the selected sentences in favor of the concept:** This step requires more live support from the students. Teacher is like a passive listener. The teacher gives a list of selected sentences which gives strength to the statements. The students give logical justification to the selected sentences one by one.
vii. **Finding the arguments for the selected sentences against the given concept:**
This step is similar to the above step. The teacher will show the second list of harmful sentences and ask the students for their justifications. That justification must be based upon the logical arguments.

viii. **Drawing the boundaries by specifying for the judgment:** This step is essential for making the process of Identifying Pros/Cons complete. Student thinks properly or step by step to get best solution of the situation or a problem. They draw boundaries on the basis of effect of selected sentences on the statement.

1.3.4 Purpose of Identifying Pros/Cons

- It is a strategy designed to encourage all students to participate actively in class discussions and to think critically.
- It gives students a framework for evaluating both sides of an issue or question. Students are encouraged to process opposing evidence and information before asserting viewpoints, giving them an opportunity to refine their thinking.
- It requires students to work in groups and helps to develop cooperative learning skills.
- It incorporates all the four language skills (reading, writing, speaking, and listening).
- It functions as a pre reading, post reading, or prewriting strategy.
- Develops students who are active, purposeful, and independent learners.

1.4.0 INSTRUCTIONAL MATERIAL:
Instructional Material includes video and audio recordings, motion pictures, film strips, module, CAI, photographic and similar visual material, audio and video transmission,
computer program, three dimensions and exhibits, which are prepared or produced in whole or in parts by a faculty and which are used to assist or enhance instruction.

1.4.1 Components of Instructional Material

- **Title:** The title of the Instructional Material should be clear and concise.

- **Introduction:** The introduction should give the background and rationale of the development of the Instructional Material.

- **Overview:** The purpose, structure, organization and users of Instructional Material provide an overall impression of its content.

- **Introduction to the users:** This component includes clear instructions to the learners as to how this should proceed and what he/she has to do after each step.

- **Pretest:** The pretest should be taken by the experimenter in the beginning. This helps to find out the level of Thinking Skills of Identifying Pros and Cons that the learner already had.

- **Objectives:** The objectives of the Instructional Material should be clearly stated. They should specify the expected learning outcomes in terms of behavior.

- **Learning Activities:** The learning activities should be planned on previous knowledge of the learner. They should be based on the needs of the learner.

- **Post test:** The evaluation is done with the help of a post test; the post test helps in finding how well the learners have attained the expected learning outcomes.

16
1.4.2 Importance of Instructional Material

1) Instructional Material provides an opportunity for organizing numerous sequences of experiences to reflect special interest of students in Thinking Skill of Identifying Pros/Cons.

2) It helps in developing the analysis and synthesis abilities among the students.

3) It provides an opportunity to self-study and freedom for critical thinking.

4) It provides immediate reinforcement to each correct response of the learner.

5) It gives opportunity for the development of divergent thinking.

6) It facilitates the individual differences in learning situation.

7) It assesses the students' progress in learning.

8) It reduces the routine aspect of instruction.

1.4.3 Limitations of Instructional Material

1) It takes more time and money for preparation.

2) It is difficult to develop Instructional Material on all 27 skills of thinking.

3) It requires expertise in language communication and content mastery.

4) The role of teacher is minimized. He/she only acts as a guide.

5) It is difficult to develop Instructional Material for all subjects.

1.5.0 KEY TERMS USED

Main key terms used in this study are as follows-

Thinking Skill

This can be defined as a pattern of behavior in which we make use of internal representations (symbols, signs etc.) of things and events for the solution of some specific purposeful problem.
IPC (Identifying Pros/Cons)
This is one of the skills among twenty seven skills of thinking. It deals with recognizing and analyzing strengths and weaknesses of an element and finding arguments in favor and against of the element to draw some boundaries.

Instructional Material
According to Good’s dictionary (1960), “It is a device with instructional content or function i.e. used for teaching purposes including book, textbook, supplementary reading materials, audio-visual and other sensory material, scripts for radio or television, modules, instructions and packaged sets of materials for construction or manipulation.”

In the present study Instructional Material refers to a device or a content which includes activity task and solved exercise to provide a guide line for the learners.

Cognitive Domain
It is grouping of levels of learning associated with mental activity which ranges from knowledge through comprehension, application, analysis, and synthesis to evaluation. This domain is concerned with how individuals think; their intellectual capabilities, level of development and preferred thinking styles.

