CHAPTER 2

REVIEW OF RELATED LITERATURE AND RESEARCHES
# CHAPTER 2

**Review of Related Literature and Researches**

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CHAPTER 2

Review of Related Literature and Researches

2.0 Introduction

Research can never be undertaken in isolation of the work that has already been done on the problems which are directly or indirectly related to a study proposed by a researcher. A careful review of related literature and related researches is an important stage in the research after selection of the topic of the study. Before deciding the research plan the researcher has to find out all the related literature and references and has to carry out in-depth study of the same.

The literature in any field works as a foundation upon which all future work is to be built. Review of the related literature and related researches has immense importance in the research process. It is a part of the scientific approach and carried out in all areas of scientific research, and is one of the first steps though it occupies later in final report. Until it is not learnt what others have done and what remains still
to be done one can not decide what is to be done. Therefore, a researcher should make every effort to complete a thorough review before starting own research work, because the insights and knowledge gained by the review lead to better designed project and improve the chances of obtaining important and significant results. Review of the related literature and related researches helps researcher in reaching a number of important specific goals as following-

To know the previous researches carried out in the subject.

To delimit the research problem and define it better.

To see new approaches that other researcher has not seen.

To avoid duplication of work.

To get insight into methods of work.

To decide the direction and line of action for one's own research.

To carry out innovative research for the same subject.

According to Best and Kahn\(^1\) "A summary of the writings of recognized authorities and of previous research provides evidence that the researcher is familiar with what is already known and what is still unknown and untested. Since effective research is based upon past knowledge, this step helps to eliminate the duplication of what has been done and provides useful hypotheses and helpful suggestions for significant investigations."

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While studying related work the researcher may find some recommendations for further researchers, some conflicting conclusions and help in sharpening, understanding and defining the existing knowledge in the problem area. Such studies provide proper ground for the research and make the reader aware of the status of the issue.

To enlist all the studies related to the problem is not of use. Only those studies that are relevant, competently executed, and clearly reported should be included in review of related work.

While searching for related researches and literature, the researcher has to keep in mind certain important points. The related researches should provide information regarding following points-

Closely related problems that have been investigated.

Design of the study, including procedures employed for data-collection and instruments used for that.

Populations that were sampled for study and sampling methods employed.

Variables that were defined in the study.

Extraneous variables that could have affected the findings.

Faults that could have been avoided.

Recommendations for further research.
Articles written by experts on the related subject are also useful. Review of related literature is to be carried out and presented separately. Both study of related researches and related literature is a valuable guide for defining the problem, recognizing its significance, suggesting appropriate data collection tools, appropriate research design and also, the source of data.

In order to study related work done by previous researchers the researcher visited following sources-

- Branch Library of S.N.D.T. Women’s University, Pune.
- Jaykar Library, Pune University.
- Library at Education Department of Yashvantrao Chavhan Maharashtra Open University, Nasik.
- Library at Dr. Babasaheb Ambedkar Marathwada University, Aurangabad.
- Relevant references from internet search.

In order to find out researches related to present study the researcher has gone through many research journals, research bulletins, encyclopedias, survey of research in education, internet etc. As learning styles is a relatively new term very few researches were found which were not directly related either with present topic. The researcher searched for related literature to get clear idea about the topic selected for study.
In present chapter the researcher has presented related literature and related researches separately.

2.1 **Review of Related Literature**

As the term learning style is relatively new, the related literature is given in more detail as compared to the literature of achievement and attitude towards science.

2.1.1 **Learning styles:**

Learning styles are the preferences of students for learning conditions or the ways of learning. A student’s consistent way of responding to and using stimuli in the context of learning may be called as is his / her learning style. Where as, learning means, the development of meanings, skills, strategies, and values.

Sometimes the term learning style is interchangeably used with cognitive learning style. But the cognitive learning style specifically refers to the ways that people use for processing information. It does not include affective preferences, interpersonal relations and social interactions.

In 1970s the interest in learning style was at its height, and the theorists were trying to understand how individual learner differences interact with teaching strategies. And from those efforts educators got a way of describing individual differences other than ability and intelligence.
Learning style is a value set of characteristics that means no one learning style is better than the other.

There is always some theory behind every learning style. Theory that identifies and explains people's learning styles is learning style theory. Through learning styles one can infer about how that particular person acquires, processes and learns new information and skills.

While describing various learning styles some similar terms related to learning style are used. The meanings of those terms are given below.

(1) **McLoughlin** (1991),(2) provided definitions of similar terms relating to learning styles.

Learning preference means favouring one method of teaching over another.

Learning strategy means adopting an action plan in the acquisition of knowledge, skills or attitudes.

Learning style is the way of adopting a habitual and distinct mode of acquiring knowledge.

Cognitive strategy means adopting a plan of action in the process of organizing and processing information.

Cognitive style is a systematic and habitual mode of organizing and processing information.

There are various learning styles described by many well known people in this field. Some theorists made
available the instrument to determine a student's learning style along with their theories of learning style.

(2) **Guild and Garger** (1985)\(^3\) suggested “four categories that educators should be aware of in the classroom: cognition, conceptualizing, affect, and behavior.”

People from ‘cognition’ category perceive information and develop understanding differently.

People from ‘conceptualizing’ category develop and form ideas differently.

People from ‘affect’ category feel and value differently.

People from ‘behavior’ category behave or act differently.

(3) **The Three Representational Modes (TRiM)** - TRiM can be used to determine the mode of learning of a student. The theory behind this is all information that is perceived via the senses passes through three processors; that encode it as linguistic, nonlinguistic or affective representations. Whenever one learns something for the first time, the information is encoded linguistically such as rules; then mental images are retained nonlinguistically, and finally, various sensations are encoded affectively. Each representation can be thought of as a record and then that is encoded and then filed away. It is not really a style but it allows making accurate judgments about the various learning styles.
VAK Learning Styles-VAK seems similar to TRiM, but it is quite different in nature. The term VAK is derived from the accelerated learning world (Visual, Auditory, Kinesthetic), and seems to be about the most popular model now a days. Because of its main strength, it is quite simple, which appeals to a lot of people. The VAK learning Style uses the three main sensory receivers viz. Vision, Auditory, and Kinesthetic for determining the dominating learning style of the learners. Learners use all three receivers to receive information, but one or more of these receiving styles are normally dominant. This dominant style defines the best way of a person to learn new information. The dominant style may not always be the same for all tasks. The learner may prefer one style of learning for one task, and a combination of others for another task.

According to Guild and Garger (4) "In most cases learners will have a dominant style within a mode that is visual, auditory or tactile/kinesthetic. Within those three modalities, their learning preferences will look different and often manifest in a variety of ways."

Some characteristics of visual, auditory, and kinesthetic learners are listed in the next pages with some cues to identify them.
Characteristics of visual learners:

Visual learners imagine and create pictures in their mind and use those images and pictures to remember.

They could easily learn through graphics and written instructions instead of oral ones.

They like to read, write, make notes, draw maps, and arrange matter in order.

They like art and drama and could pick up final expressions and accurately read body language.

While speaking they use words like look, see, observe, clear, watch, viewpoint, point of view, focus, mirror, insight, image, reflect, fuzzy, vivid, hazy, foresight, eyeball, picture, etc.

During communication with others, they use phrases like, I see what they are saying, let me clear first, let us focus on..., picture this, I get the picture, show me what you mean, another way of looking at it is..., what do you see? Do you see what I mean? It is crystal clear, it looks as though, I will show you..., let us take another look at...

They speak in faster rate with high pitch, and show hand and arm movements higher in air while speaking.

They show tense posture, while thinking.

They show upward eye movements, when trying to understand.
They like to do some things like, look at books, organize matter, material in order, detect errors, watch others’ activity in order to learn from it, read faces, enjoy puzzles.

**Characteristics of auditory learners:**

Auditory learners like to talk and listen to others, chatter constantly, and want audience.

They like to learn from lectures, verbal instructions and audiotapes.

They like to tell stories and tales to others, are good at memorization, like music, rhyme.

They like to read loudly and learn by talking to themselves, discuss what they learn, and teach others for clarification.

While speaking they use words like, listen, hear, speak, talk, and tell me, told, say, well said, answer, tune, pitch, tone, volume.

While communicating with others they use phrases like, tell me what.., what do you say? How does it sound?, it sounds to me .., it sounds right, in other words.., I will call you later, listen to me, listen to this, I don’t like the sound of.., the tone of your voice.., there is a lot to tell.

There shoulders are at average level while learning. There rate of voice, muscle tone and a hand movements are average and while speaking they show side ways eye movement, even speech, and mid-chest breathing.
Characteristics of Kinesthetic learners:

Kinesthetic learners show action oriented movements.

Show gestures, use hands and arms to express and explain and touch while communicating.

Imagine themselves in the situation and then act.

Like to tap or drum on things when not working.

Seem to be impulsive.

Choose performing instead of reading if permitted.

Interested in acting on concepts and doing things.

Like sports and dancing.

Solve difficulties while moving or walking.

Always doing something like reading, writing while listening.

Show good coordination.

While speaking they use the words like- touch, touchy, soft touch, hard, heavy, light weight, feel, gut feeling, firm, grasp, hurt, raise an issue, itchy, relaxed, rigid, sleep on it, let go, shoulder the blame, grip, come to grip etc.

They use language of action and feeling and use phrases like- get a move on, let us pool ideas, if we pool together, I feel struck, run that by me.., it all fell into place, I am sinking down, let us bounce this around, this is rough going,
let us throw out his idea, with closed mind, jump to it, I get it etc.

These learners speak slowly, show deep breathing and downward eye movement.

If one takes a glean at the educational system, one’s learning style is likely to be forced upon himself / herself through life like- in preschool to third std., new information is presented kinesthetically; from std. 4 to 8 information is visually presented; while in std. 9 to college and onwards information is presented as auditory by lectures.

(5) Multiple Intelligences- As theorized by Howard Gardner, there are multiple intelligences, and all learners use one or two for the most effective learning. The theory proposes that there are at least eight kinds of intelligence which are equally important; though our cultures teach, test, reinforce and reward only two kinds of intelligence, those are verbal/linguistic and logical / mathematical. Multiple intelligences include the types of intelligences described here.

