## CHAPTER 2
THEORETICAL ORIENTATION AND REVIEW OF THE PAST STUDIES

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CHAPTER 2
THEORETICAL ORIENTATION AND REVIEW OF THE PAST STUDIES

2.1 INTRODUCTION

This chapter attempts to make a contribution to knowledge and theory building in the field of instruction package (IP) and thinking skills. Therefore, the researcher tries to view the instruction package and thinking skills theory and understand them as the source of concepts and the connections among them that made it possible to produce hypotheses, identify confirmations or refutations.

The researcher has summarized the relevant theory from books and review of the past research which have already done in the area of instruction package (IP) and thinking skills.

2.2 THEORETICAL ORIENTATION

The theoretical orientation of the present study is to state the basic ideas on the topic i.e. definition of instruction package (IP), theoretical foundation and type of instruction package (IP), steps of constructing of instruction package (IP), advantage and disadvantage of instruction package (IP), effectiveness of instruction package (IP) in teaching-learning process, definition of thinking skills, different types of thinking skills and important of thinking skills.

2.2.1 Instruction package (IP)

2.2.1.1 Definition of instruction package (IP)

Instruction package is the intentional facilitation material provided for learning toward identified learning goals. It is the deliberate arrangement of learning material to promote the attainment of some intended goal. (Patricia, L. Smith and Tillman, J. Ragan, 2011)\(^1\)

Association for Education Communications and Technology (AECT) (1977)\(^2\) has defined instruction package (IP) as a method of instruction in which the multi-media is used to instruct the student and contains the instruction which is designed to teach, guide, and test the student until a desired level of proficiency is attained.
Instruction package (IP) is described by Frenzel (1980) as the process by which written and visual information are presented in a logical sequence to a student by the multi-media. The students learn by reading the text material presented or by observing the graphic information displayed.

Locatis and Atkinson (1984) describe instruction package (IP) as a mode of instruction that involves student interaction with the multi-media. Typically, students access programme presented in segments, with each segment including information and questions or problems for students’ response. The correctness of each response is indicated immediately and remedial or new information is presented.

Driscoll (1994) states that instruction package is an intentional arrangement of experience, leading to learners acquiring particular capabilities. These capabilities can vary qualitatively in form, from simple recall of knowledge to cognitive strategies that allow a learners to find new ways of problem solving. The instruction package is developed to focus toward one or more goals for learning. In addition to effective using instruction package, designers also wish to create it with the efficient and appealing.

According to Munden (1996) explains that instruction package (IP) is an educational medium in which instruction content or activities are delivered by the multi-media (i.e. printed materials, video, CD, tape, slide, graphics and pictures) which enhance the learning experience of a group or individual student.

Henry, S. Tenedoro (2010) defines instruction package (IP) as a self contained teaching unit which helps a student learn a set of objectives, containing a variety of instruction resources.

Dunn, R. and Perrin, J. (2011) mention that instruction package (IP) is the self-contained teaching units that appeal to students with no perceptual strengths who have previously been unmotivated. It is the individualized instruction, many of the instruction events carried out by the instructor with a group of students and individual student through instruction materials. The instructor’s role is the motivator, counselor, evaluator, decision maker and responsible for each student’s mastery of the learning objectives.
From the above mentioned it can be concluded that instruction package (IP) is an educational medium in which instruction contents or activities are delivered by multimedia which is used to enhance the students’ learning experiences in a group or in individual. It contains the teaching units which are designed to teach, guide, and test the student until a desired level of proficiency is attained. The students learn a set of objectives, containing a variety of instruction resources by reading the text material presented or by observing the graphic information displayed.

In the present study, instruction package (IP) refers to a form of learning that utilizes printed materials, pictures and graphics that appeal on thinking skills of primary school students.

2.2.1.2 Characteristics of Instruction package (IP)

Idea and practice of instruction package (IP) is grounded in all the predominant learning theories of the twentieth century. It aims to help the student to learn a set of objectives, containing variety of instruction resources (Multi-Media). The characteristics of instruction package (IP) are as follow: (Henry, S. Tenedoro, 2010\(^9\) and Dunn, R. and Perrin, J., 2011\(^10\))

(1) Instruction package (IP) focuses on a single concept.

(2) The student is immediately informed of the correctness of each response to the question or task because all resources are self-correcting.

(3) Learning is private and aimed at individual learning style. Only the teacher and student know how well the youngster is doing. Self-image and success are enhanced as progress increases without peer competition for the slower students. The multi-sensory approach; the colorful materials and packaging; the option of working alone; the motivating choices; the selection of when, where, and how to work; and the ability to move about and to eat if necessary make the instruction package an effective teaching aid for many students.

(4) Multi-Media i.e. printed materials, video, CD, tape, slide, graphics and pictures are used for providing learning contents and summary the important information.

(5) Feedback and evaluation are built in. The package includes tests, and students may respond by writing, taping, or showing results. Correct answers and responses may be checked as the items to be mastered are completed. The directions allow for
immediate feedback and self-evaluation. Mistakes can be corrected through repetition of taped or printed directions.

(6) Flexibility: Flexibility means access to use instruction package at a wide range of time or locations.

(7) Self-Pacing: Self-pacing lets students proceed at a pace appropriate for their individual learning levels. Students using instruction package can control the time allowed to solve problem as well as the rate of presentation they can spend several weeks with remedial material or skip entire lesson. When they feel ready to be tested on the specific material, they can choose the testing cycle. Self-pacing can help to individualize instruction for those students who have used the instruction package before or have prior knowledge of the subject. Self-pacing can be combined with self-placement testing, which directs the student to an appropriate beginning point and to an optimal instruction rate.

(8) Remediation Options: The instruction package can vary instruction treatments and adapt to individual differences after analyzing student responses. Records of the student's past performance can be used for remediation of students.

2.2.1.3 Components of instruction package (IP)

Three major components should be included in the effective instruction package (IP) (Dick and Carry, 1990)

(1) Learners’ direction: Learners’ directions or guide-sheets are instructions for learners. They should explain how to use the instruction package (IP). In printed-Based media, they sometimes take the form of a student manual and are particularly important for individualized instruction. They are usually unnecessary when instruction is delivered in a group setting, since the instructor can provide learners directions orally. However, most instructors do want to provide group participants with an organized manual, and that manual is a method of providing directions to learners.

The evaluation criteria should be managed when selecting existing instruction materials:

(1.1) Goal-centered criteria for evaluating materials: They are focused on the content of the instruction. Specific criteria in this area include: congruence between
content in materials and objectives, adequacy of content coverage and completeness, authority, accuracy, currency and objectivity.

(1.2) Learner-centered criteria for evaluating materials: They are focused on the appropriateness of instruction materials for the target group. The learner analysis documentation should provide the foundation for this evaluation. Specific criteria in this area include the appropriateness of the materials for the learners with regards to their vocabulary and language levels, developmental, motivation, and interest levels, backgrounds and experiences and special language or other needs.

(1.3) Learning-centered criteria for evaluating materials: They are focused on the adequacy of existing materials. Materials can be evaluated to determine whether the following items are included and adequate/complete: (a) pre-instruction materials, (b) content sequencing and presentation, (c) student participation and congruent practice exercises, (d) feedback, (e) assessments, (f) follow-through directions for enhancing memory and transfer, (g) delivery system and media formats, (h) learning guidance to move students from one component/activity to the next.

(1.4) Context-centered criteria for evaluating materials: They are focused on the appropriateness of existing materials for the instruction and performance context. Criteria in this area include the authenticity of the materials for context and learners, the feasibility of the materials for settings and budget. Here examine the technical quality of existing materials with regards to packaging, graphic design and typography, durability, legibility, audio and video quality, interface design, navigation and functionality.

(2) Instruction material: Instruction materials should be contained the actual of instruction or content either written materials, mediated or facilitated by an instructor. Instruction materials refer to any pre-existing materials that are being incorporated, as well as to those that will be specially developed for the objectives. The materials may also include information, text and visual aids that the learners will use to guide their progress through the instruction. Thus, instruction materials should provide learners with the information they need to achieve the performance objectives.

(3) Assessment: Tests are the students’ evaluation tools. The term “test” is used in a broad sense. Type of test includes pre-instruction assessments (pretest) to determine what
learners know before the participation in planned learning experiences. Other type included self-check and instructor-check objectives during instruction to determine how well learners are achieving enabling performance objectives (progress-test) and post-instruction assessment (posttest) how well learners have achieved the terminal performance objectives by the end of the planned learning experiences. Further include job-based assessments (on the job performance tests) to determine how well learners are apply on the job what they learned in the instruction setting. All instruction material should be accompanied by objective tests or by product or performance assessments.

(4) Instructor directions or guide-sheets: Instructor directions or guide-sheets are the instructors’ counterparts of learners’ directions or guide-sheets. They are procedural guides to aid instructors in delivery instruction or in supporting learners as they individually apply themselves to planned learning tasks. The format of instructor directions or guide-sheets is often a general description of the total package, typically called the instructor’s manual. It provides the instructor with an overview of the materials which mostly provides in form of the printed materials which is given message as well as how instructors’ and learner’s directions and tests will be organized and presented.

(5) Learning activities: Learning activities are consisted of two categories: individual and group. Individual learning activities are geared to individualized instruction and group learning activities are provided for groups of students.

2.2.1.4 Types and steps in preparing instruction package (IP)

There are three types of instruction package (IP): (1) Lecture package, (2) individualized package, and (3) learning centre package. Each of the instruction package (IP): is appropriate under different instruction circumstances and therefore takes a different pedagogical approach. The lecture package is used along with the teachers’ teaching-learning process in classroom. The individualized package is used for individual student. The learning centre package is used as in a group of students. All of these three types of instruction package can be prepared by the same steps of preparing. Henry, S. Tenedoro. (2010)¹²

(1) Identify the topic and related objectives
(2) Develop, in some form, a list of the information the students to master
(3) Design and include an activity, which teaches the objective for each of the perceptual preference.
(4) Write transcript which describes the objectives they will learn, summarizes the information they must master, and provides directions on how to use the instruction package
(5) Provide pretest, summative test and posttest covering the objectives
(6) Put all the materials in the box with a global and analytic title.

In order to prepare the instruction package, the following guideline can be applied:

The following guidelines apply to instruction material for participants who may not have a high level of visual or pictorial literacy:

(1) The depth pictures used in instruction package should be avoided. There should be a moderate amount of detail. The important objects should have enrichment of detail: texture, gradients of texture, shading, etc. The portrayal should be realistic, no impressionism or expressionism.

(2) The instruction package should provide good contrast, realistic cues and details for identification of the objects portrayed. Pictures can be more expressive and informative. That is, drawing in two dimensions rather than using perspective to create three-dimensional effects. Pictures of people and places should be relevant to daily life and environment for proper recognition (be in the correct cultural context).

(3) Illustrations should be interesting in their own right, compared with words that are not particularly interesting as things in themselves - it is the ideas conveyed by the words that matter. Thus, illustrations may attract or distract the reader.

- Illustrations are good for conveying concrete images and providing support material when teaching a concept, as a way of avoiding technical jargon, and for conveying visual and spatial concepts (e.g. relative size of objects).
- Words are good for conveying abstract ideas and for communicating concepts that have already been learned and for conveying propositional concepts.
- Illustrations and diagrams are good for conveying ideas that have to be considered simultaneously. They allow learners to make multiple discriminations easily.
• Words are possibly better for conveying ideas that have to be treated sequentially when the order in which the ideas are encountered is critical (a poem or set of instructions) though cartoon strips are useful for instruction.

• The positioning of illustrations is very important and should be tested if necessary.

• Pictures should not be used when the information can be readily conveyed in words.

• Two-dimensional representations of three-dimensional objects causes some difficulty in some cultures

• Translation of time into space includes learned conventions: authors must either teach the code or be sure readers know it.

