CHAPTER I - INTRODUCTION

Psychology is a discipline that deals with the most dynamic area in the ocean of knowledge which is human behaviour. The gamut of psychology covers all diverse areas touched by human walk of life, thus has a wide scope in its realm. Psychology of human behaviour has in focus a wide range of topics in trying to understand and delve on various facets that also include in trying to understand what make humans unique form other species ("The Importance of Psychology", 2016). Humans are endowed with the faculty of thought that involves abstract thinking, reasoning, conceptualising, analysing etc., among which individual differences are widely prevalent; thereby making it more dynamic (Buss & Hawley, 2011). An integral feature of human thought that makes it unique is the manner in which information are acquired in a human being’s life. This acquisition of new information is the aspect of cognition called as learning (Surgenor, 2016).

Learning refers to the acquisition of new data or information. Learning is undoubtedly an integral process of any cognitive ability (Gibson, 2016). The concept of learning is held of great importance across different fields of science, philosophy. The purview of learning mainly falls under the discipline of psychology. In psychology, there are various perspectives, orientations, theories that have sprung up in an attempt to define and conceptualise learning. However, one widely accepted definition is by Atkinson (1993) who regards learning as a relatively permanent change in behaviour, which includes both observable activity and internal processes such as thinking, attitudes and emotions,. Thus, learning is considered as:

- relatively permanent change in behaviour
- not just a visible but also a manifest responses of the learner
- Modifying the learner’s behaviour.
- Being dependent on previously acquired experience.

The procedure of learning is central to the appropriate and effective normal functioning of human beings. One of the main things that make human beings different from other animals is the ability to learn very complex behaviours and apply the different learned concepts to create new concepts (Science, 2011). Learning is acquired due to the prior experience one has gained. A child may learn from his/her environment consciously or unconsciously, and in the process, his/her behaviour is being modified either negatively or positively (Roschelle, 2016).

An important context where learning is of utmost relevance is in the field of education. Education in its ideal sense refers to any act or experience that has a formative effect on the mind, character or physical ability of an individual. However, in its technical sense, education is the process by which society deliberately transmits its accumulated knowledge, skills and values from one generation to another. (Rather, 2004). The etymology of the word education is derived from educare (Latin) which is related to the terms educere and ducere that is to "bring out", "bring forth what is within", "bring out potential" and ducere, "to lead" (Etymonlinecom, 2016).

Education in simple language is nothing but a learning experience. However, the learning that occurs in education is by and large a deliberate and a pre-designed programme with the purpose of affecting certain pre-determined behavioural and cognitive changes in an individual. The main objective of education is to initiate and nurture the cognitive, societal, moral, scholastic development of an individual and
through this, at the societal level; education aims at creating a civilized, cultured society and fosters the betterment of the society’s moral, ethical, values, and higher economic, technical standards. Education thus has a direct concurrence with the trends in the society at a larger level. In this context, education and culture go hand in hand (Rather, 2004).

Culture is the sum total of the accumulated experiences and achievements of previous generations inherited by succeeding generations as members of society (Linton, 1936). The structured process of passing on this collective pool of experiences and achievements may be called education. Hence education is not only a means of passing on cultural beliefs and ideas, but it is also shaped by cultural beliefs since it is a product of culture. The system of education thus changes along with changes in culture (Culture reflects education and education reflects culture TZM Education", 2016).

**Education in India:**

The organised system of education in Indian history was followed by religious educational institutions in India prior to the advent of British rule. India being one of the oldest civilisations in the world; has a very old heritage and culture; in whose history knowledge was given a prime value. (Mookerji, 2011). Mookerji (2011) in his book “Ancient Indian education Brahmanical and Buddhist” had given a detailed account of the contributions of Indian indigenous thought towards the educational theory and practice across different timelines. In any society’s history; it can be traced that it was Religion that practically dominated every sphere of its national life including social, political as well as economic principles. (Scharfe, 2002). So also in
India, the system that was ensued was the one based on the Hindu religious literature imparted through the Vedas; hence called as the Vedic system of education. (Jayapalan, 2000). Thus, it was the Hindu religious institution that gave ancient India its laws, social life and regulations towards economic activities. As mentioned before, the parsing of the societal law, standards and ideals across generations in every culture is the original ideal of education. So as in the Indian evolution of education, the Hindu thought influenced the course of education in the society in ancient times. (Mookerji, 2011). They were predominantly carried out by Hindu residential schools called as Gurukulas. Gurukuls were traditional Hindu residential schools of learning; typically the teacher's house or a monastery; where education was free and knowledge across religious scriptures, philosophy, law, literature and so on.