Affective Domain
This domain relates to how individuals feel emotionally and physically while learning. This includes both internal and physical factors like- hunger, thirst, fatigue, and illness and psychological terms like- willingness to take risks, persistence and attention abilities; attitudes, beliefs, and assumptions. It is grouping of levels of learning associated with a person’s attitudes, personal beliefs, and values which range from receiving through responding, valuing and organization to characterization. It includes classification of factors comprising feelings, attitudes, emotions etc. that affect learning and behavior.
There are some another important terms in the present study. These are Achievement in Science, Development of Thinking Skill of Identifying Pros and Cons and Reactions of the students towards the Instructional Material, Intelligence, Creativity, Tolerance of Ambiguity, Self Confidence, Study Habit and Introversion-Extroversion Personality. Their details are given as follows.

**Reaction**

According to Bar “Reaction is a term applied to expression of opinion or judgment regarding some situation, object and character.” In the present study the reaction scale will be developed by the researcher to measure the reactions of the students’ on 5 point scale.

**Achievement**

According to Good’s dictionary (1952) “It is an act of achieving, accomplishment, the achievement of one’s objective.” Achievement is proficiency of performance in a given skill or body of knowledge.

It is progress in school, theoretically different from Intelligence but overlaps with it to a great degree. Knowledge attained or skills developed in the school subjects, usually designated by test scores or by the marks assigned by teacher or by both. In the present study achievement refers to one’s performance in Science subject.

**Intelligence**

Intelligence as a concept has been understood in different ways by different psychologists. According to Stern (1914), “Intelligence is the general capacity of an individual consciously to adjust his thinking to new environments. It is the general mental adaptability to new problems and conditions of life.”

According to Bagnon (1937) - “Intelligence is the capacity to learn and adjust to relatively new and changing conditions.”
**Personality**

The term Personality is derived from the Latin word *Persona* which means mask. According to Allport (1948) - “Personality is a dynamic organization within the individual of those psychophysical systems that determine his unique adjustment to his environment.”

Eysenck (1972) gave three basic dimensions of Personality.
1. Introversion-Extroversion
2. Neuroticism (Emotional instability – Emotional stability)
3. Psychoticism.

In this study researcher will consider Introversion Extroversion dimension of Personality of students.

**Self Confidence**

Self Confidence is a Personality trait and it helps the individual to behave in the social environment with ease and success. A self-confident person perceives himself to be a socially competent, emotionally mature, and intellectually adequate, optimistic, independent, self-reliant, self-assured, forward moving, fairly assertive and having leadership qualities.

The layman’s meaning of Self Confidence is having faith in one self.

According to Good’s dictionary- “Self Confidence refers to one’s own ability.”

According to Baswana- “Self Confidence is an individual’s perceived ability to act effectively in a situation, to overcome obstacles and to get things alright.”

**Creativity**

Creativity generally resembles divergent thinking.
According to Drevdahl (1956) - "Creativity is the capacity of a person to produce compositions, products or ideas which are essentially new or novel and previously unknown to the producer."

**Study Habits**

According to Good (1959): Study Habits are, (i) The tendency of a student to study when the opportunity is given. (ii) The student’s way of studying, whether systematic or unsystematic, efficient or inefficient etc.

**Tolerance of Ambiguity**

The term Tolerance of Ambiguity was defined as two separate terms i.e. ‘Tolerance and Ambiguity’ as well as a whole term also.

Brunswik (1948) said that ‘Intolerance of Ambiguity refers to becoming anxious about resisting situation that were not clearly structured.’ Empson (1953) said that ‘Ambiguity plays role when separate meanings functions in the process of interpretation as alternative excluding the inhibiting each other.’

Brand (1953) considered Tolerance of Ambiguity as one of the basic variables in both, emotional and cognitive orientation of a person towards life. Further, the level of Tolerance of Ambiguity has been found to associated with the level of creative or diversion thinking ability (Bhawalkar, 1992).

According to Good (1959): “It is an ability of individual to withstand frustration generated by stimuli which are equivocal or unstructured.”

**1.6.0 RATIONALE**

The rationale given below is on the basis of review of related literature which is given in second chapter of this study.