• Illustrations of a process involving separate steps or actions should have at least as many individual pictures or frames as there are main steps or actions.

• Illustrations of things (especially line drawings) are more easily remembered than their names.

• Illustrations are usually better with captions. Labelling of illustrations aids classification and helps long term recall.

• Simple line drawings are best for instruction material particularly for signifying general concepts (a stick figure "man"), while highly detailed illustrations can be used for particular concepts ("a foreign election monitor").

• People are attracted by relative complexity and change.

• Beware of problems of ambiguity, literal or figurative meaning, depth cues, action, changes in scale, etc., especially for illiterate people.

• Reading illustrations, tables, diagrams, graphs and symbols has to be taught. People have to learn to interpret the conventions of illustrations in much the same way as they have to learn to read. Authors and designers must therefore have knowledge of the background experience of their potential readers.

• Place diagrams and illustrations where readers will see them and repeat them if necessary.
(3) Colours and shapes must be carefully chosen because of symbolic meanings attributed to colours and shapes which can distort the intended meaning. In some cases, colour may be unnecessary and can cause problems. Some points to consider are:

- Do not use too many colours or too few (e.g. when using it to depict or represent several functions).
- Colour codes must be understood and these are culturally constructed although there do appear to be some more universal constructs.

The following happens with certain colours when printed:

- Pale colours are almost invisible for words or fine lines.
- Dark colours appear almost black for words or fine lines.
- Bright colours dazzle for words or fine lines.

The use of symbols, themselves, can also be tricky and may be best avoided.

### 2.2.1.5 Advantage of instruction package (IP)

There is ample evidence that instruction package (IP) is more effective than the traditional methods of instruction. The advantages of instruction package (IP) as identified through the findings of research studies areas below:

1. Increase the high achievement level: A large number of research studies provide evidence that instruction package (IP) can be used to increase high achievement levels for students of different ages and abilities. (Chanon Chaisang, 2001)

2. Students are expected to benefit from instruction package (IP): Among the benefits that have been expected are better and more comfortable learning for students, since they learn at their own pace and convenience; opportunities to work with vastly superior materials and more sophisticated problems; personalized tutoring; automatic measurement of progress; and others. (Sanit Kongsomboon, 2011)

3. Multi-media used in instruction packages are reflected in educational practices such as reading, writing and drawing helps to increase student cognitive processes and motivation i.e. (a) personalizing information, (2) providing a fantasy context and (3) providing a learner with choice over his/her own learning.

4. Instruction package (IP) provides one-to-one interaction with a student, as well as an instantaneous response to the answers elicited, and allows students to proceed at their
own pace. Instruction package (IP) can be used diagnostically, and, once a student’s problem has been identified, it can then focus on the problem area. Because of the privacy and individual attention afforded by instruction package (IP), some students are relieved of the embarrassment of giving an incorrect answer publicly or of going more slowly through lessons than other classmates.

(5) Instruction package (IP) helps teachers to success in teaching learning process: instruction package (IP) offers mastery learning materials, individualized instruction that guarantees students’ success in mastering knowledge. As it provides lots of question types so students can find the opportunity of seeing lots of question types. Moreover, students enjoy their job, and learn more effectively.

(6) Instruction package (IP) is Learner-Centered and Interactive. The focus is the learner rather than the teacher as in Constructivistic Approach. Instruction package (IP) is individualized instruction.

(7) Instruction package (IP) help to increase students’ attention: There are lots of activities. Students can reach these activities which may be funny for students. Instruction package (IP) can increase the students’ attention to the subject and so students study their own time and they can study outside the class.

(8) Instruction package (IP) impacts and improves students overall level of mastery. In this process its’ receiving immediate feedback on students performance is very important. Students have too much chance to practice their learning, after practicing they can see their level of knowledge and they can see how much they know about the subject, in which areas they have trouble. So they should want help in the areas they are lack of. By the help of instruction package (IP) teachers can assess students’ performance and lessons efficiency easily.

From above mentioned, the advantage of Instruction package (IP) can be summarized as follow:

- One-to-one interaction
- Great motivator and sustaining motivation
- Freedom to experiment with different options
- Instantaneous response/immediate feedback to the answers elicited
• Self pacing- allow students to proceed at their own pace
• Helps teacher to devote more time to individual students
• Privacy helps the shy and slow learner to learn
• Individual attention and individualize instruction
• Learn more and more rapidly
• Multimedia helps to understand difficult concepts through multi sensory
• Student can solve the problems on their own
• Reaching learners even outside classrooms
• Using learning time efficiently
• Student can learn with enjoyment
• Increased peer interaction due to a collaborative rather than competitive learning environment
• Self directed learning, elimination of space, time and geographical constraints – students can decide when, where, and what to learn
• Increased interaction with more accessible teachers with decreased feedback turn-around time
• Increased quality of learning with deeper critical reflection and systematic scaffolding of ideas taking place
• Increased access to databases and other resources not normally available distance learners. (Berge, 1995\textsuperscript{15}; Hiltz, 1994)\textsuperscript{16}

2.2.2 Thinking skills

2.2.2.1 Definition of thinking skills

The term “thinking skills” can be defined by educators as below:

Bloom’s taxonomy of thinking skills identified various categories in the various thinking levels. (Bloom & Krathwohl, 1956)\textsuperscript{17}

Cognitive goal ------------------------- Thinking cues
1 Knowledge -----------------------------Say what you know, or remember, describe, (knowing and remembering) repeat, define, identify, tell who, when, which, where, what
2 Comprehension ---------------------- Describe in your own words, tell how you feel (interpreting and understanding) about it, what it means, explain, compare, relate
3 Application ---------------------------- How can you use it, where does it lead, apply (applying, making use of) what you know, use it to solve problems, demonstrate

4 Analysis ---------------------------- What are the parts, the order, the reasons why, (taking apart, being critical) the causes/problems/solutions/consequences

5 Synthesis ----------------------------- How might it be different, how else, what if, (connecting, being creative) suppose, put together, develop, improve, create your own

6 Evaluation ---------------------------- How would you judge it, does it succeed, will it (judging and assessing) work, what would you prefer, why you think so

Nancy Skerritt (2003)\textsuperscript{18} defines thinking skills as cognitive processes that enable human beings to comprehend experiences and information, apply knowledge, express complex concepts, make decisions, criticize and revise unsuitable constructs, and solve problem. It is the habits of mind or thinking behaviours that start with a problem and ends in a solution. Thinking skills is a tool for adapting oneself to the physical and social environment in which he/she is in.

Ministry of education (2008)\textsuperscript{19} describes that thinking skill is the human ability or capacities for analytical, synthetic, constructive, critical and systematic thinking, leading to bodies of knowledge creation or information for judicious decision-making regarding oneself society and environment.

Robert Fisher (2010)\textsuperscript{20} states that thinking skills are the human capacity to think in conscious ways to achieve certain purposes. Such processes include remembering, questioning, forming concepts, planning, reasoning, imagining, solving problems, making decisions and judgements, translating thoughts into words and so on. A skill is commonly defined as a practical ability in doing something or succeeding in a task. Usually it refers to skills in particular contexts, such as being ‘good at cooking’ but they can also refer to general areas of performance, such as having a logical mind, good memory, being creative and so on. A thinking skill is a practical ability to think in ways that are judged to be more or less effective or skilled. They are the habits of intelligent behaviour learned through practice, for example children can become better at giving reasons or asking questions the more they practice doing so.
From the definition of thinking skills mentioned above, it can concluded that thinking skill is the human capacities to think in conscious ways to achieve certain purposes. It involves the mental process used in cognitive functions that enable people to make meaning from and create with a significant amount of memory, leading to bodies of knowledge creation or information for judicious decision-making and problem solving regarding oneself society and environment.

### 2.2.2.2 Theories Related to Learning and Thinking Skills

The better explanation about the process of thinking was described by Dewey (1933). According to Dewey, this productive process moves from reflection to inquiry, then to critical thought processes that, in turn, lead to a “conclusion that can be substantiated” by more than personal beliefs and images. Thought can straighten out entanglements, clear obscurities, resolve confusion, unify disparities, answer questions, define problems, solve problems, reach goals, guide inferences, shape predictions, form judgments, support decisions, and end controversies.

According to Dewey, thinking does not occur spontaneously but must be “evoked” by “problems and questions” or by “some perplexity, confusion or doubt.” The observations or “data at hand cannot supply the solution; they can only suggest it”. Furthermore, it is this “demand for the solution” that steadies and guides the entire process of reflective thinking; the “nature of the problem fixes the end of thought, and the end controls the process of thinking”. Dewey’s conceptualization parallels current discussion and research about problem solving and metacognitive strategies and the importance of teaching students to think about their own thinking processes (Kauchak & Eggen, 1998). As students become aware of their thinking processes, they realize how their own personal makeup can play a role in how they make their choices and interpret situations (Jacobs, 1994). Factors such as culture, experience, preferences, desires, interests, and passions can radically alter the decision-making process (Kahneman et al., 1982). Nevertheless, with time and more experience in systematic thinking, individuals and groups can develop the principles to guide decision making so that “a certain manner of interpretation gets weight, authority” as long as “the interpretation settled upon is not controverted by subsequent events”.
According to Piaget, J. (1972), the developmental stages are the key to cognitive development. School-age and adolescent children develop operational thinking and the logical and systematic manipulation of symbols. As adolescents move into adulthood, they develop skills such as logical use of symbols related to abstract concepts, scientific reasoning, and hypothesis testing. These skills are the foundation for problem solving, self-reflection, and critical reasoning (Crowl et al., 1997; Miles, 1992).

Based on Bruner, J. (1974), the learning processes involve active inquiry and discovery, inductive reasoning, and intrinsic motivation. Stages of cognitive development are not linear; they may occur simultaneously. Bruner introduced the “spiral curriculum” in which learners return to previously covered topics within the context of new information learned. Both Piaget and Bruner focus on active learning, active inquiry and discovery, inductive reasoning, intrinsic motivation, and linkage of previously learned concepts and information to new learning. Stages include enactive (hands-on participation), iconic (visual representations), and symbolic (symbols, including math and science symbols) (Crowl et al., 1997).

In each of Bloom’s three taxonomies (cognitive, affective, and psychomotor), lower levels provide a base for higher levels of learning (Bloom and Krathwohl, 1956). Comprehension and application form linkages to higher order skills; here, the learner uses meaningful information such as abstractions, formulas, equations, or algorithms in new applications in new situations. Thinking skills include analysis, synthesis, and evaluation and require mastery of previous levels, such as applying routine rules to familiar or novel problems (McDavitt, 1993). Thinking involves breaking down complex material into parts, detecting relationships, combining new and familiar information creatively within limits set by the context, and combining and using all previous levels in evaluating or making judgments. There also appears to be some interaction across taxonomies. For example, the highest level of the psychomotor taxonomy involves the use of our body’s psychomotor, affective, and cognitive skills to express feelings or ideas as in the planning and execution of a dance performance or song designed to convey a particular message.
Gagné said, intellectual skills begin with establishing a hierarchy according to skill complexity. Within this structure, discriminations are prerequisites for concrete and defined concepts, simple rules, complex higher order rules, and then problem solving. Cognitive strategies may be simple or complex (Gagné, 1985; Gagné, Briggs, & Wager, 1988).

Attitudes and motor skills, related varieties of learning, may involve lower as well as higher order thinking—spanning from a simple application of a tool to a complex systems analysis and evaluation. Bloom (1956) and Gagné and Briggs (1974) allow for greater possibilities of teaching complex skills to younger learners and the possibility that learners can be “young” at any age, starting at lower levels and connecting to higher levels of thinking. This variation for learning capabilities does not fit as well in Piaget’s and Bruner’s frameworks.