Nevertheless, educational institutions specialised for Islamic learning were also prevalent in ancient India prior to the British system of education; called as Madarases (Sikand Y, 2004). These institutions aimed at the training of a class of experts in Islamic law (Ulema), who would go on to staff the bureaucracy of the state as judges (qazis) and mufis as well as administrators. The syllabus employed at these madrasas, represented a blend of naqli ‘ulum (revealed sciences), including the Quran, the hadith, fiqh (Islamic jurisprudence) and tafsir (Quranic commentary), on the one hand, and the agli ‘ulum (rational sciences), including Arabic language, grammar, logic, rhetoric, philosophy, astronomy, medicine, physics and mathematics, on the other. In medieval times, the madrasas served as the only available centres of formal education for Muslims. The syllabus employed at the Indian madrasas went through a process of gradual transformation over time, corresponding with the changing needs of the state. (Khan M.S 1999 as ct in Sikand, 2004) With the
establishment of British rule, several modifications occurred in these centres of education; with the system of education setup by the British gaining more attention and gradual decline in the importance and role played by the Madrasas. (Sikand)

Buddhist Education was also prevalent in ancient India with an aim to perpetuate wisdom and knowledge among all classes of people (Maheshwari V.K, 2009). All education, sacred as well as secular was in the hands of the monks. The curriculum of the monks included what are termed Suttanta, Dhamma and Vinaya, together with Suttas and Sutta-Vibhanga. Education in the Buddhist age was predominantly characterized by the oral tradition. Buddha identified three domains of learning namely, pariyatti (theoretical foundation of dhamma), patipatti (practice of the Dhamma through inquiry, investigation and self- experience) and pativedha (the realization of Insight Wisdom) (Mookerji, 2011). Further even in the current times, the Buddhist system lays paramount stress upon the method of debate and discussion in education.

Thus, across the Indian society, predominantly, education was furthered by religious institutions through their respective methods. Modern education system was set in by British rulers.. In 1835, Lord Macauley introduced modern education in India. It was the introduction of Wood’s dispatch of 1854, known as "Magna Carta of Indian education" that laid the foundation of present system of education and changed the state of affairs. The main intention of it was to train local human resources to use for clerical works for running local administration. (Basu, n.d.) The traditional Indian system of education gradually declined from the mainstream due to the lack of official support. English was the official language among the masses of educated
Indians. With traditional occupations becoming obsolete and popularity of modern education and government run jobs made this modern British-implemented system of education as the mainstream education. (Basu).

Despite the increasing dominance of the British system of education, there are few integral institutions propagating the respective religious thoughts. In the present context, these institutions also have recognised the need for offering basic principles of the modern education.

Thus, amongst the different religious institutions; today two kinds are being regenerated. 1. Purely conventional schools teaching only the religious texts, and 2. Conventional schools with a few additional modern elements. (Though their main focus is ancient shastras like Vedanta, Yoga, Nyaya, Vaisheshika and so on along with the Vedas, they also have a little of modern science like computers and physics. (Rangan R et al, 2008). The second kind is considered as ancient system of education in the present study.

The modern system of education in the present study refers to the system of education followed in Modern India post the changes implemented after the British system was set up.

Currently in India, There are various boards of schools in India, namely Central Board for Secondary Education (CBSE), Council for the Indian School Certificate Examinations (CISCE), Madrasa Boards of various states, Matriculation Boards of various states, State Boards of various boards, Anglo Indian Board, and so on. Generally, the syllabi followed across the boards include Languages, Mathematics, Science including Physics, Chemistry, Biology, Geography, History, General
Knowledge, Information Technology / Computer Science etc. And also includes extracurricular activities consisting of physical education / sports and cultural activities like music, choreography, painting, theatre / drama and so on (Sudha Rani.K, Ananda.T, & Krishnaveni.M, 2012).