From the researches cited in that part, it is evident that very little work has been done in this field. Choudhary (1983) conducted an investigation into the trends of creative thinking of people of age 11+ to 13+ in relation to some psycho socio correlation...
and found no significant difference between the mean creative thinking scores of male and female children of rural and urban areas. Raina and Vats (1983) studied style of learning and thinking (hemisphericity), openness to inner experience, sex and subject choice and found that in an experience as characterized by institution fantasy and imagination were positively associated with right hemisphere style of thinking. Vora (1984) conducted an investigation on the impact of divergent thinking program in Mathematics on Creative level of the Children of classes 7th & 8th and found Divergent Thinking Program in Mathematics (DTPM) effective. Dutt (1989) studied the effect of problem solving strategies on the problem solving ability in Science of high school students in relation to anxiety, Cognitive style and Intelligence and found the strategies to be effective. Gill (1990) studied the effect of training strategies on Identifying Pros/Cons skills and cerebral dominance in relation to Intelligence and Cognitive style and found Intelligence and originality positively associated. Parasnia (1990) conducted an independent study on development of problem-solving ability of students of standard 9th and found the test to be effective. Kumaria (1991) worked on Problem solving strategies and Cognitive capabilities of children of age group 10-12 and found Problem solving ability positively related to Cognitive capability. Shah (1992) conducted a study on “Effectiveness of educational programs for developing skills of thinking” and found the program to be effective. Kumari (1993) studied effect of CoRT (Cognitive Research Test) treatment upon creative thinking & problem solving of 9th class students and found it to be effective. Singh & Gosain (1993) studied Critical Thinking in relation to Intelligence& Socio economic status of Uttar Pradesh intermediate girls coming from correspondence course & regular schooling and found them related significantly. Michael (1998) prepared and tried out the program for developing Creative Thinking ability in the students of the age group 10+ to 12+ controlling some psycho-socio factors and found the program to be effective. Sharma (2001) developed an Instructional Material for developing Thinking Skills of Classification at Primary level and found it to be effective. Tripathi (2002) observed the effectiveness of Instructional Material on Thinking Skill of Creative Problem Solving in terms of Achievement and Students’ reactions at primary.
level and found it to be effective. Asthana (2007) studied effectiveness of Instructional Material on Thinking Skill of Classification in terms of students Achievement and reaction at middle school level and found it to be effective. Dhade (2008) studied the effectiveness of Instructional Material in Science based on Thinking Skill of Creative Problem Solving in terms of students’ Achievement and Reactions at middle school level and found it to be effective.

From the above mentioned researches in the field of Thinking Skills it is evident that very little work has been done for the development of Thinking Skills among students. Maximum work has been done for Primary and Middle grade students as compared to the Secondary grade students. So there is a need to develop Instructional Material on Thinking Skill, of Identifying Pros/Cons for Secondary grade students. One should be teaching students, how to think, instead teaching them what to think. We are more concerned with what answers are given rather than with, how they are produced. The present formal system of education is not fulfilling the need of society and educationists properly. The lecture method still predominates as an important method of instruction at all levels. This method cannot make the students to think. The students also believe in rote memorization of concept. The teaching method should be such that they encourage students to think rather than to cram.

As thinking leads to a strong motivation for the particular problem that is why it is very essential to develop Thinking Skills among children. Students can learn to think if school concentrates on teaching them how to do so? As the researcher is Post graduate in Science, she has interest in the field of Thinking Skill. The Thinking Skills have a sound basis in the research & theoretical literature. Thinking Skills are important to study the mental process in systematic & sophisticated manner. Thinking Skills provide a mechanism for stimulating thoughts and a framework for conceptualizing mental process, to construct new knowledge & to develop both discipline and logical analysis. Every concept or phenomenon has two aspects, one is positive and other is negative. The Thinking Skill of Identifying Pros/Cons helps the students to think about both the aspects of a concept or phenomenon. It develops the positive and negative thinking approach
simultaneously which helps the students to evaluate the concept/phenomenon properly. That is why the researcher decided to work on the Thinking Skill of Identifying Pros/Cons.

Along with the independent variable as Instructional Material and dependent variables as Achievement in Science, Development of Thinking Skill of Identifying Pros/Cons and Reactions of the students towards the Instructional Material. Intelligence, Creativity, Tolerance of Ambiguity, Self Confidence, Study Habits and Introversion-Extroversion Personality are taken as co-variates. These co-variates will be affecting the study in the following manner.

**Intelligence**
The intelligent student can think about more pros and cons as compared to a less intelligent student. Intelligence helps an individual in thinking about various aspects of the concept and ultimately in decision making. Intelligent students can easily understand how to think as compared to less intelligent students who might be thinking only what to think.

**Personality**
In this study researcher will consider introversion extroversion Personality of students. The highly extroverts are recognized as sociable, outgoing, impulsive, optimistic and jolly people while the introverts are recognized as quite introspective, reserved, reflective, disciplined and well-ordered people. The extroverts will point out more pros and cons as compared to introverts. Introverts may not point out the pros and cons even if they think about them. It may affect the decision making on that topic. This is just an assumption. There is no concrete evidence. In order to find out who Extroverts or Introverts can better suggest various pros and cons for a given topic, this variable has been selected.
Self Confidence
Self Confidence is a Personality trait and it helps the individual to behave in the social environment with ease and success. A self-confident student will put pros and cons without any hesitation while a low self-confident student will hesitate in presenting pros and cons of any problem even being correct. In that situation some important points may remain untouched which were able to change the outcome.