To Marzano, the dimensions of thinking (Table 2.1) feed into dimensions of learning, both of which build upon contributions from other scholars and researchers (Marzano et al., 1988). For example, Gagné refers to the generalizations that describe relationships between or among concepts as “rules” (Gagné, 1974; Gagné, Briggs, & Wager, 1988), while Marzano calls them “principles” (Marzano et al., 1988). The book Dimensions of Thinking has been designed as a practical handbook with definitions, examples, and classroom applications.

**TABLE 2.1**

**DIMENSIONS OF THINKING**

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<tr>
<th>Dimensions</th>
<th>Concept</th>
<th>Element</th>
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<tbody>
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<td>Metacognition</td>
<td>knowledge and self-control</td>
<td>commitment, attitudes, attention</td>
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<td></td>
<td>knowledge and control of process</td>
<td>types of knowledge important in metacognition: declarative, procedural, conditional</td>
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<tr>
<td></td>
<td>executive control of behaviour</td>
<td>evaluation, planning, regulation</td>
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<td>Critical and creative</td>
<td>Critical thinking</td>
<td>goals, dispositions</td>
</tr>
<tr>
<td>thinking</td>
<td>Creative thinking</td>
<td>intense desire and preparation, internal rather than external locus of evaluation, reframing ideas, getting away from intensive engagement to allow free-flowing thought</td>
</tr>
<tr>
<td></td>
<td>Critical and creative thinking</td>
<td>application</td>
</tr>
<tr>
<td>Dimensions</td>
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<td>----------------------------------------------</td>
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<tr>
<td>Thinking process</td>
<td>Concept information</td>
<td>labels, levels</td>
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<tr>
<td>Principle information</td>
<td>cause-and-effect, correlation, probability, axiomatic, and fundamental principles</td>
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<tr>
<td>Comprehension</td>
<td>processes, strategies</td>
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<tr>
<td>Problem solving</td>
<td>processes, strategies</td>
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<tr>
<td>Decision making</td>
<td>models, processes</td>
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<td>Research</td>
<td>describing phenomena, testing hypotheses</td>
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<td>composition</td>
<td>planning, translating, reviewing</td>
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<td>Oral discourse</td>
<td>process, application</td>
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<td>Core thinking skills</td>
<td>focusing</td>
<td>defining problems, setting goals</td>
</tr>
<tr>
<td>Information gathering</td>
<td>observing, formulating questions</td>
<td></td>
</tr>
<tr>
<td>Remembering</td>
<td>encoding, recalling</td>
<td></td>
</tr>
<tr>
<td>Organizing</td>
<td>comparing, classifying, ordering, representing</td>
<td></td>
</tr>
<tr>
<td>Analyzing</td>
<td>identifying attributes and components, relationships and patterns, main ideas, errors</td>
<td></td>
</tr>
<tr>
<td>Generating</td>
<td>inferring, predicting, elaborating</td>
<td></td>
</tr>
<tr>
<td>Integrating</td>
<td>summarizing, restructuring</td>
<td></td>
</tr>
<tr>
<td>Evaluating</td>
<td>establishing criteria: a philosophical perspective</td>
<td></td>
</tr>
<tr>
<td>Relationship of</td>
<td>Content areas of as schema dependent</td>
<td>Types of schema</td>
</tr>
<tr>
<td>content area knowledge to thinking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Content areas as models and metaphors</td>
<td>Task, systems</td>
<td></td>
</tr>
<tr>
<td>Content areas as changing bodies of knowledge</td>
<td>from simple to complex and diverse, hierarchical to heterarchical, mechanical to holographic, determinate to indeterminate, linear to mutual causality, assembly to morphogenesis, objective to perspective</td>
<td></td>
</tr>
<tr>
<td>Content areas as special approaches to investigation</td>
<td>Conditions needed</td>
<td></td>
</tr>
</tbody>
</table>
Dimensions of learning (McREL, 1997)\textsuperscript{39} evolved from constructs expressed by scholars and researchers in a 1988 framework on dimensions of thinking (Marzano et al., 1988)\textsuperscript{40} and the follow-up experiences of educators in classroom situations (Huot, 1995)\textsuperscript{41}. These dimensions parallel early concepts expressed by Dewey (1933)\textsuperscript{42}.

Rather than differentiate levels of thinking skills, the dimensions of learning establish a learner-centered framework with a set of practical, research-based instruction strategies that infuse critical thinking and self-directed learning into curriculum and instruction; a flexible planning approach that allows teachers to focus on (1) knowledge to be learned, (2) broad issues and their applications to contemporary life, and (3) the meaningful use of knowledge. (Huot, 1995)\textsuperscript{43}

Educators have used the dimensions of learning as a resource for instruction strategies, managing school improvement, planning instruction and assessment, making systematic reforms, and defining what students must be able to do in order to solve problems and make decisions in many situations (McREL, 1997)\textsuperscript{44}. In studies conducted by Huot (1995)\textsuperscript{45}, Marzano et al. (1988)\textsuperscript{46}, and McREL (1997)\textsuperscript{47}, the dimensions of learning are identified as follows.

- **Dimension 1**: fostering positive attitudes and perceptions about learning in a supportive and safe learning environment. Dewey (1933)\textsuperscript{48} emphasized open-mindedness, wholeheartedness, and responsibility for thinking in environments of freedom, curiosity, variety, spontaneity, and novelty, and with joyful, structured, and integrated learning about thinking in all subjects.)

- **Dimension 2**: acquiring and integrating knowledge, with emphasis on procedural knowledge (Dewey, 1933)\textsuperscript{49} explained that thinking must include access to “past experience and a fund of relevant knowledge” to unravel confusion or generate a solution; it requires integration of character and mind through infusion of intellectual subjects with “so-called ‘informational’ subjects”; students use what they already know to attend to new knowledge.

- **Dimension 3**: extending and refining knowledge through thinking (Dewey, 1933)\textsuperscript{50} emphasized that changes in knowledge and belief rest upon careful and extensive study, purposeful widening of the area of observation, reasoning out the conclusions of alternative conceptions and “personal examination, scrutiny, and inquiry”.
- **Dimension 4**: using knowledge in meaningful tasks, including systems analysis (ecosystems, systems of government, number systems, etc.) and authentic tasks over a period of time (Dewey, 1933)\(^1\) observed that students use the power of thought to enrich meaning and cannot learn to think via drill and practice on isolated tasks that have nothing in common with or too much familiarity with their earlier life experiences; students learn best “when something beyond their ken is introduced” to which they can apply “the old, the near, the accustomed”.

- **Dimension 5**: developing habits of mind that help one organize new information, think, and learn, such as seeking accuracy, avoiding impulsiveness, and persisting when answers are not apparent (Dewey, 1933)\(^2\) proposed that “correct habits of reflection” are a central factor in thinking, involving systematic movement from one thought to another, instead of an “irresponsible stream of fancies”; noting or observing facts instead of just “something . . . brought to mind”; using quality proof and logic as the “basis of belief,” and carefully looking into things, instead of reckless or impatient glances “over the surface”; following up ideas and outcomes of discovery instead of “haphazard, grasshopper-like” guessing; and “suspending judgments till inferences have been tested by the examination of evidence” instead of “whim, emotion, or accidental circumstances”. The McREL Institute makes the dimensions framework a practical tool by offering a teacher’s manual, a newsletter, and other resources to teachers that link their teaching strategies in the dimensions to standards and benchmarks. These resources show teachers how to apply the dimensions in real classroom situations and how to integrate the dimensions in curriculum frameworks across a variety of subject areas. Tips on how to apply the dimensions are specific and evolve from a dialogue with teachers entrenched in the process of learning.

Much of the structure and information in “dimensions of thinking” and “dimensions of learning” relates not just to the work of Dewey but also to Glaser (1941)\(^3\). Glaser drew upon concepts articulated by Dewey and reported research from the 1930s and 1940s. Their work, together with contemporary research, shows the stability of several major concepts for higher order thinking. Glaser reported that the type of thinking required for problem solving originates in a perceived difficulty, state of doubt, or perplexity. It begins with “making acquaintance with the particular facts that creates a need for definition and generalization,” in
order to see “the correct difficulty to be overcome”, not with “definitions, rules, general principles, classifications, and the like” (Dewey, 1933). Furthermore, the way a problem is “apprehended or defined limits the kind of answers that will occur to the thinker. To get out of the rut requires a reformulation of the issue” (Glaser, 1941). This perspective suggests that higher order thinking involves more than a simple hierarchy or continuum. The importance of dispositions like attitudes and habits of mind also comes into play in steering the thinking process in the right direction or taking it off course through aberrations of analysis, selection, association, inference, generalization, and language comprehension, such as:

- ambiguity or misunderstanding of directions, word elements or language, or simple lack of information, material, or statements beyond the educational level of the individual;
- habits of thinking, false analogies, and logical errors; previously conceived orientations, rigid mind sets, and the tendency to block the correct response; perhaps egocentric perceptions of relationships, particularly by young children; or to read one’s own beliefs or prejudices into interpretations; and
- failing to see what has to be solved; to isolate and define values of a problem; to consider all data, fallacies of inspection, observation, generalization, and confusion; and the influence of feelings and temporary physiological conditions.

Vygotsky, L., & Vygotsky, S. (1980) seems to have consolidated major concepts of cognitive development.

- Cognitive development progresses as children learn; biological maturity accounts for “elementary processes” such as reflexive responses.
- When learning a specific skill, students also perceive the underlying principles.
- Social interaction and social culture play major roles in learning and cognitive development; children internalize knowledge most efficiently when others, such as teachers, parents, or peers, guide and assist them; significant people in an individual’s life contribute to the development of “higher mental functions”; people’s cognitive processes function differently when working on their own versus working in groups.
- Everyone has a “zone of proximal development,” and asking certain questions or giving suggestions will move the individual toward potentially higher levels; such support
helps students in solving problems until they can solve them independently and may include hints, questions, behavior modeling, rewards, feedback, information giving, self-talk, or peer tutoring.

Haladya (1997) expressed the complexity of thinking and learning dimensions by classifying four levels of mental processes (understanding, problem solving, critical thinking, and creativity) that can be applied to four types of content (facts, concepts, principles, and procedures). Applying a set of skills across dimensions of content fits well with the actual complex, recursive, and systemic processes of higher order thinking. Although his terminology often varies from other theorists, the territory is similar:

<table>
<thead>
<tr>
<th>Haladya’s terms</th>
<th>Gagné’s terms</th>
<th>Bloom’s terms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Facts</td>
<td>Information</td>
<td>Knowledge</td>
</tr>
<tr>
<td>Concept</td>
<td>Concepts</td>
<td>Comprehensive</td>
</tr>
<tr>
<td>Principles, procedures</td>
<td>Rules</td>
<td>Application</td>
</tr>
<tr>
<td>Critical thinking</td>
<td>Problem solving</td>
<td>Synthesis and evaluation</td>
</tr>
<tr>
<td>creativity</td>
<td>No direct match</td>
<td>No direct match</td>
</tr>
</tbody>
</table>

According to Gardner (1983), multiple intelligences form a major part of an individual’s dispositions and abilities. These intelligences are independent of each other and account for the spectrum of abilities used in different fields of work, such as teaching, surgery, athletics, dancing, art, or psychotherapy.

Gardner’s theory, which regards intelligence as having seven dimensions (Table 2.2), has been receiving recent attention related to teaching (Kauchak & Eggen, 1998). Schools are shifting curricula and teaching methods to accommodate the diverse abilities and talents of students (Crowl et al., 1997). Teachers may have a greater impact by creating lessons that “use the various types of intelligence in classroom activities”.