The present education system as elucidated above is the mainstream formal system of education followed across India. Though the system of education in India is catering to a large mass and has in general been credited for numerous innovations and human excellences in wide areas; there are some ideals of education that are not achieved in its true sense and have been under the eye of criticism for various reasons. One major criticism in the aspect of learning has been for its over-emphasis on rote learning.

Zachariah (1993) believes that memorisation strategies are very common among Indian undergraduate students and also cautions against over-generalising the same; as there are exceptions to this. He argues that, some weeks prior to the examination, a typical student "begins to read the textbooks and memorize from guidebooks ready-made answers to essay or other type questions asked in several previous public examinations". Zachariah also asserts that because exam papers contain substantial amounts of choice, students can estimate the probability of a particular question or a similar one reappearing and focus their revision accordingly.

Basu (1989) has quoted that on independence, India "inherited a system of education where ... the method of teaching was authoritarian and did not encourage students to think for themselves", but argues that the extent to which such approaches to teaching have persisted varies substantially within the higher education system. Thus, in
general some authors, such as Zachariah (1993) believe that passing examinations is the principal focus of many Indian undergraduate students. Other studies believe that in general Indian undergraduates are not encouraged to think independently. (Ninnes, Aitchison, & Kalos, 1999) Learning and teaching processes involving only rote, reproductive, and surface approaches, and lacking a critical and analytical approach is a major characteristic of the Indian education system. (Ballard, 1989; Ballard & Clanchy, 1984, 1991, 1997 However, the present study is not just limited to the undergraduate system of education; it is found to be widely prevalent at all levels including primary, secondary and higher secondary levels of education. (National Center on Education and the Economy, 2005)

Hence, an analysis of learning in the context of education should consider learning beyond just rote or memorisation. Moreover, learning as a cognitive ability involves several dynamics and underlying processes that influence every other cognitive ability. (Schutz, n.d.)

Several theories describe and analyse and the myriad processes involved in human learning. Some of the prominent ones include Gagne's Nine Events of Instruction, Ausubel’s idea of meaningful learning, Felder-Silverman Learning and Teaching Styles Model in Engineering Education, Jerome Bruner’s modes of representation theory and so on (Cassidy, 2004). These models have often advocated the relevant components of learning which include comprehension, application and use of learnt information than just recollection of facts. (Jordan, Carlile, & Stack, 2008)

Another popular theory of human learning specially suited in the context of education is the Blooms Taxonomy. Empirical studies have validated the relevance of the

Hence, in the present study, Blooms Taxonomy - The Revised edition forms the essential framework of operationally analysing and comparing learning between the two schooling systems.

**Blooms taxonomy:**

In 1956, Dr Benjamin S Bloom formulated the Taxonomy of Educational Objectives: The classification of Educational Goals with the purpose of objectively verifying students’ learning outcomes and that was representative of various forms and levels of learning. (Bloom, 1956). This theory was published as Bloom's Taxonomy of Educational Objectives and comprised of the accompanying three areas:

The Cognitive Domain – information based, comprising of six levels, encompassing scholarly or thinking abilities such as Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation

The Affective Domain – attitudinal-based area, comprising of five levels, enveloping attitudes and qualities namely Receiving phenomena, Responding to phenomena, Valuing, Organisation and Internalising values.

The Psychomotor Domain – aptitudes based area, comprising of five levels, incorporating physical aptitudes or the execution of activities which include Imitation, Manipulation, Precision, Articulation and Naturalization. (Dave R.H, Armstrong,R.J, 1970)
It is to be noted that the third area that is the "psychomotor" domain of the Bloom's taxonomy has gained a lot of subsequent academic attention; which Bloom initially recognized in an expansive sense; however which he never did detailed work. This was because Bloom and his colleagues felt that the scholarly environment did not have enough scope for mastery to break down and make an appropriate dependable structure for the physical capacity "Psychomotor" area. (Ferris & Aziz, 2005).