Verbal Linguistic intelligence:

Learners who are strong in Verbal Linguistic intelligence are sensitive to the meaning and order of words. They like activities that involve hearing, listening, formal speaking, oral or silent reading, spelling, creative writing, poetry, tongue twisters, humor, and documentation.
Logical-mathematical intelligence:
Learners who are strong in Logical-mathematical intelligence are able to handle chains of reasoning and recognize patterns and orders. They like to do activities involving numeric sequences, calculation, abstract symbols/formulae, graphic organizers, problem solving.

Musical intelligence:
Learners who are strong in Musical intelligence are sensitive to pitch, melody, rhythm, and tone. They like to involve in the activities related to music, musical instruments, musical recitals, singing on key, environmental sounds, vibrations, rhythmic and tonal patterns, and music composition.

Spatial intelligence:
Learners who are strong in spatial intelligence perceive the world accurately and try to re-create it accordingly. They are interested in the activities which involve art, sculpture, drawings, pictures, patterns, designs, imagery, active imagination, mind mapping, block building, and color schemes.

Bodily Kinesthetic intelligence:
Learners who are strong in bodily kinesthetic intelligence are able to use the body skillfully. They are interested in activities which involve sports, games, physical exercise, dancing, and are good at role playing and drama. They can
make use of physical gestures, and body language effectively.

**Interpersonal intelligence**:

Learners who are strong in Interpersonal intelligence understand easily people and relations between them. Learners think by sharing each others ideas. They are interested in activities that involve collaborative skills such as, giving and receiving feedback, division of labor, sensing others' motives and group projects.

**Intrapersonal intelligence**:

Learners who are strong in Intrapersonal intelligence can easily understand one's emotional life and use it as a mean to understand self and others. They are interested in activities which involve emotional processing, thinking strategies, concentration skills, higher order reasoning, silent reflection methods, and meta-cognitive techniques.

**Naturalist Learners**:

Naturalist Learners are the learners who are strong in understanding the complications, relations, and details of the parts of nature. They also realize the importance of small part of nature to the whole. They are interested in activities which involve observing wild life, relation to the natural world, bringing the outdoors into the class, charting,
mapping changes, keeping journals or logs of the things or events in nature.

The inventory available to determine the above mentioned intelligences is Multiple Intelligences Test.

According to multiple intelligences theory, all learners possess numerous mental representations and intellectual languages, and also differ from one another in the forms of these representations, their relative strengths, and the ways in which these representations can be manipulated.

(6) **Kolb's Learning Styles:** The study of three well-known persons is the base of Kolb's Learning Style Inventory (Kolb, D. A. 1984). John Dewey's emphasis on the need for experience oriented learning, Kurt Lewin's, work that stressed on person's activity while learning, and Jean Piaget's theory on intelligence stressed the importance to the person and the environment.

The figure which explains the learning cycle and the learning styles accordingly is presented on the next page.
Concrete experience
(sensing and feeling)

Accommodators
Concrete, active.

Divergers
Concrete, reflective.

Active experimentation
Test hypotheses
(doiing and planning)

Reflective observation
(Review and watching)

Convergers
Abstract, active

Assimilators
Abstract, reflective

Abstract conceptualization/
generalization
(Thinking and concluding)

Figure: 2.1 Kolb’s experiential learning cycle and learning style model

Kolb's four stage theory is based on a model with two dimensions. The first dimension is running horizontally and it is based on task. The left end of the dimension is doing the tasks (performing), while the right end is watching the task (observing). The second dimension runs vertically and is
based upon thought and emotional processes. The top of the dimension is feeling (responsive feelings) while the bottom of the dimension is thinking (controlled feelings). These four positions on the two dimensions describe a four-step learning process.

Four positions:

• Concrete Experience (Feeling or Sensing) - Learners with a high score in the concrete experience dimension represent a receptive experience based approach to learning so they rely on feeling based judgments. Thus, these learners tend to be empathetic. Theoretical approaches are not helpful for them and they prefer to treat each situation as a unique case. They learn best when they involve in specific example. These learners tend to relate to peers, and not to authority. Group work and peer feedback often lead them to success. They are self-directed autonomous learners.

• Reflective Observation (Watching) - these learners reflect on ‘how’ part of a thing, situation, knowledge that show impact on some aspect of our life. They show high score in reflective observation, and indicate a tentative, impartial and reflective approach to learning. They rely totally on careful observation in making judgments, and prefer learning situations such as lectures that allow the role of impartial objective observers. These learners tend to be introverts. As they prefer visual and auditory inputs, lectures are helpful to
them. These learners need the expert interpretation and want their performance to be measured by external criteria.

• Abstract Conceptualization (Thinking) - while learning, these learners compare how the content fits into their own experiences. They show a high score in abstract conceptualization, which indicates an analytical, conceptual approach to learning. These learners rely heavily on logical thinking and rational evaluation. These learners tend to be more oriented towards things and symbols, and less towards other people. They learn best in authority-directed, impersonal situations and emphasize on theory and systematic analysis. Theoretical readings and reflective thinking exercises help this learner. They want constructed material and get frustrated and gain little from unstructured "discovery learning" approaches such as exercises and simulations.

• Active Experimentation (Doing or testing hypotheses) - while learning they think about how this information offers new ways to act / work. These learners are high scorers on active experimentation and it indicates an active "doing" orientation to learning. They are not interested in lectures, as they feel it a passive learning situation. They tend to be extroverts and rely heavily on experimentation, so they learn best when they are engaged in small group discussions, games, projects, homework, and peer feedback help them to
learn. These learners want to touch everything, like to see everything and determine their own criteria for the relevance of the materials so problem solving and self directed work assignments also help them to learn.

Four Learning Styles:

The dimension based on task and the dimension based on thoughts, these two lines intersect each other and form four quadrants. These quadrants form the four personal learning styles as mentioned below.

(i) Assimilator:- Assimilators like to learn using the combination of abstract conceptualization and reflective observation. They relate the new information with the previous knowledge and like to ask questions like "How does this relate to that?" They have ability to create theoretical models and it is their strength. They are often more concerned with abstract concepts and interested in case studies, theory readings, and thinking alone. They tend to be less concerned with practical applications of knowledge and not much interested in people. Theorists are often found in research and planning departments. This learning style is more characteristic of basic science and mathematics than applied sciences.

• Assimilators’ strengths:-

Learners from this category set clear goals, plan in advance to achieve, are well organized, and work well alone.
Like to examine facts carefully, and find out its details.
Like to collect data and see links between ideas, create theoretical models and apply it to problem or problem situation, but not too concerned with practical use of theory.
Show sequential, thorough thinking, but precise in work, and like to rework on previous notes.
These learners are analytical and logical and use past experiences constructively.
They are enthusiastic reader, think thorough and can collect different theoretical viewpoints to critique something.
Social interests of these learners are not strong, and they are concerned with abstract concepts rather than people.
Show inclination towards integrated knowledge, and enjoy didactic teaching.
Their attention moves from parts to whole.
They show special interests, get attracted to basic sciences.
Their characteristics suit to work in research and planning department.
These learners are high scorer on abstract conceptualization and reflective observation.
• Weaknesses of assimilators:
These learners are over cautious and not ready to take risk so they are reluctant to try anything new.
Waste too much time in collecting information before starting work, taking decisions, or giving opinions.

These people like to do things in previously settled and successive way, reluctant in trying new way.

Give too much importance to the theory and logic and not to the feelings.

Spend too much time on thinking on theory and want to know what experts think on the same.

Are not comfortable in group discussion and do not like to take help of teachers or friends.

(ii) Convergers:- Convergers like to learn using the combination of abstract conceptualization and active experimentation. While learning they are always thinking of application of that knowledge, they ask question like "How can I apply this in practice?" This tendency of practical application of idea is their strength. They prefer to deal with things rather than people and are relatively unemotional. They show narrow technical interests and quite often choose to specialize in the physical sciences. They like to learn through observations in laboratories and field work. As they are self-directed autonomous learners, teacher's role is to help them wherever necessary.
• Convergers’ strengths:-

Main strength of these learners is their practical application of ideas, they draw inferences from experience.

Able to see practical relevance of theory and integrate theory and practice.

Like to try out things in a common sense way, and feel happiest after getting correct answer.

Set goal and prepare action plans, good in time management, and get things done on time.

Perform well when there is a single correct answer, and working alone.

Good in focusing on specific problems and decision making.

Good in using skills and in repairing things.

At first concentrate on parts and then move on whole.

Are thorough and good in strategic thinking.

Know how to find out information, read carefully and prepare systematic notes or files.

Prefer to deal with things rather than people, somewhat unemotional, this helps them in remaining undistracted.

These learners choose to specialize in physical sciences.

Characteristics of these learners match with the characteristics of many engineers.
These learners are high scorer on abstract conceptualization and active experimentation.

• Weaknesses of convergers:-

These learners tend to think that their way of doing something is the only way of doing that, and are not good in suggesting alternatives.

Get irritated with wooly ideas.

Can’t listen and accept other people’s suggestions patiently.

Trying to work out at once may affect the quality of work.

Need to control and do the job alone.

Do not care for others emotions.

Show narrow range of interests.

Always need to know how things are helpful in real life.

(iii) Accommodator:- Accommodators like to learn using the combination of concrete experience and active experimentation. Doing things and involving themselves in new experiences are their strengths. They like the teachers who leave them to determine their own criteria for relevance of materials. For them, trainer should be a model of a professional, and should allow them practicing the skill, problem solving, small group discussions, peer feedback etc. They often involve in simulations, case study and homework. They excel in adapting to specific immediate circumstances that is why they are called accommodators. They rely on others for information and tend to solve
problems intuitively. These learners are often found working in marketing and sales because they are at ease with people but sometimes seen as impatient and pushy. They are often seen in technical or practical fields such as business.

• Accommodators’ strengths:-

These learners are very flexible, they enjoy change and variety.

Ready to take risks and not worried about getting wrong.

Get others involved in the job they are doing, learn from others and are mentally prepared for asking for help.

Show wide range of interest, like to involve in the things which spark their interests.

They are committed to action.

Test the experience received through trial and error.

These people often get right answers without logical explanation.

Interested in seeing whole picture before examining the parts.

• Weaknesses of accommodators:-

Not interested in planning work, time management is very poor; keep the things till the last minute.

Try to do too many things at a time.

Do not like to check the previous work or rework on it again
Do not show interest in collecting details, directly jump on the thing without thinking on it.