TABLE 2.2
ACTIVITIES AND ABILITIES RELATED TO INTELLIGENCES

<table>
<thead>
<tr>
<th>Types of Intelligence</th>
<th>Forms and Texture</th>
</tr>
</thead>
<tbody>
<tr>
<td>linguistic-verbal</td>
<td>language, rhythms, inflections, meaning, and order of words (stories, books, humor, rhymes, songs)</td>
</tr>
<tr>
<td>logical-mathematical</td>
<td>reasoning with strings and patterns of symbols (pattern blocks, activities to form numbers and letters, building, measuring, cooking, gardening, other math-logic applications)</td>
</tr>
<tr>
<td>musical</td>
<td>pitch, melody, tone, and sound movements in time (rhythm sticks, varieties of music, interaction with musicians, dance exercises)</td>
</tr>
<tr>
<td>spatial</td>
<td>visual perception, transformation, modification, and creations (colors, shapes, spaces, games with movement and coordination)</td>
</tr>
<tr>
<td>bodily-kinesthetic</td>
<td>body motion and manipulation of objects (games with movement and manipulation, hands-on projects, dance exercises, sports, tactile activities)</td>
</tr>
<tr>
<td>interpersonal</td>
<td>relationships with others (cooperative games or exercises, peer or paired activities, public performances, conversation, exercises to focus on sensitivity to diverse needs)</td>
</tr>
<tr>
<td>intrapersonal</td>
<td>knowledge of self (exercises to express and acknowledge feelings, possibly journals or speeches or drawings; resources and exercises to identify and analyze one’s own thinking processes, skills, interests, and feelings)</td>
</tr>
</tbody>
</table>

Although Gardner is commonly credited with theories related to multiple intelligences, others also have developed models of thinking that reflect the multifaceted nature of intelligence. Table 2.2 shows a variety of models reflecting specific abilities: Gardner’s multiple intelligences, Guilford’s structure of intellect, and Sternberg’s triarchic theory. Some of the abilities associated with the different types of intelligence include forms of thinking, reasoning, and problem solving.
Certain components of models or theories of intelligence are similar to factors identified in models and theories of learning. For example, Guilford’s products (Guildford, 1967) resemble the learning outcomes described by Gagné, Briggs, and Wager (1988). “Units” are like the lower levels of discriminations and verbal information, “classes” are like the classification of concepts, “relations” are like the rules formed by relating one concept to another, and “systems” are like the systems of rules integrated into problem-solving strategies.

Similarly, Guilford’s “content areas” are ways of receiving and perceiving information and instruction, and Guilford’s “operations” parallel the mental processes that teaching strategies attempt to influence. There also are parallels with the notion of learning capabilities, in that Gagné and Briggs refer to stating, classifying, demonstrating, generating, and originating as the functions associated with different learning outcomes (i.e., stating verbal information, classifying concepts, demonstrating rules, generating problem solving, and originating cognitive strategies). These functional terms guide instruction designers in their specification of learning strategies and test items and have meanings that are similar to Guilford’s terms of cognition, memory retention, memory recording, and divergent and convergent production. Table 2.3 shows the perspective about intelligence. (Guildford, 1967)

<table>
<thead>
<tr>
<th>Structure of intellect</th>
<th>Operations (Mental Processes)</th>
<th>Content (Type of Information)</th>
<th>Products (Outcomes)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cognition</td>
<td>Visual</td>
<td>Units</td>
</tr>
<tr>
<td></td>
<td>Memory retention</td>
<td>Auditory</td>
<td>Classes</td>
</tr>
<tr>
<td></td>
<td>Memory recording</td>
<td>Symbolic</td>
<td>Relations</td>
</tr>
<tr>
<td></td>
<td>Divergent production</td>
<td>Semantic</td>
<td>Systems</td>
</tr>
<tr>
<td></td>
<td>Convergent production</td>
<td>Behavioral</td>
<td>Transformations</td>
</tr>
<tr>
<td></td>
<td>Evaluation</td>
<td></td>
<td>Implications</td>
</tr>
</tbody>
</table>

**TABLE 2.3**

**PERSPECTIVE ABOUT INTELLIGENCE**
TABLE 2.3 (Continued)

<table>
<thead>
<tr>
<th>Multiple intelligences</th>
<th>Intelligence</th>
<th>Ability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Linguistic-verbal</td>
<td>Sensitive use and awareness of language</td>
</tr>
<tr>
<td></td>
<td>Logical-mathematical</td>
<td>Reason, recognize, and manipulate logical-mathematical patterns</td>
</tr>
<tr>
<td></td>
<td>Musical</td>
<td>Appreciate and produce musical pitch, melody, and tone</td>
</tr>
<tr>
<td></td>
<td>Spatial</td>
<td>Perceive and transform perceptions</td>
</tr>
<tr>
<td></td>
<td>Bodily-kinesthetic</td>
<td>Use and control the body and objects</td>
</tr>
<tr>
<td></td>
<td>Interpersonal</td>
<td>Sense needs, thoughts, and feelings of others</td>
</tr>
<tr>
<td></td>
<td>Intrapersonal</td>
<td>Recognize and respond to one's own needs, thoughts, and feelings</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Triarchic theory</th>
<th>Aspects of Intelligence</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Componential</td>
<td>Metacomponents to organize and monitor one’s thinking</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Performance components to recognize and perform</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Knowledge-acquisition to organize and comprehend information</td>
</tr>
<tr>
<td></td>
<td>Experiential</td>
<td>Ways to confront new and unfamiliar situations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ways to cope with novel or unfamiliar situations</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Automatization of familiar task behaviors to reduce demands</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for mental capacity during problem-solving operations</td>
</tr>
<tr>
<td></td>
<td>Contextual</td>
<td>Ability to adapt, select, or shape the environment in order to succeed</td>
</tr>
</tbody>
</table>

In conclusion, thinking skills includes creative, critical, analytical, logical, reflective and metacognitive thinking. These skills are activated when students of any age encounter unfamiliar problems, uncertainties, questions, or dilemmas. Successful applications of these skills result in explanations, decisions, performances, and products that are valid within the context of available knowledge and experience, and promote continued growth in higher order thinking, as well as other intellectual skills. Some of the key definitions are provided in Table 2.4. (King, F.J. et al, 2010)
TABLE 2.4  
SAMPLE OF TERMS ASSOCIATED WITH THINKING SKILLS

<table>
<thead>
<tr>
<th>Terms</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>cognition</td>
<td>the “mental operations involved in thinking; the biological/neurological processes of the brain that facilitate thought”; “all of our mental processes, such as perception, memory, and judgment”</td>
</tr>
<tr>
<td>comprehension</td>
<td>the process by which individuals “construct meaning from incoming information”</td>
</tr>
<tr>
<td>creative thinking</td>
<td>generating and producing ideas through brainstorming, visualizing, associating relationships, making analogies, inventing, inferring, and generalizing</td>
</tr>
<tr>
<td>critical thinking</td>
<td>an attitude of suspended judgment, logical inquiry, problem solving, evaluative decision or action; skillful, responsible thinking that facilitates good judgment, relies upon criteria, is self-correcting and sensitive to context; skepticism, curiosity; questioning of beliefs, aims, definitions, conclusions, actions, appraisal of frameworks or sets of criteria by which judgments are made</td>
</tr>
<tr>
<td>graphic frame</td>
<td>an organizing pattern to visually represent relationships; serves as a medium for organizing new information and patterns of relationships (e.g., flowcharts, cartoons, symbols, diagrams, time lines, grids, graphs, concept maps, chains, towers, circles, pyramids, boxes)</td>
</tr>
<tr>
<td>higher order thinking</td>
<td>understanding of facts, concepts, principles, and procedures; analysis, synthesis, and evaluation</td>
</tr>
<tr>
<td>inquiry</td>
<td>investigating beliefs or forms of knowledge, taking care to consider the grounds that support them and the conclusions drawn from them</td>
</tr>
<tr>
<td>insight</td>
<td>“seeing” a correct solution; sudden coherency or change in perceptions, feeling, thought; the “aha” experience, from a state of not knowing to knowing</td>
</tr>
</tbody>
</table>
### TABLE 2.4 (Continued)

<table>
<thead>
<tr>
<th>Terms</th>
<th>Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>metacognition</td>
<td>mental process of being aware of monitoring, supervising, organizing, and making executive decisions about one’s own thinking process; thinking about thinking, the use of information and strategies to solve problems; mind’s management system; ability of the mind to control its own processing of how we think.</td>
</tr>
<tr>
<td>problem solving</td>
<td>application of more than one rule/more than four concepts to solve problems to situations with multiple variables, multiple relationships; combines two or more rules to solve a problem</td>
</tr>
<tr>
<td>rational thinking</td>
<td>the interdependent skills of creative thinking, critical thinking, and problem solving</td>
</tr>
<tr>
<td>scaffolding</td>
<td>support and guidance gradually removed until one can work independently</td>
</tr>
<tr>
<td>schemata</td>
<td>systems of relationships between concepts; complex networks of related knowledge; cluster of knowledge associated with a type of problem; typical solution procedures</td>
</tr>
<tr>
<td>scripts</td>
<td>simple routines developed through repeated practice of elaborate reasoning procedures</td>
</tr>
<tr>
<td>transfer</td>
<td>“the ability to apply thinking skills taught separately to any subject”</td>
</tr>
</tbody>
</table>

#### 2.2.2.3 Types of thinking skills

Thinking skills can be classified into different types according to different educators.

Kogan Spencer (2003)\(^6\), in his article “The Information Processing Approach to Thinking” states that more and more people are employed in the information segment of the economy, and it is the fastest growing segment. In the information age, people have to live by generating, analyzing, categorizing, evaluating, and communicating information. An information processing approach to thinking skills aligns well with preparation of students for 21st century life.
The approach of information processing thinking skills can be divided into three types: understanding information, manipulating information, and generating information. In each of the three categories consisted of five specific skills. Therefore, 15 fundamental types of thinking skills are shown in table 2.5

**TABLE 2.5**

**FIFTEEN FUNDAMENTAL OF THINKING SKILLS**

<table>
<thead>
<tr>
<th>Thinking Skills</th>
<th>Fundamental of Thinking Skills</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding Information</td>
<td>Recalling</td>
</tr>
<tr>
<td></td>
<td>Summarizing</td>
</tr>
<tr>
<td></td>
<td>Symbolizing</td>
</tr>
<tr>
<td></td>
<td>Categorizing</td>
</tr>
<tr>
<td></td>
<td>Role-Taking</td>
</tr>
<tr>
<td>Manipulating Information</td>
<td>Analyzing</td>
</tr>
<tr>
<td></td>
<td>Applying</td>
</tr>
<tr>
<td></td>
<td>Inducing</td>
</tr>
<tr>
<td></td>
<td>Deducting</td>
</tr>
<tr>
<td></td>
<td>Problem solving</td>
</tr>
<tr>
<td>Generating Information</td>
<td>Brainstorming</td>
</tr>
<tr>
<td></td>
<td>Synthesizing</td>
</tr>
<tr>
<td></td>
<td>Predicting</td>
</tr>
<tr>
<td></td>
<td>Evaluating</td>
</tr>
<tr>
<td></td>
<td>Questioning</td>
</tr>
</tbody>
</table>

Ministry of Education (2008) identifies three important types of thinking skills for students to learn how to think more effectively as follow:

(1) Creative thinking: This refers to the human ability regarding the invention or origination of any new things (a product, solution, artwork, literary work, etc.) that has value. New may refers to the individual creator or the society or domain within which novelty occurs.

(2) Critical thinking: This refers to the human ability to determine the value of an argument, set of beliefs, claim or issue. It is usually employs logical reasoning and empirical evidence to reach a conclusion and ultimately seeks to move away from personal biases.
(3) Analytical thinking: This refers to the human ability to solve the problem quickly and effectively.

Robert Fisher (2010) identifies five types thinking skills as follow:

(1) Information processing thinking skill: This refers to the ability of finding out relevant information, organizing information and representing or communicating information.