However, several other contributors attempted to fill in the details such as Anderson, Krathwhol, Masia, Simpson, Harrow and Dave (these last three having each developed versions of the third 'Psychomotor' domain). Amongst them, the Dave version is gained more prominence for its relevance in lifelong development compared to others. (Ferris & Aziz, 2005).

Each of these three areas comprises of a multi-layered, progressive structure for arranging learning across increasing levels of difficulty. In this various levelled structure, every level of learning is an essential for the following level, i.e., authority of a given level of learning requires dominance of the past levels.

However, among the three domains, the Cognitive domain of the Bloom's Taxonomy has received more focus compared to the affective and psychomotor domains in developing goals and objectives of educational assessment (IACBE, 2014).

The original Taxonomy provided carefully developed definitions for each of the six major categories in the cognitive domain. The categories were Knowledge, Comprehension, Application, Analysis, Synthesis, and Evaluation. With the exception of Application, each of these was broken into subcategories. The categories were ordered from simple to complex and from concrete to abstract. Further, it was
assumed that the original Taxonomy represented a cumulative hierarchy; that is, mastery of each simpler category was prerequisite to mastery of the next more complex one. (Krathwohl, 2002)

Nevertheless; later new researches had generated new information about how learning occurs and also with teaching methods. This also had led to changes in the measurement of achievement. Thus, in order to integrate the changes in the education scenario that had happened in the past four decades, a team of scholars led by David Krathwohl and Lorin Anderson. (Krathwohl.D, &Anderson.L., 2001) took up the task in revising and enhancing the taxonomy. In order to refocus the educators’ attention on the value of the original taxonomy and make it more aligned with the changed instructional and assessment standards in the schools, they revised and published their work in 2002 as “A Revision of Bloom's Taxonomy: An Overview” (Krathwohl, 2002).

**Revised Blooms Taxonomy:**

The revised Blooms taxonomy underwent some significant changes including making the taxonomy two-dimensional; identifying both the kind of knowledge to be learned (knowledge dimension) and the kind of learning expected from learners (cognitive processes) to help the educators to improve the connection between the learning process and measuring learning outcomes in the classroom (Krathwohl, 2002).

There were some changes in the terminology as well as the definitions put forth in the revised taxonomy as against the original taxonomy. A brief description of the same is given below:
The original taxonomy by Bloom enmeshed both the noun and verb aspects in the Knowledge dimension; and was specified in the sub-categories of the dimension. The verb angle was incorporated in the definition of Knowledge in which the learner was expected to have the capacity to recollect as well as identify knowledge or information. This made the Knowledge dimension dualistic in nature unlike the other categories of the Bloom’s taxonomy. To correct for this incongruity, the revised taxonomy classified the Knowledge dimension into two separate aspects – wherein the noun aspect made the basis for the knowledge dimension and the verb aspect was made as a framework for the cognitive process dimension. (Krathwohl).

**The Knowledge dimension**

The new revised Knowledge dimension was similar to the Original in terms of being relevant to different subject matters; however it was categorised into four main categories.

1. **Factual knowledge** – The fundamental concepts that students must know to be familiar with the discipline; including knowledge of terminology, specific details and elements.

2. **Conceptual Knowledge** – the knowledge of interconnections among the basic concepts including the knowledge of classifications, basic principles, theories and models so as to understand their role within a larger construct and how they function together.

3. **Procedural knowledge** – the knowledge of how to do something, methods, techniques, algorithms and criteria required in determining the use of appropriate skills or procedures.
4. The fourth category was a new addition to the original taxonomy; **Metacognitive Knowledge.** Metacognitive knowledge refers to the knowledge and awareness of one’s own cognition (Pintrich, 2002) including appropriate contextual, conditional and strategic knowledge. (Krathwohl)

**The Cognitive Process dimension**

Similar to the original taxonomy the numbers of categories were retained to be six; but some important changes were incorporated. The categories were reworded into their gerund forms. For instance; Application was reworded as Apply so as to emphasis the process” involved in learning. (Krathwohl). The verb aspect of the original Knowledge category was kept as the first of the six major categories, but was renamed **Remember.** Comprehension was renamed as **Understand.** Application, Analysis, and Evaluation were retained, but in their verb forms as **Apply, Analyze, and Evaluate.** Synthesis replaced the category of Evaluation in the original taxonomy and was renamed as **Create.**

A short description of the six cognitive process dimensions is as follows:

1. **Remember** – refers to retrieving relevant information from the long term memory including both recognising as well as recalling.