(iv) Diverger:- Divergers like to learn using the combination of reflective observation and concrete experience. Their imaginative ability is their strength. As imaginative, they take time to think about the subject. They like the trainer who delivers lecture with plenty of reflection time and provide expert interpretation - taskmaster/guide; judge performance by external criteria. Learners with this learning style tend to be interested in people and emotional elements, so they tend to become counselors, organizational development specialists and personnel managers. They show broad cultural interests and tend to specialize in the arts. These learners are often seen in humanities and liberal arts backgrounds.

• Divergers’ strengths:-

Divergent learners are imaginative thinker; they enjoy brainstorming and generate ideas or alternatives.

These learners like to involve in experience, collect information through own experiences and then reflect on it. Practical application is their main strength.

Look at the situation from many angles, and bring coherence in the collected information.

Like to see the whole picture, then examine the things or parts in it and understand the relation between them, and grasp the whole.
Like group discussion, group work, like to interact with others, they are collaborative learners.

These learners show wide range of interests.

As they are good in listening can understand people’s feelings and can share the feelings.

These learners are high scorer on concrete experience and reflective observation.

These learners generally specialize in Arts.

Characteristics of these learners match with the characteristics of people from humanities and liberal arts.

• Weaknesses of divergers:-

Are easy going and take too much time to start.

Reluctant to work on action plans.

Forget important details.

Sometime unable to take decisions.

Work only in burst of energy, and get distracted easily.

Kolb’s model it actually consists of two models. In one model a four step learning process which includes -

Reflective Observation,

Abstract Conceptualization,

Concrete Experience and

Active Experimentation.
The other model describes the four learning styles used within the learning process—

Divergers,
Assimilators,
Convergers and
Accommodators.

Though four different characteristics of learners are given above, it should be kept in mind that every learner learns from all four quadrants, but one of the four is dominant.

Kolb’s learning style inventory is the tool available to find out the learning styles of students.

(7) **Kolb and Boyatzis (1991)** developed Learning Skills Profile to assess adaptive competences associated with learning style. Modified Q-sort method was used to assess level of skill development in four skill areas which are related to the four learning modes, viz. interpersonal skills, perceptual skills, analytical skills and behavioral skills. After that Adaptive Style Inventory was developed.

(8) **The adapted four learning styles:** Peter Honey and Alan Mumford adapted Kolb's original cycle and identified four different preferences. According to them a learner would consciously move through every stage in the cycle in every learning situation.
These preferred ‘learning styles’ are named as Activist, Reflector, Theorist and Pragmatist. The cycle along with learning styles is given below.

**Figure 2.2: Honey and Mumford’s learning cycle**

According to Honey and Mumford some people are happiest in operating just one mode; others may in two or even three. Perhaps, it is not surprising that learners’ learning style tends to reflect their work style or vice versa.

Characteristics of these four types of learners are given here one by one.

**Activists**

Activists are interested in involving themselves in new experiences fully and without bias. This tends to make them enthusiastic about anything new, and thrive on the challenge of new experiences. As soon as the excitement from one
activity has cooled down, they look for the next. They are constantly involving themselves with others and ultimately bring themselves at the centre of all activities.

Activists learn best from novel experiences, and learn least well from passive situations like reading, watching or listening to lectures, and theory.

Reflectors
Reflectors like to stand back and observe others' experiences from many different perspectives. Before coming to the definite conclusions they collect data and analyze them thoroughly. Their act includes the past as well as the present and others' observations as well as their own. Reflectors learn best from observing, thinking, commenting, and reviewing activities.

They learn least well with insufficient data, without time to plan, through role-play and short-cuts.

Theorists
Theorists think on problem step-by-step, through various logical ways, analyze and synthesize and try to find out theory behind it. They are very keen on basic assumptions, principles, theories, models and systems. They do not feel comfortable with subjective judgements, ambiguity and lateral thinking.
Theorists learn best when they are kept in structured situations with a clear purpose, and allowed to explore associations and interrelationships, to question assumptions and logic and to analyze reasons and generalizations; basically they like to be intellectually stretched. They learn least well without apparent purpose, with unstructured and ambiguous activities, lack of data to support the subject, and when they can not tune with group.

Pragmatists

Pragmatists are interested in trying out ideas, theories and techniques to see if they really work in practice. They like to experiment with applications. They like to act quickly and confidently on ideas which attract them and tend to be impatient with open-ended discussions and like to take practical decisions.

Pragmatists learn best when there is an obvious link between the subject-matter and the activity to be done, and when they get opportunity to implement the practical ideas. They learn least well when there is no immediate benefit or reward from the activity and the learning events seem distant from reality.

Honey, Mumford’s learning style inventory is available to categorize the learners on the above mentioned styles.
The Seven Perceptual Styles:

The perceptual styles theory is a theory based upon research conducted by Dr. Russell French, Daryl Gilley, and Ed Cherry. According to them perceptual learning styles are the means by which learners select and extract information from their surroundings by using their five senses. Individuals have different and specific pathways of collecting information according to their own constitution. They conducted the researches from 1975 to 1981, and since from that time studies have been continued throughout the United States by researchers who were interested in the improvement of process of learning and teaching. In the mean time the theory has been refined and the testing instrument has been revised. The seven perceptual modes or pathways included in the theory are -

Print mode - where the learner refers printed or written words to collect information.

Aural mode - where the learner refers to listening of the information.

Interactive mode - where the learner refers to verbalization of the content.

Visual mode - where the learner refers to seeing visual images such as pictures and graphs, charts.
Haptic mode - where the learner refers to the sense of touch to grasp the thing.

Kinesthetic mode - where the learner uses the whole body and its movement for getting information.

Olfactory mode - where the learner uses the sense of smell and taste for learning.

The tool available to test the modality of the learner is Multi-Modal Paired Associates Learning Test (MMPALT-III). The tool is a performance test, tested and used on ages ranging from elementary students to the elderly. The MMPALT-III is administered by trained testers who are certified by the Institute for Learning Styles Research.

(10) Learning Styles by Pask

Many educators recognize two types of learners; first one is holists and the other is serialist. These types are described by Pask. According to him serialists prefer to learn in a sequential fashion, whereas holists prefer to learn in a hierarchical manner.

(11) Gregorc’s four learning styles:

Holists are also called as global learners. Gregorc classes them as random learners. The second type is serialists, also called as sequential. Gregorc classes them as analytical learners. According to him the random learners are general to specific learners who learn best by developing a
conceptual framework into which they fit details and specific information. And sequential learners on the other hand, are specific to general learners who like to learn individual details and then use a series of steps to gain an overall understanding. Gregorc added another dimension to this concept: learners also have a preference for concrete or abstract content. This gave rise to the theory of thinking in 1982.

This theory is based on two variables; one is the way one orders the world that is in ‘random’ or ‘sequential’ manner; and the other is the way, one views the world, that is in ‘abstract’ or ‘concrete’ way. Gregorc’s four learning styles are the combination of these four variables. The four learning styles are concrete random, concrete sequential, abstract random and abstract sequential. Characteristics given on the next page are helpful in identifying the students having the above mentioned learning styles.

Concrete random learners:
Learner from this category show attributes of both concrete way of viewing the world and random manner of ordering world. While viewing the world they like practicality, trial and error, need model, and see the whole and not part. While ordering the world they prefer divergent thinking, look for options, appreciate choice, and follow intuitive leaps.
Special learning activities which would match their learning style are provided to them pertaining to their attributes so as to achieve more. Some of the attributes are presented below style-wise.

**Concrete sequential learners:**
These learners like to learn lists and like to learn through hands on activities. They appreciate order and are procedural and like details.

**Abstract random learners:**
As these learners learn through feelings and emotions; they need free, nonthreatening environment, sometimes they know answers but can not explain. While ordering the things they are flexible and spontaneous, seek variety and use visual imagination.

**Abstract sequential:**
These learners prefer investigations and analysis and need time to process while viewing the world. These learners appreciate order and are logical and rational in nature.

Gregorck style delineator is available to determine the above mentioned styles.

(12) **Carl Jung and Myers Briggs Type Indicator (MBTI)**
The Myers-Briggs Type Indicator (MBTI) is a widely used instrument to find out the individual differences. The MBTI is a personality model; however, personality does play an
important part in determining the learning style, with this view it is discussed here.

It is a four dichotomous dimensional behavioral model similar to Kolb's Learning Style Inventory.

Scores obtained from the MBTI indicate a person's preference on each of four dichotomous dimensions as following-

- Extroversion (E) versus Introversion (I)
- Sensing (S) versus intuition (N)
- Thinking (T) versus Feeling (F)
- Judging (J) versus Perceptive (P)

**Extroversion (E) versus Introversion (I)**

This shows whether a learner prefers direct attention to the external world of people and things or the internal world of concepts and ideas. This preference finds from where the learners get their energy.

**Introvert learners find energy from the inner world of ideas, concepts, and abstractions. They concentrate and think more than they talk. Introverts integrate or connect the information they learn; this knowledge is the interconnection to see a global view.**

**Extrovert learners find energy in things and people.** They like to interact with others, and tend to be action-
oriented. They talk more than they listen. Extrovert learns by teaching or explaining others. Problem Based Learning and Collaborative Learning are good teaching techniques for extrovert learners.

**Sensing (S) versus intuition (N)**

This shows whether a learner perceives the world by directly observing the surrounding or through impressions and imagining possibilities.

Sensing learners rely on their five senses in perceiving. They seek for details, want to know facts, and trust them. They like well organized, linear, and structured lectures.

Intuitive learners trust ‘sixth’ sense and intuition and look for the metaphors and analogies. Intuitive learners prefer various forms of discovery learning. They also trust in imagination and innovation. They like to prepare and study concept maps or and often compare and contrast tables.

**Thinking (T) versus Feeling (F)**

This shows how the learner makes decisions, and whether do they prefer logic or human values.

Thinkers take decisions based on analysis, logic, and principle. They value logic of the situation and give importance to the objective criteria of decision making. They see mistakes and tend to be critical.
Thinking learners are precise; they prefer clear goals and action-oriented cognitive, affective and psychomotor objective. They also want to know clear instructions about what they have to do to learn the material.

Feeling learners while making decisions or arriving at judgments focus on human values and needs. They value empathy and harmony and are good at persuasion. Feeling learners enjoy exercises in small harmonious groups.

Judging (J) versus Perceptive (P)

This shows how the learner views the world around, either as a structured, planned environment or as a spontaneous environment.