(2) Reasoning thinking skill: This refers to the ability of giving reasons, making inferences or deductions and arguing or explaining a point of view.

(3) Enquiring thinking skill: This refers to the ability of asking questions, planning research or study and engaging in enquiry or process of finding out.

(4) Creative thinking skill: This refers to the ability to generating ideas, imagining or hypothesizing and designing innovative solutions.

(5) Evaluating thinking skill: This refers to the ability to developing evaluation criteria, applying evaluation criteria and judging the value of information and ideas.

Robert Kizlik (2012) illustrates that thinking skills refers to the process of creating a structured series of connective transactions between items of perceived information. It can be classified into three types of thinking skills as follow:

(1) Critical thinking: this refers to reasonable, reflective thinking that is focused on deciding what to believe or do. Critical thinkers try to be aware of their own biases, to be objective and logical. Critical thinking uses the specific dispositions and skills such as analyzing arguments carefully, seeing other points of view and reaching sound conclusions.

(2) Creative thinking: This refers to the ability to form new combinations of ideas to fulfill a need, or to get original or otherwise appropriate results by the criteria of the domain in question.

(3) Analyzing skills: This refers to core thinking that involve clarifying information by examining parts and relationships i.e. identifying attributes and components, determining characteristics or the parts of something, identifying relationships and patterns, identifying main ideas and identifying errors.
In the present study, the instruction package of thinking skills refers to three types of thinking according to the suggestions of Ministry of Education (2008)\(^{69}\) i.e. creative thinking skill, critical thinking skill and analytical thinking skill. The details about these three types of thinking skills are discussed as follow:

1. **Creative thinking skill**

   Creativity is quickly becoming the central guiding force in the world economy, displacing the importance of globalization and technology in recent years. Creativity is the backbone of economy. Using technology, individuals can be more engaged in the global communication and teachers can develop a teaching format that focuses on a learner-centered environment, stimulates the child’s creativity, and helps them go beyond their immediate experiences and observations. Schools need to develop the connectivity students have between instructors and other learners. This inner connectivity, or creative partnership, builds the individual’s creativity, enabling them to better identify the appropriate problems, and to how to solve them. Furthermore, creativity identifies possibilities and opportunities that may not have been noticed by others, reinforcing creativity is the backbone of the economy.

   During the past fifty years, some scholars have engaged in a rigorous study on the concept of creativity, beginning in the area of psychology, and later extending to the areas of sociology and economics. Guilford (1950)\(^{70}\) and Torrance (1974)\(^{71}\), both psychometricians, believed divergent thinking was the basis for creativity and that creativity could be measured. Consequently, Guilford and Torrance focused on creating tests identifying the personality traits of an individual that would enhance creativity. Guilford defines “creativity exclusively as a mental process of combining parts in such a way as to constitute a pattern or structure that did not exist before. Creative thinkers are able to put ideas together in new or unique ways or create new idea configurations”.

   Guilford first proposed the concept of "divergent thinking" in the 1950s, when he noticed that creative people tend to exhibit this type of thinking more than others. He thus associated divergent thinking with creativity, appointing it several characteristics:

   1. **Fluency** (the ability to produce great number of ideas or problem solutions in a short period of time);

   2. **Flexibility** (the ability to simultaneously propose a variety of approaches to a specific problem);
(3) **Originality** (the ability to produce new, original ideas);

(4) **Elaboration** (the ability to systematize and organize the details of an idea in a head and carry it out).

Fasko, D. (2001)\(^72\) states that creative thinking in the mental process involved with the invention of new ideas or concepts, divergent from that which currently exists". Divergent thinking plays an important role in such thinking, which begins with the capacity to believe in that which others do not believe exists and to recognize novelty and difference. Developing an environment that nurtures innovation requires emphasis on trust, motivation and inspiration. Within that environment, the capacity to find or identify something as a problem is as important as developing a creative solution for it.

In a summary of scientific research into creativity Michael Mumford suggested: "Over the course of the last decade, however, we seem to have reached a general agreement that creativity involves the production of novel, useful products" (Mumford, 2003)\(^73\). Creativity can also be defined "as the process of producing something that is both original and worthwhile".

King, F.J. et al (2010)\(^74\) mentioned that the very act of generating solutions to problems requires the creative process of going beyond previously learned concepts and rules. Creativity involves divergent and convergent thinking to produce new ideas. Major features of creativity are listed below.

- Creativity involves the consistent use of basic principles or rules in new situations, resulting from sketches and modifications of previous work.
- Creativity involves discovering and solving problems. Innovative approaches are used to accurately evaluate shortcomings, and actions are taken to remedy those weaknesses.
- Creativity involves selecting the relevant aspects of a problem and putting pieces together into a coherent system that integrates the new information with what a person already knows. In a basic sense, it involves a series of decision-making choices between "two or more competing alternatives of action."
• Creativity overlaps with other characteristics, such as “intelligence, academic ability, dependability, adaptiveness, and independence” and can “evolve within each of the seven intelligences”.

• Creativity requires many of the same conditions for learning as other thinking skills. The learning processes are enhanced by supportive environments and deteriorate with fears, insecurities, and low self-esteem. Creativity deteriorates with extrinsic motivation, restraint on choice, and the pressure of outside evaluation.

Robert Harris (2012) gives three definitions of creative thinking.

First, creativity is the ability to imagine or invent something new. Creativity is the ability to generate new ideas by combining, changing, or reapplying existing ideas. Some creative ideas are astonishing and brilliant, while others are just simple, good, practical ideas that no one seems to have thought of yet.

Second, creativity is also an attitude. It is the ability to accept change and newness, a willingness to play with ideas and possibilities, a flexibility of outlook, the habit of enjoying the good, while looking for ways to improve it.

Third, creative people work hard and continually to improve ideas and solutions, by making gradual alterations and refinements to their works. Contrary to the mythology surrounding creativity, very few works of creative excellence are produced with a single stroke of brilliance or in a frenzy of rapid activity. Much closer to the real truth are the stories of companies who had to take the invention away from the inventor in order to market it because the inventor would have kept on tweaking it and fiddling with it, always trying to make it a little better. The creative person knows that there is always room for improvement.

According to Robert Harris, several methods have been identified for producing creative results such as evolution, synthesis, revolution, reapplication and changing direction. Evolution is the method of incremental improvement. New ideas stem from other ideas, new solutions from previous ones, the new ones slightly improved over the old ones. Many of the very sophisticated things we enjoy today developed through a long period of constant incrementation. Making something a little better here, a little better there gradually makes it something a lot better—even entirely different from the original. The evolutionary method of creativity also reminds us of that critical principle: Every problem that has been solved can be
solved again in a better way. A creative thinker's philosophy is that "there is no such thing as an insignificant improvement." **Synthesis** is the two or more existing ideas are combined into a third, new idea. Combining the ideas will give the new idea. **Revolution** is the new idea to complete the work different from the previous ones. **Reapplication** is the idea to look at something old in a new way. **Changing direction is the idea which** shifted from one angle of a problem to another. This is sometimes called creative insight.

From the discussion about creative thinking mentioned above, it can be concluded that creative thinking is a mental process of combining parts in such a way as to constitute a pattern or structure that unique and did not exist before. It involves the thinking that generates something new or different from the current exists and well or better than previous ideas. It is generative and divergent in nature. Creativity involves divergent and convergent thinking to produce new ideas by combining, changing and reapplying. Divergent means thinking that starts from a common point and moves outward into a variety of perspective. Divergent thinking with creativity can be appointed in four characteristics: fluency, flexibility, originality and elaboration. There are four abilities included in creative thinking:

- **Fluency:** This is the ability to produce great number of ideas or problem solutions in a short period of time.
- **Flexibility:** This is the ability to simultaneously propose a variety of approaches to a specific problem.
- **Originality:** This is the ability to produce new, original ideas.
- **Elaboration:** This is the ability to systematize and organize the details of an idea which can be describes and carry it out.

**(2) Critical thinking**

Critical thinking is an incredibly important skill. Everyone uses this skill in every aspect of lives every single day. Although it’s an important part of academic success, it’s not often taught at school unless it’s part of a math, science, or business curriculum. The basic definition of critical thinking is the ability to take information and make informed decisions without being influenced by one’s own opinions.
In education, critical thinking skills give students the ability to not only understand what they have read or been shown but also to build upon that knowledge without incremental guidance. Critical thinking teaches students that knowledge is fluid and builds upon itself. It is not simply rote memorization or the ability to absorb lessons unquestioningly. Critical thinking products and courses encourage students to think for themselves, to question hypotheses, to develop alternative hypotheses, and to test those hypotheses against known facts.

Michael Scriven & Richard Paul (1987)\textsuperscript{76} defines critical thinking skills as the intellectually disciplined process of activity and skillfully conceptualizing, applying, analyzing, synthesizing, and evaluating information from, or generated by, observation, experience, reflection, reasoning, or communication as a guide to belief and action. In its exemplary form, it is based on universal intellectual values that transcend subject matter divisions: clarity, accuracy, precision, consistency, relevant, sound evidence, good reasons, depth, breadth, and fairness.

Robert Fisher (1998)\textsuperscript{77} defines critical thinking as a process that requires the constant use of questions. Questioning all information passing through the mind is a critical aspect of thinking. Thus, critical thinking is the process ideally an objective process used to determine the value of an argument, set of beliefs, claim or issue. It is usually employs logical reasoning and empirical evidence to reach a conclusion and ultimately seeks to move away from personal biases. Fisher also describes three interdependent types of critical thinking strategies:

- **Affective strategies:** This refers to the ability to think independently of others (however, this should include taking others’ views into account)

- **Macro-abilities:** This refers to the ability to harness, and have insight into, the mechanical or other skills being used for any task. Metacognition, the ability to be aware and critical of one’s own thought and learning processes, Bloom values as a highest-order thinking skill (he includes it in ‘evaluation’).

- **Micro-skills.**

In order to develop critical thinking skills, Bloom identified six levels of cognitive functioning, with each subsequent level indicating higher cognitive ability (Bloom, 1956).
Knowledge focuses on remembering and reciting information. Comprehension focuses on interpreting and comparison of previously learned information. Application focuses on applying acquired knowledge, techniques, and rules in such a way as to foster solutions to a problem. Analysis involves the use of critical thinking skills to break down information into parts and understanding how each part relates to the whole. Synthesis involves the use of critical thinking skills to form a new and original integration of the whole. Evaluation is focused on using critical thinking skills to present and defend conclusions by making judgments, testing the legitimacy of the conclusion, and supporting with fact-based evidence. Critical thinking is said to take place during the Analysis to Evaluation range of Bloom’s taxonomy.

Critical thinking can be seen as having two components: (1) a set of information and belief generating and processing skills, and (2) the habit, based on intellectual commitment, of using those skills to guide behaviour. Critical thinking is self-guide, self-disciplined thinking which attempts to reason at the highest level of quality in a fair-minded way. (Linda Elder, 2007)

Richard Paul & Linda Elder (2008) stats that critical thinking is the mode of thinking about any subject, content, or problem in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them. Well cultivated critical thinker should be performed as follow:

(1) Raise vital questions and problems, formulating them clearly and precisely;
(2) Gathers and assesses relevant information, using abstract ideas to interpret it effectively comes to well-reasoned conclusions and solution against relevant criteria and standards;
(3) Thinks openmindedly within alternative systems of thought, recognizing and assessing, as need be, their assumptions, implications, consequences;
(4) Communicates effectively with others in figuring out solutions to complete.

Linda Popolano (2011) said that when an individual makes a decision, he should be identifying and evaluating evidence for and against the choice he is making. This process is called critical thinking. Analyzing evidence to guide one’s decisions is a key to being an
effective thinker and making well-reasoned choices. Critical thinking plays a fundamental role in making any choice, from choosing the correct answer from multiple choices on an exam question to making major life decisions such as choosing a spouse. A child taught to think critically is a child far less likely to make poor choices that are harmful to one’s self or to others. A child taught to think critically can accurately predict the possible outcomes of his actions.