2. **Understand** – refers to determining the meaning of oral, written and graphic messages; including interpreting, exemplifying, classifying, summarising, inferring, comparing and explaining the same.

3. **Apply** – refers to the process of carrying out or executing a procedure in a given situation and implementing it.
4. **Analyze** – refers to the breaking down of a material into its constituent parts and the ability to identify their inert-relationships with one another and also with the overall structure. This includes differentiating, organizing and attributing.

5. **Evaluate** – refers to making judgements, checking and critiquing based on given criteria or standards.

6. **Create** – refers to the process of putting different elements together to generate, plan or produce a coherent whole or make a novel product.

Like the original taxonomy, the revised taxonomy also orders the dimensions in a hierarchical sense – implying that the lower levels are less complex than the higher levels. Be that as it may, it is noteworthy that the revised taxonomy allows some amount of relaxation in the categories to overlap one another as it emphasises more on the usability and application of this model for teachers in assessing learning outcomes (Krathwohl, 2002).

Thus in the present study, learning is analysed in terms of the revised Blooms taxonomy.

Studies have also shown that the process of learning from the learners’ perspective is also influenced by the learning style adopted by the learner. (Sarasin, 1999; Csapo & Hayen, 2006; Sims, R. R. & Sims, S. J., 1995).

**Learning styles:**

In the field of psychology, various theories and perspectives are propounded in the quest towards human learning- in trying to understand the aspects and processes required to optimise learning amongst students (Mbaegbu, 2012).
According to Reiff (1992), as et in (Mbaegbu, 2012) during the early 20th century, psychologists like Ausubel, Bruner, and others were examining on the method to increase learning capacity. It was then observed that different learners were using different processing and cognitive strategies in assimilating the information. Further, researches showed that not only the cognitive styles used were different; but also the affective and kinaesthetic approaches were different (Mbaegbu, 2012).

This highlighted the concept of learning styles in the field of education as well as psychology. A popular definition of learning styled is given by Keefe and Languise (1983), the task force committee of National Association of Secondary School Principals (NASSP), who defined it as “the composite of characteristics of cognitive, affective and physiological factors that serve as relatively stable indicators of how a learner perceives, interacts with and responds to the learning environment. It is demonstrated in that pattern of behaviour and performance by which an individual approaches educational experiences. Its basis lies in the structure of neural organization and personality which both moulds and is moulded by human development and the learning experience of the home, the school and the society.” (as ct in Mbaegbu, 2012).

Because of its diversity in its nature and the great amount of individual variations amongst the learners themselves, different perspectives and models have come up to offer explanations of the same. Some of them are Dunn’s Model, Kolb’s Model, Anthony Gregorc's model, Sudbury model of democratic education, Fleming's VAK/VARK model and so on. (Cassisy, 2004)
One of the most common and widely-used categorizations of the various types of learning styles is Fleming's VARK model (sometimes called as VAK) developed by Neil Fleming (2006)

1. Visual learners;
2. Auditory learners;
3. Reading/writing-preference learners;
4. Kinaesthetic learners or tactile learners

Fleming claimed that visual learners have a preference for seeing (think in pictures; visual aids such as overhead slides, diagrams, handouts, etc.). Auditory learners best learn through listening (lectures, discussions, tapes, etc.). Tactile/kinaesthetic learners prefer to learn via experience—moving, touching, and doing (active exploration of the world; science projects; experiments, etc.). Its use in pedagogy allows teachers to prepare classes that address each of these areas. Students can also use the model to identify their preferred learning style and maximize their educational experience by focusing on what benefits them the most (Fleming).