Judging learners are decisive, self-starters and self-disciplined. They give emphasis on completion of the task, know the essentials, and take action quickly. They plan their work and work according to plan. They get encouraged for self-improvement and are interested in guides who provide quick tips.

Perceptive learners are too curious, adaptable, and spontaneous. They start many tasks at a time; want to know everything about each task, so it becomes difficult to complete a task. They often postpone doing an assignment until the deadline. They are not lazy, but they like to leave their options open and try to seek information up to the very last minute. They also give emphasis on how the task is
completed and therefore, easily get adapted. Breaking down a complex project into a series of sub-assignments and providing deadlines helps these learners to reach to the target.

The inventory available to determine the above mentioned styles is Myers Briggs Type Indicator.

(13) **Canfield Learning Styles**

The theory behind Canfield Learning Styles Inventory is established by Albert Canfield. According to him learning style is the affective component of education that motivates a student to learn, and has developed an approach that students will learn best if the instructor's methods and preferences are similar to their own.

According to him there are several types of learners as-

**Social Learners**: are those who prefer extensive opportunities to interact, and lots of group work.

**Independent Learner**: are those who prefer to work alone toward individual goals.

**Applied Learner**: are those who prefer the activities directly related to real world experience.

**Conceptual Learners**: are those who prefer highly organized verbal approaches.
Neutral Learners: are those who have no clear preferences. This person may respond to any method or may find it difficult to become involved in the learning experience.

Mixed Style learners: are those who prefer to use a combination of appropriate strategies according to the content. They may use combinations like - social/applied, social/conceptual, independent/applied or independent conceptual.

The inventory available to determine the above mentioned styles is Canfield Learning Styles Inventory.

(14) **Field dependence-independence**

Herman A. Witkin et al worked on the idea of field independence and prepared a classic measure of field dependence-independence. The idea behind field independence is that performance on perceptual/spatial tasks can diagnose a learner’s ability to learn and perform on non-perceptual tasks.

Field independence and field dependence are the styles sometimes referred to as cognitive controls. The cognitive controls control the ways of learners’ process information.

Field independent learners: like to work individually and prefer situations that allow them freedom in working toward
their goals and solving problems. Here are some specific characteristics of field independent learners.

They like to learn in environments that require minimal interaction.

They are good at understanding visual cues and are better at Mathematics.

They excel at remembering names.

Field independent learners have ability to break up an organized visual field and keep part of it separate.

They enjoy self-paced and discovery learning.

Most of the males are field independent.

Field dependent learners: like group projects and need more assistance from the teacher. While helping these students, diagrams and illustrations along with verbal information explaining them are to be provided. Here are some specific characteristics of field dependent learners.

Field dependant learners need well-structured learning environment with much positive feedback.

Can remember faces very accurately.

They do not have ability to separate figures from background.

These learner face difficulty in understanding visual cues.

Interested in the social aspects of learning.
Most of the females are field dependent.

Combination of both types of learners in virtual teams will be helpful, so that they can compensate for each other's strengths and weaknesses.

While learning, how students work, and to know whether they depend on the field or not is assessed by Group Embedded Figures Test.

(15) **4MAT System**

Bernice McCarthy created the 4MAT System. It is based on brain dominance theory. It is often used for K-12 learners, but may be used with older learners as well. This 4MAT System identifies four learning styles.

**Type 1: Experiencing - Innovative Learners**: like to talk about their experiences and feelings, ask questions, and enjoy group work. They need the answer of “why” and connection of learning with real life problems.

They dislike listening to long verbal explanations, and not being allowed to discuss their perceptions. They also dislike giving oral presentations, memorizing, therefore also dislike tests, especially if they are timed.

**Type 2: Conceptualizing - Analytic Learners**: are knowledge-oriented, conceptual, and organized. They prefer to work independently. They learn well through lectures, and discussing ideas. They do well in traditional educational
system that stresses verbal skills. Therefore they tend to do well at tests.

They do not like to talk about their own feelings and role playing. They also dislike high activity, noisy environments, and working in groups.

**Type 3: Applying - Common Sense Learners:** interested in active problem solving, learning through discovery, touching, manipulating, constructing, and spatial tasks. They are also interested in testing whatever they are learning about. They enjoy competition and also like to try things for themselves.

These learners are comfortable with change but they face difficulty with open-ended tasks. It is preferable for them to give deadlines. They are not comfortable with verbal reading and verbal complexity.

**Type 4: Creating - Dynamic Learners:** prefer to work independently and learn by self-discovery. They are interested in asking questions, risk taking and open-ended tasks. They do not like routine work, visual complexity and time management, and tend not to do well on tests.

McCarthy recommended teacher to answer the question why, what, how and if; that help students to develop every learning style.
Grasha-Riechmann Student Learning Styles

Anthony Grasha and Sheryl Riechmann developed the Student Learning Styles Scale. The purpose of the scale is to measure the preferences of college and high school students. Through this scale preferences appear along three dimensions. The dimensions and characteristics of learning preferring those dimensions are described here in short.

Participant/Avoidant style: learners with a participant style eagerly participate in learning process of the course content. They enjoy learning, and so, take responsibility for their own learning. They can learn successfully in distance learning.

In contrast to participant learners, learners with an avoidant style don't want to learn the content, so they avoid taking part in course activities. They do not enjoy learning, so to teach them teacher should make them understand the benefits of learning that specific content in their own life.

Collaborative/Competitive style: learners with a collaborative style work well with others, enjoy working in groups and cooperative learning. These learners can do well in distance education where stress is given on the cooperative learning and group projects.

In contrast to learners with a collaborative style, the learners with competitive style enjoy competitive activities. They perceive the classroom as a win-lose situation and they
try hard to win. These learners should be provided with opportunities for individual recognition.

**Independent/Dependent style:** learners with an independent style are curious and confident in nature. They prefer individual activities and like to work on their own. For these learners, teacher should provide opportunities for independent study, self-paced work, or special projects which are based on their interests.

In contrast to independent learners, learners with a dependent style are not curious, they see the teacher as a source of information. They are always in need to tell what to do, and they learn only what is just enough. For this learner teacher should provide more guidance.

(17) **Dunn & Dunn Styles**

Dunn and Dunn’s view of learning styles deals with multiple interacting preferences of the learner and focuses on setting up the environment which will fit the learner. There are two measurement tools that may be used to know the learning style and environmental preferences of the learner.

These are - (i) Productivity Environmental Preference Survey (PEPS) - for adults and (ii) Dunn & Dunn Learning Styles Inventory - for K-12.

These two instruments measure four types of learning preferences.
(i) Sociological preferences, for example authority figures and groups

(ii) Environmental preferences, for example seating, light, temperature, and sound

(iii) Emotional preferences, for example motivation, persistence, need for structure, and need for breaks

(iv) Physical preferences, for example time of day, mobility, and intake (e.g., eating and drinking).

**Visualizer/Verbalizer style**

Visualizer / verbalizer style is based on the way how people process information. It concerns with whether they prefer to process information by seeing, or through words. It can be assessed through the Visualizer/Verbalizer Questionnaire. Some characteristics of the Visualizer and Verbalizer are listed below.

**Visualizers' characteristics:**

Learner who process information by seeing tend to think concretely.

They tend to show high imagery ability and vivid daydreams.

While learning they like illustrations, diagrams, and charts.

They prefer to be shown how to do something.
They tend to be more subjective about what they are learning.

**Verbalizers’ characteristics:**

The learners who process information through words tend to think abstractly.

They tend to have low imagery ability.

They like reading text or listening.

They prefer to read about how to do something.

They tend to be more objective about what they are learning.

Some learners show strong preferences as mentioned earlier, while some others are equally comfortable with both styles.

(19) **Felder and Silverman's Index of Learning Styles**

Felder and Silverman's Index of Learning Styles is one of the most widely used models of learning styles. It is developed by Richard Felder and Linda Silverman in the late 1980s. This model is revised by Felder in 2002. According to this model there are four dimensions of learning styles.

**Sensory X Intuitive learners:** Sensory learners tend to prefer concrete, practical, and procedural information while learning and always look for the facts.
Intuitive learners tend to prefer conceptual, innovative, and theoretical information and always look for the meaning.

**Visual X Verbal**: Visual learners like graphs, pictures, and diagrams used by the teacher. They understand visual representations of information easily.

Verbal learners like to hear or read the information. They understand better through explanations with words.

**Active X Reflective**: Active learners like to manipulate objects, do physical experiments. They learn by trying or doing. They enjoy problem solving in groups.

Reflective learners prefer to think things deeply. They evaluate options, and learn by analysis. They enjoy figuring out a problem on their own and not in group.

**Sequential X Global**: Sequential learners prefer to learn the information if it is presented linearly and in an orderly manner. To understand the big picture, they collect the details put together them in order.

Global learners always prefer a holistic and systematic approach. They see the big picture first and then its details.

(20) **Silver and Hanson’s Learning Styles Profile:**

Harvey Silver and J. R. Hanson studied the theory of Carl Jung and developed a profile describing four types of learners. Those are explained on the next page.
Interpersonal learners: like to interact, discuss, and mix with other learners. They are interested in getting approval of teacher and meaningful and personalized learning.

Understanding learners: like to process their learning by analyzing, comparing, classifying and summarizing it. They believe in quality of information. They think logically and analytically on learned part.

Mastery learners: like to observe, describe, practice and memorize newly learned information and try to be more perfect about the learnt knowledge. They practice till they achieve mastery on that.

Self-expressive learner: like to take opportunity to express through the matter. They like to show their identity through originality and spontaneity. Elaborative thinking is an important characteristic of these learners. As they are creative and innovative learners, they are happy when choices are available.

(21) **Children's Learning Styles**

June Griswold, has done research into the ways children learn. She believes that identifying learning styles and adapting lessons helps in motivating students and eliminate unfair labeling.

She grouped learning styles into four, major categories- spatial visual, kinetic or movement, language-oriented, and logical/analytical. Children may use a mixture of learning styles or be dominant in one. A child with diverse learning styles is usually a more flexible learner.
Spatial visual learners: need to visualize things to learn, as they learn through images. They enjoy art and drawing; reading maps, charts, diagrams. They are daydreamers.

Kinetic learners: process knowledge through physical sensations. They are highly active; communicate with body language and gestures. These learners need to touch and feel world; good at mimicking others; like scary amusement rides; naturally athletic and enjoy sports. They can not concentrate too long on one specific thing, so are labeled as attention deficit.