To teach a child critical thinking skills, teachers should not give him facts to memorize. Instead, teachers should train a child to ask questions, seek alternative answers, try hypotheses, and consider other viewpoints. Critical thinking helps a child formulate the right questions, assess possible answers, judge the credibility of information and sources, and make solid judgments based on the evidence. Critical thinking should be a component of every curriculum. Knowledge without critical thinking skills turns a person into a parrot. Fully developed human beings don’t necessarily need all the answers but should have effective skills for formulating and evaluating the questions.

Rogue, C. (2011) points out that critical thinking involves drawing sound conclusions based on facts and observations. Critical thinkers carefully analyze and evaluate information to probe for faulty and poor reasoning. When individuals use effective critical thinking skills and processes, they draw valid inferences based on accurate evidence and well-supported claims. Critical thinking is one of the foundations of democracy and is central to preserving our liberties, such as freedom of speech. In turn, liberty is necessary for critical thinking to flourish. We need to be able to openly discuss, debate, and deliberate ideas in order to examine them critically. Critical helps to reach sound conclusions, groups must use critical thinking when making decisions. Critical thinking helps groups avoid making serious mistakes by encouraging group members to examine carefully all their options. The success of an organization depends on the ability of members to ask relevant questions, evaluate complex information, make difficult decisions, and anticipate the outcomes of those decisions. Critical thinking skills can be developed by the raising of questioning skills, observation skills, effective listening skills, exploring information skills, reading skills, and identifying underlying assumptions.
According to Orlich et al. (2011), critical thinking involves analysis and evaluation of observations and materials. Analysis involves taking apart complex items, such as speeches, written communications, statistics, or machines and explaining their underlying organization—figuring out how they work or what they are really saying. It is more than just understanding an object or concept, but looking below the surface to discover how different parts interact. Evaluation requires making decisions on topics and substantiating these decisions with sound reasons. In order to evaluate an idea or object, one must first set up appropriate standards or values by which to make a judgment and determine how closely the idea or object meets the standards or values. In other words, people use critical thinking when they make decisions and solve problems. Good critical thinkers don’t accept information at face value, but look inside it for hidden agendas, things that are left out, and underlying bias. Journalists, lawyers and educators are just some of the professions that require a lot of critical thinking.

Orlich et al. also states that learning critical thinking skills can result in high levels of student achievement. Some lessons that incorporate critical thinking are: identifying relationships between elements, deducing implications from data, inferring motives from speakers or authors, making interpretations, and identifying issues. Other activities include discussions that involve empathy.

King, F.J. et al, (2010) Summarizes that critical thinking is a particular domain that has described by different educators in the following ways:

- Goal-directed, reflective, and reasonable thinking, as in evaluating the evidence for an argument for which all the relevant information may not be available (Cotton, 1997)

- An essential component in metacognitive processes (Crowl et al., 1997)

- Analysis, inference, interpretation, explanation, and self-regulation; requires inquisitive, systematic, analytical, judicious, truth-seeking, open-minded, and confident dispositions toward critical-thinking processes (Facione, 1998)

- The disposition to provide evidence or reasoning in support of conclusions, request evidence or reasoning from others, and perceive the total situation and change one’s views based on the evidence (Cotton, 1997)
From the discussion about critical thinking mentioned above, it can be concluded that critical thinking is an important element of all professional fields and academic disciplines. Critical thinking skills can be defined as way of thinking that assesses the worth and validity of something in existing. It involves carefully analysis, synthesis, judgement or evaluation the evidence or information by observation, experiences, reflection, statistics, machine, explaining, reasoning or communication. It is the thinking which process careful acquisition and interpretation information around a common point-out attempt to bring thoughts from different directions to reach a well-justified or common conclusion. There are five abilities included in critical thinking:

- Critical thinking skills related to consequence: This is the ability to criticize the consequence that might happen as a result of catastrophic event.
- Distinguishing facts: This is the ability to distinguish between fact and opinion
- Criticize the unsure situation: This is the ability to criticize the unsure situation.
- Making decision: This is the ability to make a decision or select the best choice.
- Criticize the things as being same or difference: This is the ability to criticize the two or more things as being same or difference.

(3) Analytical thinking skills

Everyday living is a series of decisions and choices that always revolve around what everyone wants, need or do and it can be difficult to separate the two. Analytical thinking is a critical component of visual thinking that gives one the ability to solve problems quickly and effectively. It involves a methodical step-by-step approach to thinking that allows you to break down complex problems into single and manageable components. (Visual Thinking Magic Association, 2011)

Analytical thinking involves the process of gathering relevant information and identifying key issues related to the information. This type of thinking also requires comparing sets of data from different sources; identifying possible cause and effect patterns, and drawing appropriate conclusions from these datasets in order to arrive at appropriate solutions.
Analytical thinking can be broken down into three main steps:

(a) Gather information: For this step, one must gather all the necessary information that will be required for problem solving. It is needed to obtain more or higher quality information in order to collect all the relevant data to arrive at an appropriate solution. Gathering information requires the appropriate questions which enable to make more effective decisions about the problems. However, one also needs to consider the relevance of sources and the means by which he/she will gather this information.

(b) Identify issues and problems: When it comes to analytical thinking, it's important to develop the ability to recognize underlying issues or problems based on trends, associations and cause-effect relationships between datasets.

(c) Organize information: Once all relevant information has been collected successfully, it is needed to organize and integrate all the pieces in a way that will provide the insights and ideas that can be used to draw appropriate conclusions. This in turn will lay down the foundations for potential solutions to the facing problem.

Analytical thinking is very much integrated into the visual thinking framework. It's a part of the problem solving process which will utilize as work visually towards acquiring the necessary insights that will help to achieve the goals and objectives.

Wikipedia Encyclopedia (2011) defines analytical skill is the ability to visualize, articulate, and solve both complex and uncomplicated problems and concepts and make decisions that are based on available information. Such skills include demonstration of the ability to apply logical thinking to gathering and analyzing information, designing and testing solutions to problems, and formulating plans. For instance in systems of analytical thinking skills, four sets of thinking should be focused: organizational knowledge, problem identification, problem analyzing and solving.

Karen (2011) states that the ability to think analytically is crucial to being successful and fulfilling everyone’s purpose. In his view, the analytical thinking is based on the deductive thinking. The deductive thinking is the act of reasoning which move from a whole to its part, from the general to the particular, from the universal to individual, from broader generalizations to specific observation, and from general theories to specific instance.
Napoleon Hill (2011) suggests that to be an accurate analytical thinker, one must take two important steps:

(a) Separate facts from opinions, fictions, and unproved hypotheses.

(b) Separate facts into two categories: important and unimportant.

According to the Work Related Competencies Organization (2011), analytical thinking skills can be defined as the ability to analyze problems systematically, organize information, identify key factors and underlying concerns and generate solutions. It combines the ability to draw on one’s experience and knowledge to effectively solve problems through assembling facts by discerning and comparing before reaching a sound conclusion. There are two levels of analytical thinking:

(a) Distinguishes aspects of problems: Distinguishes important from unimportant aspect of an issue or a problem, making it possible to come to new decisions more quickly and decisively and discusses the problem and possible solutions with a supervisor, who would have the analytical thinking and judgment to respond.

(b) Sees relationships and makes timely decisions: Breaks the issue or problem into smaller parts so as to recognize important facts and issues. Makes links and analyzes relationships among several parts of a situation. Anticipates obstacles and thinks ahead to the next steps. Notices and uses patterns or trends from similar experiences. Makes well-timed decisions to meet the needs of the situation.

From the discussion about analytical thinking mentioned above, it can concluded that analytical thinking is the human ability to separation a whole into its constituent parts or element parts order to study the parts and their relations. It is the process of separating and distinguishing elements of a concept, idea, problem and issue in order to understand its essential nature and inner relationships. The analytical thinking is based on the deductive thinking. The deductive thinking is the act of reasoning which move from a whole to its part, from the general to the particular, from the universal to individual, from broader generalizations to specific observation, and from general theories to specific instance. It is based on reasoning, experience, experimentation and draws conclusions from them. There are four abilities included in analytical thinking:
Analyzing relationship of the two things or more: This is the ability to analyze the relationship between the two things or more.

Separation the whole into the parts: This is the ability to separate the whole into the parts such as separate the parts of animal, trees and things.

Analyzing patterns or order: This is the ability to analyze the pattern or order of the things.

Comparison of the things: This is the ability to compare the things or all the being.

2.2.2.4 Importance of thinking skills

Because of the rapid growth in information technology, the number of knowledge in which everyone may be found has increased dramatically. Today, more than half of the global workforce employed in any kind of job and demand for good fundamental skills of thinking.

Since knowledge work is primarily intellectual rather than physical in nature, it requires people to gather, create, produce, evaluate, capture or analyze information. Knowledge work primarily requires people who can communicate and who can think. In the present situation, people need to be able to locate, assess, and represent new information quickly. They need to be able to communicate this to others, and to be able to work productively in collaborations with others. They need to be adaptable, creative and innovative, and to be able to understand things at a ‘systems’ or big picture’ level. Most importantly, they need to be able to think and learn for themselves.

Creative thinking skills, critical thinking and analytical thinking skills are the skills which most demanded by employers around the world when assessing job candidates, according to organizational and people development consultancy. The firm was quoting from a global survey of managers and executives while drawing attention to the fact that students are usually taught to listen, rather than to question, and as a result are often lacking this vital skill. The survey, conducted by the American Management Association (2010), involved 2,115 managers and executives around the world. It was found that thinking skills was regarded as the most important skill employees could contribute in helping their companies to grow. It ranked higher than innovation or mastery of information technology. Globalization,
the increased flow and complexity of information and constant changes in the business environment all demand that employees have excellent thinking skills so they are able to adapt to new roles, understand issues quickly and solve problems gracefully.

**Importance of thinking skills for preparing young generation**

Thinking skills play an important role for preparing the young generation people of rapidly changing world. Teaching thinking involves the creation of challenging learning experiences which call for high level thinking, such as the development of the skills listed in the Basic education core Curriculum, A.D. 2008 under the three headings of creative thinking, critical thinking and analytical thinking. It is stipulated that the curriculum should promote an enquiring mind and a capacity to think rationally which enable students to think creatively, critically and analytically. Providing people in thinking skills is important for several reasons: (Kathleen Cotton, 1991)

1. These skills are necessary for people to have in rapidly changing, technologically oriented world.

2. Instruction in thinking skills promotes intellectual growth and fosters academic achievement gains. Research supports that providing instruction in a variety of specific creative thinking, critical thinking and analytical thinking are found to promote intellectual growth and achievement gains. Many commercially available thinking skills instruction programmes have been shown to bring about improvements in students’ performance on intelligence and achievement tests. Student performance has been shown to improve as a result of both direct teaching and inferential learning of thinking skills.

**Teaching of thinking skills involves teachers in the following points:** (Lesley A. B., 2003)

1. Setting challenging tasks that encourage students to strive to think through a problem or issue which may have no single correct answer

2. Planning for learning objectives, which encourage students to gain an understanding of the patterns of thinking and principle concepts
(3) Encouraging students to use and build on what they already know in order to make sense of new information

(4) Planning for students to ‘think together’ through collaborative talk

(5) Intervening, when necessary, by asking questions that support or extend pupils’ thinking

(6) Using the plenary to check learning against objectives and to debrief pupils on both their solutions to the task and their strategies for carrying it out

(7) Helping students to make connections between the thinking involved in the task and other contexts in order to encourage transfer of knowledge and skills.