Furthermore, some aspects that are also related to the preference for learning models as claimed by Fleming (2006) are:

- Modal preferences influence individuals’ overall behaviours, including learning
- These modes of preferences are not fixed, but they are mostly stable
- Both students as well as teachers can suitably identify and give examples based on their preferred modality
• Using matched learning strategies based on individual’s preferences is helpful as there are strategies better suited for some modes than others and thus information is better understood and can be motivating

• Using matched learning strategies with preferred modalities also helps in persistence, improved depth of learning and an active and effective metacognition

Fleming suggested the use of VARK tool as a means of gaining insight on the above aspects so as to aid both the student as well as the teacher in achieving optimal learning (Fleming, 2006).

Fleming’s VARK model has been adopted in the present study in order to measure learning preferences of the students.

Further, it is noted that ideally, to achieve optimal learning; it not just using varied learning strategies but also in teaching or pedagogy that teachers should try to make changes in their classroom that will be beneficial to every learning style. (Dunn & Dunn, 1978) Researches have shown that in India too, there is growing diversity and reforms in the structure of the classrooms, and strategies are available to cater to this diversity. Teachers are expected to use different strategies to cater to the diverse needs of the students. The concept of differentiated instruction helps in integrating the teacher – learner styles (Thakur, 2014).

**Differentiated Instruction:**

Differentiated instruction is an organising framework used in teaching and learning which necessitated an overall restructuring of the classroom situation and in the
curriculum so as to bring out great benefits in terms of effective teaching and learning. It is defined as “a philosophy of teaching that is based on the premise that students learn best when their teachers accommodate the difference in readiness levels, interests and learning profiles” (Tomlinson, 2004 as ct in Thakur, 2014). The objective of differentiated instruction is to maximise each student’s growth and individual success by catering to each student’s style and in assisting their overall learning process (Thakur).

Differentiated instruction proposes to enable students from a wide range of low to gifted intellectual abilities and receive appropriate education in an inclusive classroom environment. The principles of practicing DI (Differentiated Instruction) are articulated as follows (Logan, 2011 as ct in Thakur):

1. Every child can learn.
2. All children have the right to high quality education.
3. Progress for all will be expected, recognized and rewarded.
4. Learners in a classroom have common needs, distinct needs, and individual needs.

According to Tomlinson (2001) there are 6 components or underpinnings for effective differentiated instruction namely: Student interest, Assessment, lesson planning, content, process and product.

In a nutshell, for effective implementation of DI, its developers suggest that teachers need to modify curriculum and instruction by selecting and organizing content on the basis of learning objectives, choosing instructional approaches for its effective
transaction, designing learning activities and assessments according to students’ interests, learning styles and readiness levels. (Thakur)

Furthermore, the objective of the present study was to compare learning (operationally defined in terms of the revised blooms taxonomy) across the two different schooling systems. In order to compare learning across a common platform, after a qualitative study using an interview of subject experts of different religious institutions, disciplines for which both the ancient as well as modern system of schooling prevails were chosen. In this direction; the disciplines of mathematics and Sanskrit grammar are chosen that have both ancient alternative techniques of study and are studied under the modern regular curricular educational system as well.

**Sanskrit grammar:-**

Sanskrit is often considered to be highly respected language, a classical language that has a repertoire of Indian heritage and culture it has been subjected to serious study by indologists everywhere; owing to the rich literature and data available in Sanskrit (Swamy, n.d.).

Patel A .L (2013) gives an account of the major methods of teaching Sanskrit that have been in vogue:

1. The logical method

The Logical method or also called the Paathshaala method is considered to be the oldest of that has been in vogue since times immemorial. The medium of instruction in the pathshala method is not always Sanskrit although at the higher stages of specialization the medium of not only teaching but even of communication is Sanskrit.
2. The Adult method

This method is also called as the Bhandarkar method which mostly involves teaching through and writing books; specially suited for children and less suited for children.

3. Technique of vocational guidance

This method basically involves adopting the teaching method to suit the majority of pupils. The stress on grammatical is substantially less and focus is on the ability to recognize and use forms that are found in their textbooks.