Language oriented learners: think in words, verbalize concepts; spell words accurately and easily. Can spin tales and jokes, they prefer the spoken word more. They have excellent memory for names, dates and often found to be musically talented.

Logical learners: these learners think conceptually. They like to explore relationships, enjoy puzzles and seeing how things work. They show capability of highly abstract forms of logical thinking at early age, compute Mathematics problems quickly. Use computers and experiment with purpose.

(22) Don Lowry’s Color Inventory

Don Lowry developed a learning style inventory in (1979). In this inventory four colors are used to typify each learning style.

Blue: are harmonious learners like balanced and tension-free environment. They are complete, calm, and having
sense of belongingness. They symbolizes reliability, authenticity, comfort and security. Close relationships and spiritual touch to their nature is their characteristic.

**Green** : are curious learners, like to strive for perfection and always try to reach to their true potential. They experience deep feelings but do not like to express it openly. They are happy with complex problems which need to be analyzed.

**Gold** : show loyalty, security and stability in their temperament. They are responsible, enjoy service to others, and prefer order and traditions. They prove to backbone of the society by caring others and fulfilling their obligations.

**Orange** : are adventurous, and typified by vitality, energy and activity. They are often impulsive and ever ready to solve problem, and get joy from solving it.

After taking the review of different learning styles, the researcher came to the conclusion that there are many learning styles described by different researchers. Many styles are overlapping. Nomenclature is different; but same characteristics are found under different styles. Styles given by different researchers which show same characteristics are tabulated in the next pages in table No. 2.1, 2.2 and table No. 2.3.
Table No 2.1: Overlapping learning styles (1)

<table>
<thead>
<tr>
<th>Learning style</th>
<th>Pask’s</th>
<th>Gregore’s</th>
<th>Kolb’s</th>
<th>Homey and Mumford’s</th>
<th>4 MAT</th>
<th>Color</th>
<th>Silver and Hanson’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Styles showing same characteristics</td>
<td>Holist</td>
<td>Concrete random</td>
<td>Accommodator</td>
<td>Activist</td>
<td>Type 4 dynamic</td>
<td>Orange</td>
<td>Self-expressive</td>
</tr>
<tr>
<td></td>
<td>Abstract random</td>
<td>Diverger</td>
<td>Reflective</td>
<td>Type 1 Innovative</td>
<td>Blue</td>
<td>Interpersonal</td>
<td></td>
</tr>
<tr>
<td>Serialist</td>
<td>Abstract sequential</td>
<td>Assimilator</td>
<td>Theorist</td>
<td>Type 2 Analytical</td>
<td>Green</td>
<td>Understanding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Concrete sequential</td>
<td>Converger</td>
<td>Pragmatist</td>
<td>Type 3 Common sense</td>
<td>Gold</td>
<td>Mastery</td>
<td></td>
</tr>
</tbody>
</table>
Table No 2.2: Overlapping learning styles (2)

<table>
<thead>
<tr>
<th>Learning style showing same characteristics</th>
<th>VAK</th>
<th>7 Perceptual modes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>Visual</td>
<td></td>
</tr>
<tr>
<td>Auditory</td>
<td>Aurual</td>
<td></td>
</tr>
<tr>
<td>kinesthetic</td>
<td>kinesthetic</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Interactive</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Haptic</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Olfactory</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Print</td>
<td></td>
</tr>
</tbody>
</table>

Table No 2.3: Overlapping learning styles (3)

<table>
<thead>
<tr>
<th>Learning style showing same characteristics</th>
<th>Children’s learning style</th>
<th>Multiple intelligences</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language Oriented</td>
<td>Verbal linguistic</td>
<td></td>
</tr>
<tr>
<td>Logical</td>
<td>Logical mathematical</td>
<td></td>
</tr>
<tr>
<td>kinesthetic</td>
<td>Bodily kinesthetic</td>
<td></td>
</tr>
<tr>
<td>Spatial visual</td>
<td>Spatial</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Musical</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Interpersonal</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Intrapersonal</td>
<td></td>
</tr>
<tr>
<td>--</td>
<td>Naturalist</td>
<td></td>
</tr>
</tbody>
</table>
Apart from these Jungs and Mayer Briggs's extroversion x introversion is similar to Grasha Riechmann's participant x avoidant. Felder & Silverman's sensing x intuitive is similar to Jungs and Mayer show similarity with each other.

While categorizing the learners one must keep in mind that these various learning styles or intelligences are categories that help to discover the different forms of mental representation; they do not tell what people are or are not. In some leaning styles individual differences are also found reflected.

Different learning styles are found classified into different categories but there is no firm system of classification of learning styles. Many researcher studied many learning styles and tried to classify those on their own criteria of classification.

2.1.2 Achievement in science:

In the present research the researcher had to study achievement in relation to learning style and attitude towards learning science, so literature related to achievement studied by the researcher is described here in short.

Achievement is generally defined as the level of success attained by an individual on completion of a task.
The task may include academic, manual, personal or social task.

Academic achievement or scholastic achievement may be defined as attained level of functioning of a student in school task of any subject, measured by marks or grades.

Achievement in science is an attainment in science which can be measured through achievement test in terms of marks or grades.

According to Dandekar, W. N. (1962) "A test of educational achievement is one that is designed to measure knowledge, understanding, or skill in a specific subject or group of subjects, taught in school."

Thorndike and Hagen (1969) observe, "The type of ability test that describes what a person has learned to do is called an achievement test."

According to Micheels and karnes, "an achievement test is an instrument designed to measure relative accomplishment in a specified area of work."

The primary goal of the achievement test is to measure past learning that is, the accumulated knowledge and skills of an individual in a particular field.

There are always some objectives behind any teaching learning process, and it is essential to test whether those objectives are achieved through attempts made or not. This
is generally tested through achievement test; because of that achievement tests are of prime importance in educational field.

Educational institutes use achievement tests in order to - (i) evaluate school's educational program of school and its several components, (ii) help the teacher to plan the work of his class and the grouping of pupils within it, and (iii) provide an understanding of the individual pupils. In addition to these classroom uses, achievement tests are also used for guidance, supervisory administration and research purposes.

2.1.3 Attitude towards learning science:

Attitude is the term about which considerable literature is available in Psychology, Education, Sociology and Political science. Of which some articles are related to the definitions, theory, and nature of attitudes. Some are written about attitude change. Some others report on the relation between attitude and other psychological variables, and some stick to the attitude measurement. Some researchers have studied the influence of attitude upon learning, remembering, perception, thinking and reasoning and the outcome like achievement and memory.

Allport referred to attitude as the most distinctive and indispensable concept in social psychology; and Thurstone asserted that attitude can be measured. These two statements
show that attitude has become an important concept in the field of education.

The term attitude has been defined by many people in many ways. According to Fisher (1977) the concept of attitude has more definitions than any other concept in social psychology.

Allport in 1935, studied definitions of attitude existed at that time and found out set of common features. Those three common features are given below.

i) Readiness for favorable or unfavorable responses,
ii) Which is organized through experience,
iii) Which is activated in the presence of object and situations to which the attitude is related.

According to Fishbein and Ajzen (1975) attitude must show/posses following three features.

i) Attitude is learned,
ii) It predisposes action,
iii) Actions towards the target are consistent (irrespective of favourableness or unfavourableness).

Over a period of many years, now a certain degree of agreement about the nature of attitude has achieved.

In 1981, Anderson tried to understand attitude in relation to element of the affective domain and identified
some common features of attitudes, like emotion, consistency, target, direction and intensity. Of which all affective characteristics possesses emotion and consistency, but only attitude possess all the five features. Likewise all elements of affective domain possess the feature that is ‘attitudes are learned’ and ‘are organized through experience’ so, it does not allow the differentiation of attitudes from other affective characteristics. Only the features ‘target’ ‘direction’ and ‘intensity’ could differentiate attitude from all other affective elements. For example, attitudes are directed toward or away from some common ‘target’ that may often be an abstract idea. Attitudes are favourably or unfavourably ‘directed’ towards or away from some target. Emotional component of the attitude not only differ in their direction but also in their intensity. For example ‘strongly agree’ is more ‘intense’ than only ‘agree’. ‘emotion’ involved feeling and attitude ranges from positive to negative feelings. ‘Consistency’ of an attitude relates to the strength of the one who has feelings toward a particular target in different situations.

Attitude cannot be observed directly, but it can be inferred through what an individual says or does. Now a day various measures are available to measure attitude of an individual towards various objects.
2.2 **Review of the related researches**

In present research the researcher was concerned with achievement in science, with special reference to (1) learning style of the students and (2) attitude of the students towards learning science. There were no researches found resembling with present subject. Some researches which are partly related with the present study were found in surveys in education edited by Buch, M.B. and one Ph. D. thesis was found in the library of education department at Yashvantrao Chavhan Maharashtra Open University, Nasik. Some researches done abroad were found on internet. Except one thesis it was not possible to collect any material through primary source and thus all the researches collected are from the secondary sources. Those few researches are presented into six groups as follows.

(1) Studies related to learning styles, attitude towards learning science and achievement.

(2) Studies related to learning styles.

(3) Studies related to learning styles and achievement.

(4) Studies related to learning styles and attitude towards science.

(5) Studies related to attitude towards learning science.
(6) Studies related to attitude towards learning science and achievement in science.

While presenting the related researches, the researches related to science are presented first, after that, studies related with subjects other than science are given, and in the last researches are given in brief having different objectives but their findings somewhat are related.

Total related researches are grouped into two broad types namely (i) the researches done abroad and (ii) the researches done in India.

2.2.1 Researches abroad

There was not a single research found from abroad which matched with the present study but one study was found which dealt with learning-style-based homework and achievement and attitudes of Middle School students.

(1) **Study related to learning styles, attitude towards learning science and achievement.**

Minotti, Jennifer Lauria. studied on the “Effects of Learning-Style-Based Homework Prescriptions on the Achievement and Attitudes of Middle School Students.”

The objective of the research was to examine the effects of the use of individualized, learning-style based homework prescriptions on the achievement and attitudes of middle level students.
The sample included $6^{th}$, $7^{th}$, and $8^{th}$ grade students from an urban, parochial school in New York City.

All students in the sample were provided either learning-style-based homework prescriptions or guidelines for traditional study strategies.