Some characteristics common to thinking skills lessons: (Lesley A. B., 2003)

(1) Challenging tasks should be prepared to encourage students to use prior knowledge and students should be asked to make connections between the thinking and learning from the task to build a bigger picture – transferring skills

(2) A puzzle, ‘mystery’ or problem that provokes cognitive conflict, e.g. a felt need to examine and advance one’s thinking

(3) Students should be encouraged to have attention to the vocabulary and process of reasoning

(4) Considerable discussion, especially with peers, to identify and resolve problems should be motivated by teachers for students

(5) Teacher should only give assistance when necessary. Teachers should give the students a chance to struggle

(6) During the plenary and the debriefing there should be an opportunity for students to discuss the solutions and how the task was done

(7) Co-operative work – tasks in groups with discussion should be encouraged

(8) Opportunity to reflect upon the development of both group and individual thinking should be provide for students
2.2.3 Learning achievement

Learning achievement means the achievement score of the student which obtain from the learning activities conducted by the learning materials for development of the learning outcomes and measure by the learning achievement test. This learning achievement test is a teacher – made – test which will prepare in different types of test i.e. Paper-pencil-test, True-False-test, Completion-test, Matching-test, Multiple choices-test and Oral – test.

The term “learning achievement” in the present study refers to the quality or the achievement or out put of using instruction package for enhancing thinking skills of primary school students. The learning achievement involves the ability of students to accomplish a purpose of learning which includes three types of thinking skills i.e. creative thinking, critical thinking and analytical thinking. Learning achievement is measured by the learning achievement test. This learning achievement test is a teacher-made-test which has been prepared in different types of test i.e. Paper-pencil-test, True-False-test, Completion-test, Matching-test and Multiple choices-test. This also includes the power or the degree to be effective and the quality of being able to bring about the highest level of students’ satisfaction about the instruction package for enhancing of thinking skills of primary school students.

2.3 REVIEW OF THE PAST STUDIES

The review of literature is a link between the research proposed and the past studies. It tells the reader about aspects that have been already established or concluded by other authors, and also gives a chance to the reader to appreciate the evidence that has already been collected by previous research, and thus projects the current research work in the proper perspective.

2.3.1 Importance of review of the past studies

Review of the past studies is a very important aspect of any research both for planning the work as well as to show its relevance and significance. It provides the background and justification for the research undertaken. According to Bourner, T. (1996) there is good reasons for spending time and effort on a review of the literature before embarking on a research project. The effective review of the past studies can identify gaps in
the literature, information and ideas that may be relevant to research project, methods that could be relevant to research project, and seminal works in researcher’s area. It help the researchers to avoid reinventing the wheel and increase the breadth of knowledge of researcher’s subject area. It provides the intellectual context for researcher’s work, enabling researcher to position the project relative to other work and put the work into perspective. It also demonstrates that the researcher can access previous work in an area.

As far as the literature review process goes, ultimately the goal for the researcher is to complete their review in the allocated time and to ensure they can maintain currency in their field of study for the duration of their research. Leedy & Ormrod (2005) mentioned two critical considerations stem about the review of past studies: (1) Research must enhance the current understanding of a phenomenon, or contribute to enhance the body of knowledge, and (2) Research must communicate what was discovered in the new study. Leedy & Ormrod also suggest that an effective literature review helps the researcher to understand the existing body of knowledge including where excess research exists (i.e. what is already known?) and where new research is needed (i.e. what is needed to be known?). It provides a solid theoretical foundation for the proposed study, substantiating the presence of the research problem, justifying the proposed study as one that contributes something new to the body of knowledge, and framing the valid research methodologies, approach, goals, and research questions for the proposed study.

Kumar, V. (2009) states that review of the past studies help the research to make sure that the researches are not repeating the work that someone has already done earlier. It provides an option of modifying the work by adding a new perspective or altering some of the methods of research to obtain a perspective that will be different from earlier works and thus more valuable.

It can be summarized that review of literature is an important part of research studies. It provides ideas, theories, explanations or hypotheses valuable in formulating the problem. It also suggests methods of research appropriate to the problem, to locate comparative data useful in the interpretation of results and to contribute to the general scholarship of the researcher. Review of literature is also important to highlight difference in opinions, contradictory findings or evidence, and the different explanations given for their conclusions and differences by different authors.
2.3.2 Past studies related to the development and try out of instructional package for enhancing of thinking skills

This chapter presents 11 past researches related to the development and try out of instructional package for enhancing of thinking skills which was already done in Thailand and in different countries as follow:

STUDY 1 : Instructional Package in Mathematics on Geometry Forms. (Chanon Chaisang. (2001) 100

Objective of the study : The purpose of this study was to construct the instructional package in Mathematics on Geometry Forms for primary school students and to find the efficiency the created package according to the standard criteria.

Research design : The experimental research was designed, to see the effect of instructional package in Mathematics on Geometry Forms on students’ achievement. Study was conducted using pretest-posttest design. Students of the experimental group received instructional package in Mathematics on Geometry Forms, for a period of nine weeks.

Tool used in the study : Instructional package in Mathematics on Geometry Forms was developed by the researcher using as a tool of the study. Posttest was an achievement test comprising one hundred multiple-choice items, measuring knowledge, comprehension and application components of achievement in Mathematics on Geometry Forms. To evaluate the instructional package in terms of student’s opinion an opinionnaire was administered to the students.

Sample of the study : An experiment was conducted with 6th class students of primary school students in Bangkok, Thailand.

Technique of analysis of data : t-test (dependent sample) was applied to determine the significance of difference between the mean achievement scores of the students. Mean and standard deviation was applied to explore the level of students’ opinion regarding the instructional package.

Major findings : The results of the study reveled that there was the significant difference between the scores of pretest and posttest Mathematics on Geometry Forms using the instructional package as a tool. The posttest score was greater than the posttest score.
Students satisfy the instructional package on Mathematics on Geometry Forms and benefited from it. They found it better mode of instruction than the traditional method.

**STUDY 2 : A Self-Instructional Package for Increasing Achievement in Thinking Skills**

*(Baxter, L.P.: 2003)*

**Objective of the study** : The major objectives of the study were:

1. To develop a self-instructional package;
2. To explore the difference between treatment effects on the students achievement;

**Research design** : This study was designed, to see the effect of instructional package as a supplementing strategy on the thinking skills of secondary school students. The experimental research was adopted for this study. To achieve the objectives of the study, the null hypotheses were tested: that there is no significant difference between the mean scores of the students taught by instructional package for enhancing thinking skills as supplementing strategy and without instructional package for enhancing thinking skills.

**Tool used in the study** : The instructional package for enhancing thinking skills was used to be a tool of the study. The experiment continued for one week. In order to find out treatment effects, a teacher-made post-test was administered to the experimental as well as control group immediately after the treatment (teaching) was over. The purpose of this test was to measure the achievement of the students constituting the sample of the study. Final data were collected from 40 students, 20 for each group.

**Sample of the study** : 40 Secondary school students were selected as sample of the study. Sample students were assigned to two group i.e. experimental group and control group. Both the groups were equated on the basis of their achievement scores in previous semester. Each group comprised 20 students.

**Technique of analysis of data** : The achievement scores of the sample were obtained as a result of the post-test. After obtaining the scores, the lists were prepared for each group and the means, standard deviations, differences between means were computed. Significance of difference between the mean scores of both the groups on the variable of previous achievement was tested at .05 levels by applying t-test.
Major findings: The results of the analysis of data revealed that the students taught through instructional package for enhancing thinking skills as supplementary strategy performed significantly better. The posttest score was greater than the pretest score after taught through instructional package for enhancing thinking skills. The students in experimental group (used the instructional package) obtained the higher mean core on thinking skills than the students in control group (not use instructional package).


Objective of the study: The purposes of this research were:

1. To construct the instructional package on critical thinking skills for primary school students in urban and rural area;

2. To measure the dimensions of critical thinking of primary school students in urban and rural area in Japan;

Research design: The experimental research was designed, to see the effect of instructional package on critical thinking skills for primary school students. Study was conducted using pretest - posttest design and testing the significant difference between the pretest-posttest scores on students’ achievements.

Tool used in the study: The California Critical Thinking Disposition Inventory was used to measure the critical thinking skills. The structured interview forms and opinionnaire were used for gathering data about the students’ opinions after instructional package on critical thinking skills for primary school students. Achievement tests (pretest – posttest) was used to obtained the students’ achievement scores.

Sample of the study: An experiment was conducted with the 82 primary school students in urban schools and 67 primary school students in rural schools.

Technique of analysis of data: The descriptive statistical methods used in data analysis were percentage (%), mean (\( \bar{X} \)), standard deviation (S.D.), t - test (dependent type) and t - test (independent type).

Major findings: The results of the analysis of data indicated that the learning achievements of pretest and posttest obtained by primary school students in urban and rural schools were statistically significant difference. The posttest score on critical thinking was
greater than the pretest score when taught through instructional package on critical thinking skills. There was no significant between mean scores of critical thinking obtained by primary school students in urban and rural areas after using the instructional package. The students’ opinions towards the instructional package on critical thinking skills were at the highest levels both in whole part and in details. They found it is better mode of instruction for enhancing critical thinking skills.

**STUDY 4 : Effect of Instructional Package on Thinking Skills for Primary School Students.** (Anderson, S.J.: 2007)

**Objective of the study** : The purpose of this study was to investigate the effect of instructional package on thinking skills for 5th grade students. The essential question investigated is that "Is there any significant difference between pretest and posttest score on thinking skills teaching by instructional package?".

**Research design** : The pre-experimental research was designed to see the effect of instructional package on thinking skills for 5th grade.

**Tool used in the study** : Instructional package on thinking skills for 5th grade was used for the experiment which was developed by the researcher. The tests which contain multiple choice questions based on Bloom’s Taxonomy was used to measure the achievement of students on thinking skills.

**Sample of the study** : This study based on experimental method was carried out on 40 primary school students during the 2006 academic year.

**Technique of analysis of data** : The descriptive statistical methods used in data analysis were percentage (%), mean (\(\bar{X}\)), standard deviation (S.D.), t - test (dependent sample).

**Major findings** : The result of the analysis of data indicated that the learning achievement score on pretest and posttest obtained by primary school students was statistically significant difference. The posttest score on thinking skills was greater than the pretest score. At the end of the study, it is determined that instructional package on thinking skills for primary school students is more effective for enhancing thinking skills of studnets.
STUDY 5: **Effect of Instructional Package in increasing Thinking Skills of Secondary School Students**. (Apiwat Ananthachote.: 2009)\(^{104}\)

**Objective of the study**: The purpose of this study was to investigate the effect of instructional package in increasing thinking skills of secondary school students.

**Research design**: The quasi-experimental research was designed, to see the effect of instructional package in increasing thinking skills of secondary school students. Instructional package in increasing thinking skills of secondary school students was applied to the experimental group and lecturing method was given to the control group.

**Tool used in the study**: The instruments of the study were instructional package in increasing thinking skills of secondary school students. It was developed by the researcher.

**Sample of the study**: The sample of the study consisted of 40 secondary school students distributed randomly on one experimental group and one control group.

**Technique of analysis of data**: The descriptive statistics i.e. mean, standard deviation, t-test (dependent sample) and t-test (independent sample) were used to find out the effect of instructional package in increasing thinking skills of secondary school students.

**Major findings**: The results of the study revealed that the student of experimental group obtained more successful than the students in control group. There were statistically significant differences between the students’ achievement mean scores in thinking skills attributed to the instructional package. This difference is in favour of the students in the experimental group. There were statistically significant differences between the pretest and posttest scores of students’ achievement in thinking skills attributed by the instructional package. In light of the findings of the study, it was recommended that instructional package in increasing thinking skills was effected on secondary school students’ achievement.
STUDY 6: The Development of Instructional Package on Thinking Skills for 2nd Grade Students. (Warunothai Pongjit: 2010)

Objective of the study: The purpose of this study was to develop the instructional package on thinking skills for second grade students and investigate the effect of instructional package in increasing thinking skills of secondary school students.