4. The psychological method

The new method aims at making things easily comprehensible to pupils principally by adapting the teaching to their mental calibre and to their instinctive interests because this method is adapted to the common pupils. In this method some stories, dialogues of descriptions appealing to the pupil are introduced in the textbooks to relieve monotony. In this method asking pupils to translate sentences in to Sanskrit for providing them opportunities to use their newly acquired knowledge some more interesting means are used for the same purpose. Sometimes readymade sentences are provided to them with some gaps left in them. Pupils are asked to fill in these gaps by one of the forms provided to them. That enables them to distinguish between the uses of those forms and tests their gaps of the matter newly taught. Sometimes wrong sentences are provided and pupils are asked to correct the sentences. The new method aims at creating a Sanskrit atmosphere in the class. Conversation is to be the means of study and not the aim. Intelligent understanding of Sanskrit must be emphasized. Use of mother tongue is advised in teaching grammar, in explaining abstract ideas.

5. Direct method
This method emphasizes the oral way of teaching the language which is quite in accordance with the principle of teaching a language as mother tongue is learnt. The fundamental thinking is that language is essentially speech. The method develop learners' ability to think and to express their idea and feeling; with its emphasis on speech. It helps learners to use their passive vocabulary change in to active vocabulary.

**Mathematics:**

Mathematics as a subject has the largest history of more than 5000 years developed in isolation in the beginning of different cultures-later exchanged the ideas somehow till the emergence of modern era and what is observed today is the synthesis of concepts of ancient, medieval and, of course, later modern periods in its major share (Mishra V, 2011).

Mishra (2011) gives an account of the evolution of mathematics in India and the corresponding changes with the changes in the education system.

In Indian subcontinent, mathematics thrived under the banner of Hindu astronomy in the early centuries and after the emergence of *Jaina* philosophy in about 300 B.C., Indian mathematics evolved in interaction each other. The concept of permutation and combination, infinity among others are of course some of the notable contributions of the Jaina sects.

A major part of the body of mathematical knowledge from the Vedic period that has come down to us is from the *Sulvasutras*. The *Sulvasutras* are compositions aimed at providing instruction on the principles involved and procedures of construction of the
vedis (altars) and agnis (replaces) for the performance of the yajnas, which were a key feature of the Vedic culture. The replaces were constructed in a variety of shapes such as falcons, tortoise, chariot wheels, circular trough with a handle, pyre, etc (depending on the context and purpose of the particular yajna) with sizes of the order of 20 to 25 feet in length and width, and there is a component of the Sulvasutras describing the setting up of such platforms with tiles of moderate sizes, of simple shapes like squares, triangles, and occasionally special ones like pentagons. Many of the vedis involved, especially for the yajnas for special occasions had dimensions of the order of 50 to 100 feet, and making the overall plan involved being able to draw perpendiculars in that setting. The Sulvasutras like other Vedic knowledge were transmitted only orally over a long period.

Apart from the Sulvasutras, mathematical studies have also been carried out in respect of the Vedas, mainly concerning understanding of the numbers. For example, the Rig-Veda shows considerable preoccupation with numbers, with numbers up to 10,000 occurring, and the decimal representation of numbers is seen to be rooted there; The Yajurveda introduces names for powers of 10 up to 1000 and various simple properties of numbers are seen to be involved in various contexts. There is scope for further work in understanding the development as a whole; this would involve familiarity with mathematics on the one hand and knowledge of Vedic Sanskrit on the other hand (Plokker, 2008 as ct in Dani, n.d.).

Another source of mathematical tradition in India is from the mathematical astronomy tradition - The mathematical astronomy tradition has been the dominant stream of mathematics in India, with an essentially continuous tradition that
flourished for close to a thousand years, starting from about the third or fourth
centuries.

Other major contributions to the field of mathematics also comes from laureates and
grammarians like *Panini* who used mathematical formula in contrasting a basis of a
strong grammar fro Sanskrit language, *Pingala* in his use of *chandas shastra*.