It was found that each group showed increased levels of achievement in reading, mathematics, science, and social studies and higher attitude-test scores after treatment. However, the students in the experimental group who used individualized learning style based homework prescriptions clearly showed larger gains.

(2) **Studies related to learning styles**

While searching on internet for the researches done on learning styles the researcher found one institute namely 'The Institute for Learning Styles Research' from Maryville, TN 37803. The (ILSR) is a group of researchers, instructors, and individuals interested in the art and science of learning and teaching. The ILSR is dedicated to fostering research and development of learning and teaching, especially for the matching of learning styles knowledge with teaching strategies and techniques.

The abstracts of the related dissertations done in the institutes are given in the next pages.
Cherry, C. E. (1981) conducted a research entitled "The measurement of adult learning styles: Perceptual modality". This study focused on the measurement of individual perception learning styles.

Two individual subject styles measurement systems were used in the study- A revision of Gilley's Multi-Modal Paired Associates Learning Test (MMPALT) and the other was the Perceptual Modality Preference Survey (PMPS) which was developed specifically for the study.

Subjects in this study were 76 males and 20 females adult volunteers, with an age range of 19 through 68 years, and a formal education range of eighth grade to advanced degrees from 31 different states.

In both assessments, patterns for the entire subject population were determined by simple summations of individual subject data. Patterns within various recognizable sub-groups were also established using the summative approach.

The two relevant findings were –

- The most dominant perceptual style found empirically in these adults was the visual; the second most dominant style was the haptic.
- Patterns found in these adult subjects were comparable to those found by Gilley in third grade children; however;
variations apparently influenced by differences in age, experience, maturity, and education did appear.


The study focused on the measurement of individual perceptual learning styles.

Three individual types of measurement processes were used in the study. One- A self report inventory-the Perceptual Modality Preference Survey (PMPS), second, the Multi-Modal Paired Associates Learning Test II (MMPALT II), and third, the Perceptual Style Interview (PSI).

The population included 45 female and 8 male university students ranged in age from 18 to 30.

Patterns for the entire subject population, subgroups, and individuals were computed. Correlations between the rank orders of the PMPS and MMPALT II were obtained.

The study yielded the findings-

• Individual styles varied.

• The most dominant perceptual learning style strength measured was the visual modality; print and interactive were also strong.
• The interactive and kinesthetic modalities were the most dominant preferences.

• Age, gender, and formal education appear to be significant variables related to perceptual learning style.

(iii) Roberts, R. J. (1999) studied "A comparison of perceptual learning styles of successful and unsuccessful high school students in Pasco County, Florida."

The sample included 72 high school juniors at a rural high school in Pasco County, Florida.

The Multi-Modal Paired Associates Learning Test III (MMPALT III) was used as a tool to assess seven individual perceptual modalities.

The research was done in order to answer three research questions: What are the patterns of perceptual modalities of successful and unsuccessful high school students? Are there significant differences in the patterns of perceptual modalities of successful and unsuccessful high school students? Are there perceptual modality differences between successful and unsuccessful high school students based on gender?

A 2 x 2 x 7 Factorial Analysis of Variance revealed no significant interaction or main effects for GPA or gender.
Findings of the study included-

- The rank order of subtest means to be visual, interactive, haptic, aural, kinesthetic, print, and olfactory. This was in contrast to previous MMPALT studies; however, this may be due to differences in versions of the instrument.

- There is no basis, in terms of learning style, to believe that the learning of males surpasses that of females, and vice versa.

- Academic success or lack of success was not found to be a factor in considering learning style.


The purpose of this study was to add to the base of knowledge surrounding the concept of perceptual learning styles.

MMPALT-III and instructional preference and self-efficacy was measured by an instructional preference/self-efficacy survey.

Dental students at a large mid-western university were included in the sample.
The relevant findings were –

- The three dominant perceptual learning styles in this sample were haptic, interactive, and visual which varied from previous studies.

- There appeared some relationship between four of the perceptual learning styles (haptic, kinesthetic, aural, and visual) and the ability to achieve in different educational settings.


This study was aimed to examine possible associations between learning styles of pharmacists.

166 pharmacists were involved in the sample.

The tools used were- Kolb’s Learning Styles Inventory (LSI) and the Pharmacists’ Inventory of Learning Styles (PILS).

In the findings 33.7% of the respondents were identified as Assimilators, 32.5% as Convergers, 21.1% as Divergers and 12.1% as Accommodators.

Results suggested that there was a statistically significant correlation between identified learning style and teaching method preferences as well as years since graduation, while there was no statistically significant correlation between learning styles and gender.
Healey, Mick., Kneale, Pauline., Bradbeer, John.\(^{(14)}\)

conducted research on the title namely “Learning styles among geography undergraduates: an international comparison.”

The study tried to find out whether geographers have a predominant learning style and whether this varies among and within countries.

The sample included 900 geography students from 12 universities in Australia, New Zealand, the UK and the US.

The tool used was - Kolb's Learning Style Inventory (LSI).

The findings discussed on the implications for curriculum design and student learning strategies. It is suggested that departments should aim to produce balanced learners with a full range of learning capacities rather than simply matching teaching to existing learning styles.

Loo, Robert. \(^{(15)}\) carried out research entitled, “Kolb's Learning Styles and Learning Preferences: Is there a linkage?”

A sample of 201 management undergraduates was used to study.

The tools used were i) Kolb's four learning styles and four learning types, ii) 12 different learning preferences.

The relevant finding was – there were found large individual differences in learning preferences within each style and
type, and small differences in learning preference mean scores. Meaning thereby that there were weak linkages between learning styles and learning preferences.

Apart from these all researches the researcher studied abstract of researches done on the Kolb’s Learning Style Inventory. The HayGroup made it available to the researcher on her request. The abstract shows that since 1971 to 1999, 1004 researches were done by using LSI. Of which 430, were from Education, and 101, were from Psychology. The bulk of studies in education were done in higher education. The sample populations used for those studies were from many countries except India. Those included research on the matching of learning style with teaching style, instructional method and curriculum.

After studying related literature and researches about learning style the researcher developed interest in Kolb’s learning style inventory. After searching more for Kolb’s LSI it was decided to use Kolb’s learning style inventory in present study.
(3) **Learning style and achievement**

Kvan, Thomas; Yunyan, Jia. (16) conducted a study on “Students' learning styles and their correlation with performance in architectural design studio.”

The tool used was Kolb's model, for exploring learning styles.

The sample included architectural students in China.

The finding was - a statistically significant correlation was found between learning styles and academic performance, with convergers achieving significantly lower marks in one studio while assimilators succeeded in the other. These results suggest that architectural studio programmes can have disadvantage for students with particular learning styles.

(4) **Learning styles and attitude towards learning science**

(i) Lovelace, Maryann Kiely. (17) carried out a research entitled “Meta-Analysis of Experimental Research Based on the Dunn and Dunn Model.”

The objective was to perform a quantitative synthesis of experimental research conducted between 1980 and 2000, in which the Dunn and Dunn Learning-Style Model (R. Dunn & K. Dunn, 1993, 1999) was used.

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The finding was - on average, learning-styles responsive instruction increased the achievement or improved the attitudes toward learning, or both, of all students.

(ii) **Howard, W. Gary; Ellis, Holly Howard; Rasmussen, Karen.** (18) conducted a study title namely “From the arcade to the classroom capitalizing on students’ sensory rich media preferences in disciplined-based learning.”

Findings of the study were –

- It indicated that significant learning occurred among all class levels of students and for each of the learning styles defined by Kolb's Learning Style Inventory.

- Student attitudes toward the learning experience were universally positive. Providing some learner control with structure seemed to accommodate the needs of varied learning styles in terms of achievement and interest.

(iii) **Dunn, Griggs, Olson, & Beasley, (1995)** (19) conducted Experimental studies between 1980-1990 (based on the Dunn, Dunn and Price Learning Style Model)

Thirty six studies provided a database of 3,181 participants.

Results were synthesized through meta-analysis and the standard normal curve suggested that students whose learning styles were accommodated would be expected to achieve 75% of a standard deviation higher than students who had not their learning styles accommodated. This
finding indicated that matching students' learning-style preferences with educational interventions compatible with those preferences is beneficial to their academic achievement.

(iv) DeBello, 1985; Dunn and many researchers (20) tried to identify the relationship between academic achievement and individual learning style. Their result supported that-

- Students do learn differently from each other.
- Student performance in different subject areas is related to how individuals learn and do.
- When students are taught with approaches and resources that complement their unique learning styles, their achievement is significantly increased.

(5) **Studies related to attitude towards learning science**

No researches were found in this category.

(6) **Attitude towards learning science and achievement**

(i) Elena C. Papanastasiou, and Michalinos Zymbylas (21) studied “Differential effects of science attitudes and science achievement in Australia, Cyprus and the USA”

The results of this study demonstrated the differential effects that science achievement and science attitudes could have on each other, depending on the characteristics of the educational systems within each of country.
Paul J. Germann\textsuperscript{(22)} studied "Development of the attitude toward science in school assessment and its use to investigate the relationship between science achievement and attitude toward science in school"

Attitude toward Science in School Assessment (ATSSA) was used to evaluate attitude.

A low correlation was found between attitude and various achievement tests. A moderate correlation was found between attitude and achievement that included an evaluation of the quality of work, as in a course grade.

2.2.2 Researches in India

Not a single study done in the category (1) learning styles, attitude towards learning science and achievement was found. Hence researches from category (2) are presented below.

(2) \textbf{Studies related to learning styles}

Though cognitive style refers to the way that people use in processing information, and does not include affective preferences and interpersonal and social interactions; the processing of information is important for any learning style, so researches on cognitive styles are included in related researches. The researcher got only two researches related to learning style. One of which was done on the theory, research and instrumentation of students learning style, and
the other was a Ph. D. thesis showing the relation of learning of the students with diverse learning styles and their achievement. It is presented under group of learning style and achievement. Here researches related to learning styles are presented first and then the researches related to cognitive styles are presented.

(i) Raina, M. K. \(^{(23)}\) conducted a study on “Students learning styles: analysis of theory, research and instrumentation.” This study aimed at analyzing and reviewing the theories and issues relating to student learning styles.

Objective was to study the theories and issues relating to student learning styles, including environmental, emotional, sociological, psychological, and physiological elements which relate to learning styles.

Methodology: An analysis of the literature available in India and abroad was made to provide answers to the questions raised above.