Creativity
Creativity generally resembles divergent thinking. As the creative student will have divergent thinking so he/she will be able to think more pros and cons as compared to a normal student. They can create pros and cons via their Creativity by thinking in divergent sides. Original and unique ideas can give direction to the decision according to themselves.

Tolerance of Ambiguity
In the last steps of Thinking Skill of Identifying Pros and Cons students are supposed to select best arguments in favor and against of the concept/problem as well as to draw boundaries to take decision. In this situation sometimes debate like situation arises. According to Fromm (1959), “Ability to Tolerance of Ambiguity refers to an ability to accept conflict and tensions resulting from polarity.” The students having high Tolerance of Ambiguity will still hold their point and will try to get that selected while the students having low Tolerance of Ambiguity may give up their point, this will affect the decision. Along with this, at the time of thinking and listing the pros and cons collectively, similar situation may arise and the students having high Tolerance of ambiguity will be able to think more pros and cons in that situation also, while those who are having less Tolerance of Ambiguity may give up thinking for more pros and cons.
Study Habits

The students having higher level of Study Habits will be more knowledgeable and will be able to think more pros and cons as compared to the students having low level of study habits. Due to this some points may remain untouched because of the students having lower Study Habits and all the pros and cons will not emerge out about the topic. This will affect the outcome. No study has been found related to skill of identifying Pros and Cons and study habits. In order to see whether there is any relationship between them, this variable has been taken.

1.7.0 STATEMENT OF THE PROBLEM:

It is as follows:

Effectiveness of Instructional Material based on Thinking Skill of Identifying Pros/Cons in terms of Students’ Cognitive and Affective domain related variables at Secondary School Level.

1.8.0 OBJECTIVES:

Following objectives were formulated in this study.

1. To develop the Instructional Material in Science based on Thinking Skill of Identifying Pros and Cons.

2. To compare the adjusted mean scores of Achievement in Science of the students of Experimental and Control groups by considering Pre- Achievement in Science as covariate.

3. To compare the adjusted mean scores of Thinking Skill of Identifying Pros/Cons of students of the Experimental and Control groups by considering Pre- Thinking Skill of IPC as covariate.
4. To study the effect of Treatment, Intelligence and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

5. To study the effect of Treatment, Personality and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

6. To study the effect of Treatment, Creativity and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

7. To study the effect of Treatment, Tolerance of Ambiguity and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

8. To study the effect of Treatment, Study Habits and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

9. To study the effect of Treatment, Self-confidence and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

10. To study the effect of Treatment, Intelligence and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.
11. To study the effect of Treatment, Personality and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

12. To study the effect of Treatment, Creativity and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

13. To study the effect of Treatment, Tolerance of Ambiguity and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

14. To study the effect of Treatment, Study Habits and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

15. To study the effect of Treatment, Self-confidence and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

16. To find out the effectiveness of Instructional Material in terms of reactions of students of the experimental group.

1.9.0 HYPOTHESIS
The following hypotheses were formulated in the present study.

1. There will be no significant difference in the adjusted mean scores of Achievement in Science of students of the Experimental and Control groups by considering Pre-Achievement in Science as covariate.
2. There will be no significant difference in the adjusted mean scores of Thinking Skill of Identifying Pros/Cons of students of the Experimental and Control groups by considering Pre-Thinking Skill of IPC as covariate.

3. There will be no significant effect of Treatment, Intelligence and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

4. There will be no significant effect of Treatment, Personality and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

5. There will be no significant effect of Treatment, Creativity and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

6. There will be no significant effect of Treatment, Tolerance of Ambiguity and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

7. There will be no significant effect of Treatment, Study habits and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.

8. There will be no significant effect of Treatment, Self-confidence and their Interaction on Achievement in Science of students by considering Pre-Achievement in Science as covariate.
9. There will be no significant effect of Treatment, Intelligence and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

10. There will be no significant effect of Treatment, Personality and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

11. There will be no significant effect of Treatment, Creativity and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

12. There will be no significant effect of Treatment, Tolerance of Ambiguity and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

13. There will be no significant effect of Treatment, Study Habits and their Interaction on Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

14. There will be no significant effect of Treatment, Self-confidence and their Interaction or Thinking Skill of Identifying Pros and Cons of students by considering Pre-Thinking Skill of IPC as covariate.

1.10.0 DELIMITATIONS OF THE STUDY

- The Instructional Material was developed for secondary level students only namely for ninth class students.
• The study was limited to one skill only out of twenty seven Thinking Skills namely Identifying Pros/Cons.
• The Instructional Material was developed only in Science.
• The Instructional Material was developed only in English language.
• The study was limited only to Indore city.