Research design: This study was a quasi-experimental type, of the pre-test, post-test, non-equivalents, non-randomized, control group design. There were two groups of treatment: the experimental group and control group.

These two groups (experimental and control groups) were test as pre-test. Then, the students in the first experimental group were exposed to instructional package on thinking skills for second grade students while the students in control group were exposed to conventional method of teaching. The students in the experimental groups were introduced to the instructional package on thinking skills format under teacher’s supervision. The control group students were exposed to the conventional teaching method on the same content used for experimental groups. They were taught using conventional classroom format. The classroom contained a chalkboard and charts which were used for the instruction.

The treatment for all the groups lasted for 10 hours. After the treatment the two groups were exposed to the post test.

Tool used in the study: The instruments for this research were the treatment instrument “instructional package on thinking skills for second grade students” The treatment instrument was a self-instructional package for 10 hour. It contained four lessons structured into modules i.e. creative thinking, critical thinking, problem solving, analyzing. It was developed by the researchers.

In the development of the package four methodological phases were strictly followed: analysis, design, implementation and validation. In analysis stage, students’ thinking skills to be improved were considered as a baseline for the development of instructional package, and evaluation instruments were also analyzed and developed at this stage.
Sample of the study The target population of this research was the second grade students in Bangkok, Thailand. The nature of the study, however, required that the research sample was purposively selected. The sample for experimental group 1 and 2 is made up of 40 students.

Technique of analysis of data:
The scores of students in the two groups were analyzed using mean, standard deviation, t-test (dependent sample) and t-test (independent sample).

Major findings: The results of the study are as follow:

1. There was the significant difference between mean scores of students’ thinking skills obtained by students in experimental group and control group.
2. The students of experimental group obtained greater mean scores on thinking skills than students of control group.
3. There was the significant difference between the pretest and posttest score of thinking skills obtained by students in experimental group and control group.

STUDY 7: Development of Thinking Skills using Instructional Package for 6th Grade Students. (Jantana Malakaew: 2010)

Objective of the study: The purpose of this study was to develop an instructional package on thinking skills for 6th grade students.

Research design: The pre-experimental research was designed to see the effect of an instructional package on thinking skills for 6th grade students.

Tool used in the study: The instruments of the study were the an instructional package on thinking skills for 6th grade students. Students were tested before the treatment and after treatment.

Sample of the study: The experimental research conducted on the sample of 20 students of 6th grade in Bangkok, Thailand.

Technique of analysis of data: t-test (dependent sample) were employed to test the significant difference between the pretest and posttest scores.

Major findings: The results of the study revealed that there was the significant difference between the pretest and posttest score. The posttest score was greater than
pretest scores. It was concluded that the instructional package was effect on the thinking skills for 6th grade students.


Objective of the study: The purpose of this study was to examine the impact of instructional package on thinking skills of secondary school in a rural school district before and after the implementation of instructional package. This study further explored whether instructional package on thinking skills of students based upon race, gender and socioeconomic status.

Research design: The experimental research was designed, to see the impact of instructional package on thinking skills of eighth grade students in a rural district in Missouri State.

Tool used in the study: The instrument of the study was the instructional package on thinking skills for eighth grade students.

Sample of the study: Participants for this study were 70 eighth grade students in the public school students from a rural school district in the low country of Missouri State. These 70 students were divided into two groups. The are in same level of academic achievement based on the score of semester test.

Technique of analysis of data: Data used in this study were examined using the following statistical procedures: Descriptive Statistics, Analysis of Variance (ANOVA), and t-test. In order to examine the hypotheses, an Analysis of Variance test was performed to investigate the relationship between student thinking skills with regards to gender, race, and socio-economic status.

Major findings: The results of this study revealed that there was the significant difference between pretest and posttest scores on thinking skills of 8th grade students of the two groups. There was no significant difference between posttest scores on thinking skills of 8th grade students in these two rural school districts. Further, this investigation found that there was no significant difference in thinking skills of students in these two rural school districts with regards to gender, race and socio-economic status.
It was concluded that there was an impact of instructional package on thinking skills of secondary school in a rural school district.

**STUDY 9: Developing of Instructional Package on Students' Thinking Skills for Secondary School Students.** (Somboon Srisakorn: 2011)

**Objective of the study:** The purpose of this study was to design and develop an instructional package on thinking skills for secondary school students and to investigate its effects on students' achievement.

**Research design:** The quasi-experimental research was designed to see the effect of instructional package on thinking skills for secondary school students. Two groups were formed, one was the experimental group and the other one was the control group. Instructional package on thinking skills for secondary school students was applied to the experimental group and conventional method was given to the control group.

**Tool used in the study:** The instructional package on thinking skills for secondary school students was the main instruments.

**Sample of the study:** The target population of this 10 hours research study was 40 students. The students were drawn from secondary school in Bangkok, Thailand.

**Technique of analysis of data:** Mean (\(\bar{X}\)), Standard Deviation (S.D.), t-test (dependent sample) and t-test (independent sample) were employed for analysis of data. All statistical significance were tested at alpha = 0.05 level. Analyses of the pretest achievement were conducted to establish the homogeneity of subject groups.

**Major findings:** The results of the study revealed that there was the significant difference between the pretest and posttest score on students’ thinking skills in both groups, experimental group and control group. The posttest score on thinking skills was greater than the pretest score. There was the significant difference between the posttest score on students’ thinking skills between the experimental group and control group. The posttest score on thinking skills obtained by students in experimental group was greater than that of the control group.
(Patrick, G.W.: 2011)

Objectives of the study : The purpose of this study was to investigate student perceptions towards instructional package, designed to support the development of critical thinking skills, and to identify how student understands of critical thinking.

Research design : The Quasi-experimental research was designed to see the effect of instructional package on thinking skills between students who received instruction using instructional package and conventional instruction method. Instructional package was applied to the experimental group and conventional method was given to the control group.

Tool used in the study : The instructional package on critical thinking skills was the main instrument.

Sample of the study : The sample of this study was 40 primary school students of Columbia selected by simple random sampling.

Technique of analysis of data : Mean (X̄), Standard Deviation (S.D.), t-test (dependent sample), t-test (independent sample) were employed for analysis of data.

Major findings : The results of the study revealed that there was the significant between the mean scores on thinking skills of students in experimental group and control group. The mean score of posttest in experiment group is greater than posttest of control group. There was the significant difference between the pretest and posttest scores of thinking skills obtained by students in experimental group and control group.

It can be concluded that instructional package on thinking skills has effect on in students’ achievement in experimental group and scores of students in experimental group were higher than the students in control group.

STUDY 11 : Development of Instructional package in Social studies (title: Our Environment) for Second Grade Students. (Sanit Kongsomboon, 2002)

Objective of the study : The purpose of this research was to develop the instructional package in Social Studies (title: Our Environment) for second grade students which consisted of four stages as follow:
(1) The study of fundamental data for the development of the instructional package.

(2) The development and finding of the efficiency of the instructional package.

(3) The implementation of the instructional package.

(4) The evaluation of the instructional package

Research design: The study makes use of the pre-experimental research, pre-test, post-test design.

Tool used in the study: The instructional package on Social studies (title: our environment) for second grade students was the main instrument.

Sample of the study: The samples were 40 second grade students of primary school in Bangkok, Thailand that were selected by simple random sampling. The experiment of the instructional package was conducted for 10 hours during the first semester of the academic year 2010.

Technique of analysis of data: The descriptive statistical methods used in data analysis were percentage (%), mean (\( \bar{X} \)), standard deviation (S.D.), t-test (dependent sample).

Major findings: The results of the study revealed that the pretest and post test achievement scores of the students were statistically significant different at 0.01 level. After the implementation of the instructional package, the students’ posttest score was higher than pretest score. They were able to perform an environment conservation conducts in school and also had abilities in taking care of plants and trees, preparing manure and keeping clean school’s area. The students also had positive attitude towards the instructional package at a high level because it could encourage students to perform activities in relevant to the environment conservation, whereas the instructional package could enhance students responsibilities, self discipline characteristics and thinking skills. Finally, students are expected to benefit from instructional package (IP). Among the benefits that have been expected are better and more comfortable learning using instructional package, since they learn at their own pace and convenience; opportunities to work with vastly superior materials
and more sophisticated problems; personalized tutoring; automatic measurement of progress; and others.

2.4 Summary

The second chapter mainly discussed about the instructional package and thinking skills.

Instructional package (IP) is an educational medium in which instructional contents or activities are delivered by multi-media which is used to enhance the students’ learning experiences in a group or in individual. It contains the teaching units which are designed to teach, guide, and test the student until a desired level of proficiency is attained. The students learn a set of objectives, containing a variety of instructional resources by reading the test material presented or by observing the graphic information displayed. In the present study, instructional package (IP) refers to a form of learning that utilizes printed materials, pictures and graphics that appeal on thinking skills of primary school students.

Thinking skill is the human capacities to think in conscious ways to achieve certain purposes. It involves the mental process used in cognitive functions that enable people to make meaning from and create with a significant amount of memory, critical thinking, creative thinking and analytical thinking information, leading to bodies of knowledge creation or information for judicious decision-making regarding oneself, society and environment. There types of thinking were contained in the instructional package:

(1) Creative thinking: Creative thinking is a mental process of combining parts in such a way as to constitute a pattern or structure that unique and did not exist before. It involves the thinking that generates something new or different from the current exists and well or better than previous ideas. It is generative and divergent in nature. Creativity involves divergent and convergent thinking to produce new ideas by combining, changing and reapplying. Divergent means thinking that starts from a common point and moves outward into a variety of perspective. Divergent thinking with creativity can be appointed in four characteristics: fluency, flexibility, originality and elaboration.

(2) Critical thinking: Critical thinking is the way of thinking that assesses the worth and validity of something in existing. It involves carefully analysis, synthesis, judgement or
evaluation the evidence or information by observation, experiences, reflection, statistics, machine, explaining, reasoning or communication. It is the thinking which process careful acquisition and interpretation information around a common point-out attempt to bring thoughts from different directions to reach a well-justified or common conclusion.

(3) Analytical thinking: analytical thinking is the abstract separation of a whole into its constituent parts or element parts in order to study the parts and their relations. It is the process of separating and distinguishing elements of a concept, idea, problem and issue in order to understand its essential nature and inner relationships. The analytical thinking is based on the deductive thinking. The deductive thinking is the act of reasoning which move from a whole to its part, from the general to the particular, from the universal to individual, from broader generalizations to specific observation, and from general theories to specific instance. It is based on reasoning, experience, experimentation and draws conclusions from them.

Eleven past studies are reviewed in order to make sure that the present research is not repeating the work that someone has already done earlier. The researcher can get more information and ideas that relevant to research work.

The present research studies aims to develop and try out the instructional package for enhancing thinking skills which combines three skills together i.e. creative thinking, critical thinking and analytical thinking of primary school students which was not appearance in any research. Therefore, this research is a unique research or only one research which indicates the three types of thinking skills. The learning achievement of eleven grade students is the dependent variables of the present study whereas the instructional package for enhancing thinking skills which combines three skills together i.e. creative thinking, critical thinking and analytical thinking of primary school students is the independent variables.

In order to go for data collection, plan & procedure as well as the development of the instructional package for enhancing thinking skills which combines three skills together i.e. creative thinking, critical thinking and analytical thinking of primary school students will be described in chapter 3.


33. Bloom, Benjamin & Krathwohl, D.R. (1956) **Taxonomy of Educational Objectives,**


49. Ibid.

50. Ibid.

51. Ibid.

52. Ibid.


http://www.cala.fsu.edu


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96. Ibid.


   [http://www.ericdigest.org](http://www.ericdigest.org)

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