Major findings:

Various models of learning style as identified by Dunn, Dunn and Price, Jung’s psychological types and the matching of cognitive styles in relation to psychological types, cognitive styles perspective, Gregore’s phenomenological perspectives, four MAT System of
learning styles, holist and serialist styles, etc., were discussed.

Review of learning styles and corresponding brain behavior was strengthened with emphasis on information processing strategies. A comprehensive research perspective in the areas of learning style along with suggestions on possible areas of further research has been provided.

Details of various instruments for-

Cognitive style measures (Edmond’s Learning Style Identification Exercise, the Group Embedded Test, Gregore’s Style Delineator, Letter’s Cognitive Profile),

Affective Style Measures (the Paragraph Completion Measure, Gresha-Riechmann Student Learning Style Scale),

Psychological Style Measures (Dunn, Dunn and Price Inventory, Learning Style Profiles),

Comprehensive Measure (Briggs and Myers Type Indicator Joseph Hill Procedure, Dunn Inventory, NASSP Inventory), and

Miscellaneous Variables (Learning Style Inventory, Style of Learning and Thinking Inventory) had been discussed.

Comparison of four learning styles instruments along with research evidence was provided.
Finally, some issues, unresolved problems, and possible applications of learning style theory, research and development have been suggested.

(ii) **Dani, D.N. (1984)** carried out research on “Scientific attitude and cognitive styles of higher secondary students.”

Scientific attitude is different from attitude towards learning science; even though the researcher included the research in related researches because, its finding tells something about gender difference in cognitive style and field dependence of science students, which is related to present topic.

Out of the five objectives of the study, one relevant objective was- to compare the scientific attitude and cognitive styles of boys and girls from village, town, and city pupils, science, arts, and commerce students.

505 students out of 1265 selected randomly were included in the sample.

Tools used were scientific attitude study (SAS) constructed by the investigator and Group embedded figure tests by Ottman, Raskin, and Witkin.

Combination of the normative, correlational and comparative study method was used for work.
The findings of the study were-

- Boys and girls did not differ in their cognitive styles.
- Science students possessed higher field dependence ability than the arts and commerce students.

(3) Learning style and achievement:

As researches mentioned earlier, here also the research related to learning styles and achievement is given first and then the researches related to cognitive styles and achievement are presented.

(i) Mahale, S. R. (2001). Conducted “A study of the effect of self teaching material based on advance organizer model and inductive thinking model on the learning of students with diverse learning styles.” (The original thesis was in Marathi.)

The objectives of the study were- to study of the effect with reference to teaching and supporting through diversified self teaching material based on teaching models. And study of the effect in relation to teaching and supporting resulted through the self teaching material and diversified teaching styles along with their interaction with selected models.

Quasi-experimental only post-test design was followed for study.

Sample was selected randomly from Yashawantrao Chavan Maharashtra Open University’s B. Ed. Students.
The tools used were Honey-Mumford’s learning style inventory, content free thinking and emotion response scale, content test, and natural effect scale.

The data were treated with two-way ANOVA unequal mean, chi-square, and ‘t’ tests.

The finding of the study was - the achievement of the students having diversified learning styles was similar.

(ii) **Panda, N.** (1985). carried out a research on “Effect of cognitive style and adjunct question on learning from connected discourse.”

Though the objectives of the study were not directly relevant to present study, its findings were somewhat related, hence this reference is included here.

Two types of samples were selected. First sample was of 60 students belonging to class VII of Vani Vihar High School, Bhuvaneshwar, and the second was of 90 students from another class of std.VII of Bhuvaneshwar.

Two tools used were revised version of Group Embedded (hidden figure) test of Gardener-et-al and tests of English, social studied and general science.

Statistical techniques used were not mentioned in that study.
Some findings of the study were-

- Field independent students learn and retain prose significantly more than field dependent students.

- Field independent students proved to be significantly superior to field dependent students in processing and comprehending scientific textual materials, at all levels of questions and at both the retention tests.

(iii) Paul, S. (1986).[^27] conducted “A study of the cognitive styles of high school students of Home science in relation to age, achievement, home environment and social class.”

Actually the above mentioned research is related with cognitive style and not with the learning style, but as the findings show the relation between way of learning and achievement in one of the branches of science that is home-science; it is included in related researches.

There were ten objectives of the study but the only one objective was relevant to present study; and that was- ‘to study the relationship between cognitive style scales and their achievement in home science.’

The sample consisted of 600 girls of home science of high school classes from nine intermediate colleges of Agra city.

The tools used were - an achievement test for home science, a social class scale, a home environment inventory and cognitive preference style scale.
The data were analyzed with the help of correlation, factor analysis, and analysis of variance technique.

One of the findings was- girls in general expressed preferences for a questioning mode of cognitive functioning in higher mental functions. Further, high achievement went with questioning and low achievement with recall modes.

Hereafter researches showing relation of cognitive styles and academic achievement are given.

(iv) De, B. (1985). (28) conducted a study on “Cognitive style and cognitive ability of tribal and non-tribal school pupils.”

Out of three objectives none is apparently matching with present study, but one of the findings is related, so the study is included here.

Male and female students of age 12-14 from high school including 160 tribal students and 80 non-tribal students were selected in sample.

Tools used for the study were - Witkin’s embedded figure test, and the tool used to test achievement was not mentioned.

Out of five findings the related one was- cognitive style was found to be associated with academic achievement.

(v) Shrivastava, Priyambada (1992). (29) carried out a research titled “Cognitive style in relation to educational interest, learning style and academic achievement.”
Objective of the study was; 'To study the relationship between cognitive styles, educational interest, learning style and academic achievement.

The sample of 600 students studying in class X in different higher secondary schools of Raipur City was selected randomly.

Tools used in the study were, Group Embedded Figure Test (GEFT) by Oltman, Ruskin and Witkin, Educational Interest Record by Kulshrestha, Hindi adaptation of Inventory of Learning Processes (ILP) by Schmeek, Ribich and Ramnaiah, and scores obtained in the last Board Examinations at Grade X.

Mean, SD, two way ANOVA and Cochran’s test were used to treat the data.

Major findings were-

• Subjects showing high interest in science and fine arts tended to be more field independent (FI) than those showing low interest.

• Students with high interest in agriculture, commerce, humanities, home science and technology did not show any significant difference in their FD-I cognitive style.

• Students with high deep processing learning style tended to be more FI than with low deep processing. • More students achieving high in literature, mathematics,
science, social studies and on overall achievement displayed FI cognitive style than those achieving low.

(4) **Learning styles and attitude towards science**

(i) Saxena, A. K. (1985). \(^{(30)}\) carried a research on “Attitude towards physics and cognitive preference style among different groups of science students.”

The researcher did not get any research showing relation between attitude towards general science and learning style. The above mentioned title is of physics; but as science is a branch of science the findings can be applicable to science to considerable extent, so the study is included here.

Out of the five objectives four relevant objectives were - (i) to develop a physics cognitive scale test (PCPST) and attitude towards physics scale (ATPS). (ii) To access cognitive preferences styles of different groups of science students of both sex studying in classes X and XI of central schools and schools of Rajastan. (iii) To access the students’ attitudes to physics. (iv) To study the relationship between attitudes and cognitive preference styles.

The 2X2X2 factorial design was used to study.

The sample comprised 1076 students.

The tools used were (i) physics cognitive scale test (PCPST) and (ii) attitude towards physics scale (ATPS).
'Recall', 'Principles', 'Questioning', and 'Application', were the dimensions of the physics cognitive preference styles test whereas 'enthusiasm in physics learning', 'views on physics as a process', 'views on physics on learning' and 'attitude towards physicists' were the dimensions of ATPS.

The findings were-

- The cognitive preference style of the entire sample was found to be R→P→A→Q with maximum preference for 'Recall' and minimum for 'Questioning.'

- Male and female students were found to have R→A→P→Q and R→P→A→Q preferences respectively.

- The science students of all the eight groups were found to possess a favorable attitude toward physics.

- The correlation coefficients between attitude towards physics scores and respective R, P, A, and Q scores were found to be 0.58, 0.102, -0.25 and 0.005 respectively.

(5) **Attitude towards learning science**

(i) Sharma, Munishwar Kumar. (1990). [(31)](31) carried out a research titled "A study of scientific literacy, attitudes towards science and personality traits of students and teachers."
Out of the three objectives of the study the related one was- ‘to study attitudes to science of different groups of students and teachers.’

The study sample comprised science students and science teachers.

Three tools were used in the study, of which the relevant one was ‘attitude to science scale.’

The collected data was treated with ANOVA.

The findings were-

- The total sample had favorable attitude towards science.
- There was effect of type of school and sex on attitude towards science.

(ii) Malviya, Dharma Shila.(1991).\(^{32}\) carried out “A study of attitude towards science and interest in science of school going adolescents.”

Out of five objectives of study one objective was relevant that was- to develop an instrument to measure students’ and teachers’ attitude towards science.

The sample of the study comprised 193 teachers and 820 students of class X from five division of Madhya Pradesh were selected through stratified random selection method.
Attitude scale (Likert method summated rating scale five point) and interest inventory by Raghu Raj Pal Singh were the tools used to collect the data.

Collected data were calculated with mean, mode, median, 't' test, one-tail analysis of variance and correlation.

The relevant findings were-

- A positive attitude towards science was observed among all the six group of the students.
- Attitude towards science differed in respect to sex in early ages.
- Sex had no effect on the attitude towards science in the later years.
- Age, sex, profession and socio-economic status had no effect on attitude towards science.

(iii) Sood, J. K. (1974). carried out “A study of attitudes towards science and scientist among various groups of students and teachers in India.”

One of the four objectives was- to construct an attitude scale so as to measure the differences of attitude towards science and scientists between male and female students and teachers.
The sample comprised 1000 students and teachers. The students were selected from high socio-economic strata and from seven English medium schools of Delhi and Rajasthan.

The tools used were- an attitude scale, the test on understanding science Form W (developed by Cooley and Klopfer), the socio-economic status scale questionnaire (SESSQ) developed by Jalota, Pandy, Kapoor and Singh, were the tools of research. Also the marks in annual examination were used as data.

The findings were-

- The sample reflected positive attitude towards science and scientists which was significantly related to understanding of science.

- The sex difference was not significantly related to attitude towards science and scientists.

(6) **Attitude towards learning science and achievement**

The researcher tried to search the researches showing relation between attitude towards learning science and achievement in science.

(i) **Darchingpui, (1989).**

(34) conducted “A study of science achievement, science attitude and problem solving ability among secondary school students in Aizawal.”

Out of the three objectives two related objectives were- To study the science achievement, attitude towards science and
problem-solving ability of high school students. And to find the interrelationship of science achievement, attitude towards science vis-a-vis problem solving ability.

The study sample comprised 812 students of class IX selected randomly.

The tools used for data collection were- the science test developed by the investigator, the science attitude scale developed by Grewal and problem-solving ability test developed by the investigator.

Statistical technique used for study was not mentioned.

The two relevant findings were –

- The study indicated significant relationships between scores on science attitude and achievement in science.
- Significant sex differences in achievement in science and problem solving ability existed.


Objective of that study was ‘to access the relationship between attitude and achievement in general science of class IX students.’

The sample of the study comprised 700 students studying in class X, 74 science teachers from 10 high schools of Cuttack
City and some science experts, professors, educationists, and headmasters of the schools, who were selected through random stratified sampling method.

The tools used to collect the data were a questionnaire, interview schedule, achievement tests in science and attitude scale.

The collected data were analyzed statistically using measures of central tendency, variability, and correlation coefficient.

The findings of that research were –

- The distribution of the attitude score was negatively skewed.
- Boys were found to be more favorably disposed towards science than girls.
- There was positive relationship between attitude and achievement.

(iii) Rup Prakash (1968).^{36} carried out a research titled "Construction and standardization of an achievement test in everyday science for class VIII students of the Punjab and to construct a scale at assess the attitude of the students towards learning of science."

Objectives of the study were as presented on the next page.

To construct and standardize an achievement test in every science for class VIII standard in the Punjab.
To construct a scale to assess the attitude of students towards learning science.

The study sample comprised 1,380 examinees.

Tools used in the study were, an achievement test in everyday science and the attitude scale to assess the attitude of students towards learning science.

The percentage norms and Z scores were computed.

The findings were-

- The achievement in science and pupils' attitude towards learning of science was positively related.

- Girls scored higher than the boys in science.

(iv) Manav, R. N. (1981). Conducted "A study of attitudes, self concept and values of professional and nonprofessional college students and relationship of these variables with the achievement."

Out of the six objectives of the study one was relevant to present study that was- to ascertain the relationship of attitudes, self concept and values with achievement of professional college students.

Sample consisted of 890 students selected through the simple random technique.
Data were collected through Bhatnagar’s self concept inventory and Shanta’s Meri Manyatayen and attitude inventory

Hypotheses were tested by applying ‘t’ test and chi square.

The related finding was- there was no relationship between students’ attitude and achievement.

Diwan, Denesh Kumar. (1991). (38) carried out a research named “A study of academic achievement of student-teachers in terms of aptitude, attitude, participation and human values.”

Though this research is not directly related with present work, it is included in related researches; as its findings give some idea about the relation between attitude and achievement, and gender difference in achievement.

There were four objectives of the study of which only two were relevant to present study are presented here. One was to determine the relationship between the academic achievement and the student-teachers’ aptitude, attitude, participation, cooperation, tolerance and their entry level. And the other was to compare the academic achievement of male and female student-teachers.

It was a normative survey.

400 student-teachers were used as the sample of the study.
The tools used included Personal Information Blank, Teaching Aptitude Test of Jai Prakash and R.P. Srivastava, Teaching Attitude Inventory of S.P. Ahluwalia, and Human Value Test constructed by the investigator.

The relevant findings were-

- Academic achievement of student-teachers was related to teaching aptitude, attitude, co-operation, dedication, nationalism, scientific outlook, tolerance and entry level.

- Female student-teachers were found significantly higher in comparison to male student-teachers in all eleven variables, Viz. academic achievement in total, theory and practical, aptitude, attitude, co-operation, dedication, nationalism, scientific outlook, tolerance and entry level.

2.3 Summary

Out of the 31 studies, 20 studies were done in India and 11 studies were done abroad. Area-wise researches carried out abroad and in India are tabulated in table No. 2.4 on the next page. And researchers and learning styles used by them for their studies are tabulated after that in table No. 2.5. This tabulation helps the reader in seeing all the researches at a glance.
Table No. 2.4: Area-wise researches carried abroad and in India

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Areas of research</th>
<th>Researches done abroad</th>
<th>Researches done in India</th>
<th>Total researches done in area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Learning styles, attitude towards learning science and achievement</td>
<td>1</td>
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<td>1</td>
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<tr>
<td>2</td>
<td>Learning styles</td>
<td>7</td>
<td>2</td>
<td>9</td>
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<td>3</td>
<td>Learning styles and achievement</td>
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<td>7</td>
<td>8</td>
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<tr>
<td>4</td>
<td>Learning styles and attitude towards science</td>
<td>2</td>
<td>1</td>
<td>3</td>
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<td></td>
<td>Total researches done on learning styles</td>
<td></td>
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<td>21</td>
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<td>5</td>
<td>Attitude towards learning science</td>
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<td>3</td>
<td>3</td>
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<tr>
<td>6</td>
<td>Attitude towards learning science and achievement in science</td>
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<td>7</td>
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<td></td>
<td>Total researches done on attitude</td>
<td></td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>
Table No. 2.5: Researchers and learning styles used

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Name of the researchers</th>
<th>The tools used in study</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Raina, M. K.</td>
<td>Edmond’s Learning Style Identification Exercise, The Group Embedded Test, Gregore’s Style Delineator, Letter’s Cognitive Profile, Gresha-Riechmann Student Learning Style Scale, Dunn, Dunn and Price Inventory, Learning Style Profiles, Briggs and Myers Type Indicator Joseph Hill Procedure, Dunn Inventory, NASSP Inventory, Learning Style Inventory and Style of Learning and Thinking Inventory.</td>
</tr>
<tr>
<td>2</td>
<td>Dani, D.N.</td>
<td>Group embedded figure tests by Ottman, Raskin, and Witkin</td>
</tr>
<tr>
<td>3</td>
<td>Shrivastava, Priyambada</td>
<td>Group embedded figure tests by Ottman, Raskin, and Witkin</td>
</tr>
<tr>
<td>4</td>
<td>De, B.</td>
<td>Witkin’s embedded figure test</td>
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<td>5</td>
<td>Panda, N.</td>
<td>Revised version of Group Embedded (hidden figure) test of Gardener-et-al.</td>
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<td>6</td>
<td>Mahale, S. R.</td>
<td>Honey-Mumford’s learning style inventory</td>
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<td>7</td>
<td>Paul, S.</td>
<td>Cognitive preference style scale</td>
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<td>8</td>
<td>Saxena, A. K.</td>
<td>Physics cognitive scale test</td>
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<tr>
<td>Sr. No.</td>
<td>Name of the researchers</td>
<td>The tools used in study</td>
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<td>9</td>
<td>Cherry, C. E.</td>
<td>A revision of Gilley’s Multi-Modal Paired Associates Learning Test</td>
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<td>Schaiper, L.</td>
<td>The Multi-Modal Paired Associates Learning Test II &amp; the Perceptual Style Interview (PSI)</td>
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<td>Roberts, R. J.</td>
<td>The Multi-Modal Paired Associates Learning Test III</td>
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<td>The Multi-Modal Paired Associates Learning Test III</td>
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<td>Loo, Robert.</td>
<td>Kolb’s four learning styles and four learning types</td>
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<td>Healey, Mick;</td>
<td>Kolb’s Learning Style Inventory</td>
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<td>Kvan, Thomas;</td>
<td>Kolb’s model, for exploring learning styles</td>
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<td>Yunyan, Jia.</td>
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<td>Rasmussen, Karen.</td>
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<td>18</td>
<td>Lovelace, Maryann Kiely.</td>
<td>Dunn and Dunn Learning-Style Model</td>
</tr>
<tr>
<td>19</td>
<td>DeBello, Dunn and others</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>20</td>
<td>Dunn, Griggs, Olson, &amp; Beasley</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>21</td>
<td>Minotti, Jennifer Lauria</td>
<td>Not mentioned</td>
</tr>
</tbody>
</table>
Only 21 researches are mentioned in the table showing ‘researchers and learning styles used’ remaining 10 researches were related to attitude.

Out of 21 researchers, 4 researchers had used Group Embedded Figure test. Other 4 had used Multi-Modal Paired Associates Learning Test, and 5 had used Kolb’s Learning Style Inventory. Dunn and Dunn Learning-Style Model, Physics cognitive scale test, Cognitive preference style scale, Honey-Mumford’s learning style inventory used by four distinct researchers. Three researchers had not mentioned the style used in their study. While, Raina, M. K. used and studied 12 different learning styles in one study.

From the studies done on learning styles it was evident that-

(i) When taught according to learning styles achievement increases.

(ii) Students opted for science showed different styles than those opted for arts or commerce

(iii) Field dependent style proved significantly superior to field independent in science related learning.

(iv) Boys and girls did not differ in their cognitive styles.

(v) Achievement of the students having diversified learning style was similar.

(vi) There were dominant learning styles observed in the sample.
After studying the researches about attitude it was found that very few researchers used previously available attitude scale, most of them had prepared their own attitude scale according to the requirement of study.

From the studies done on attitude towards science it was concluded that-

(i) Most of the students were found to possess a favourable attitude towards science.

(ii) There was found contradictory findings about the effect of sex on attitude towards science and on achievement.

(iii) Distribution of attitude scores was negatively skewed.

(iv) Some contradictory findings about relationship between attitude and achievement were found.

The samples used in previously conducted researches occupied varied range. In 32.25 % studies students from secondary and higher secondary schools were used as sample. Equal proportion of studies was conducted on college/university students. In 12.9 % studies sample was not mentioned. 9.37 % studies carried out on 6th to 8th std. 6.45 % studies included student-teachers as their samples. Adults were used as sample in 3.22 % studies, and in the same proportion teachers and students were also used as sample.
From the studied researches not a single research was found which was exactly similar to the present research, even though this review helped the researcher a lot. Study of related literature and researches provided insight in the subject and helped the researcher to know the previous work carried out in the subject by many researchers. It also helped in delimiting and defining the problem in better way and in deciding the direction and line of action for her own research.

The study of all the related research reports show that, this sort of work has not been carried out previously. It suggests that and there is need to study on such topic. With this background the research plan was developed by the researcher which is presented in the next chapter.
2.4 References


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