Thus, mathematics a discipline is not new to Indian education system. As mentioned
before it was being taught in the Gurukulas using the above mentioned reference
models which were a part of the Vedic education. (Mishra)

However, after the implementation of the British system of education; there were
changes in the syllabi and the content taught in the field of mathematics as in other
disciplines. While mathematics was seen to be an essential part of any curriculum
from early on, perspectives differed. The Zakir Husain committee in 1937 saw it in
relation to work. The National Policy on Education in 1986 saw it as a “vehicle to
train a child to think, reason, analyze and to articulate logically.” Nevertheless, in
response to global curricular processes in India too there has been considerable
curricular acceleration in school Mathematics. (Mishra) For instance, calculus which
was only taught in college three decades ago is taught now at the higher secondary
level. On the other hand projective geometry has almost entirely disappeared from
the school. At the undergraduate level, the core curriculum remains much the same,
though the influence of computer science and other modern disciplines can be seen.
(Ramanujam, n.d.) However, the shape of mathematics education has remained
largely the same over the last 50 years (NCCE, 2004). Therefore, a comparison of
learning of mathematics across the ancient and modern schooling systems could
throw more light on the factors that could foster better learning and application of the learnt knowledge across other disciplines of study and in life.

In the purview of the theoretical background as elucidated; in the present study, learning is compared between the two schooling systems and additionally attempts to examine the role of the other relevant variables of learning and its influence on the same is examined based on an exploratory study paradigm.

**Need for the study**

A brief survey of the various researches and articles about the dynamics of education in the present day of India is no doubt being conducted with far reaching success with an objective to cater to the mass. With continuous reforms in the society, law and technology, education and teaching is undergoing radical changes day by day with an aim to be at par in the global front (Brinkmann, 2015). Hence, advances in technology and science across all fields – even in the field of education are no doubt taking place at a promising pace and is showing improvements. However, in this quest to update and advance education; the true ideal of education – that is to have a formative effect in bringing out a holistically equipped individual – is not being met. In addition, the main ideal of education – setting aside the holistic development – is to bring out a learned / skilled individual to cater to the society’s varied needs. Additionally, issues with the present day system in terms of lack of efficient work force, issues in the gaps between the knowledge acquired and the knowledge required, overload of syllabus content forcing shortcut methods of success in examinations, the very definition of “success” in examinations being restricted to marks/ grades than skilful/meaningful learning are some of the challenges that have
been bothering the academia in recent times. These issues being cyclic in nature require a dire attention at some level and some reform to bring about a gradual change in the coming times.

Any reform in any society should always consider that particular society’s unique, indigenous cultural background and history – is a well known fact. This perspective is found to be ignored in the present times. The age old system of education that was prevailing in India before the imposition of the western system is now looked up to as a probable alternate. In the ancient Indian context, perpetuation of knowledge was rested with the traditional religious institutions called as Gurukulas. It is imperative that the mass of knowledge that was being transmitted across centuries of human existence was done infallibly, and only through the oral tradition. This suggests that the methods of memorisation and the learning methods that were ensued to do the same were efficient in various ways. Moreover, the system of learning was not just restricted to the transmission of information but was multi-faceted. Also, the scope of knowledge that was taught was not limited to religious texts but was spread across a wide genre including applied subjects. Thus, this system of education is no doubt a time-tested one and the ranges of disciplines learnt were not one-dimensional by nature. The system of evaluation also was not limited to any marking/grading system but on introspection, pragmatic learning that is advocated by modern thinkers of education. Therefore education of those times was catering to the actual higher levels of learning in line with the objectives of learning outlined by modern theorists on human learning (Mookerji, 2011).

This basic assertion has been the initiation for research in the present study – that is to compare and empirically find out the differences in different levels of learning.
Researches available in the field of comparative education — specifically the gurukula/ancient/vedic and the modern system are very few, and those that are available are done on specific cognitive aspects or values, personality or are theoretical by nature. There is a paucity of empirical studies comparing the learning process — in the context of education across the two systems. Further eminent scholars in the field of ancient Indian education like Saran (1954) have attempted to theoretically explore the possibility of reinstating the gurukula system of education in India. Also, more recently, Mookerji RK (2011) have stated that the ancient ideals of education have to be adapted to modern conditions, without any doubt.

The present study is a strict academic endeavour in this direction. Taking into account the various factors that are inherently different between the prevalent ancient and modern schooling systems; an attempt is made to draw a scientific, empirical analysis of the factors that could cause and that could explain for the difference, if any, found in the learning processes between the schooling systems.

Learning, by itself is a complex multidimensional term to define. In this research, learning is operationally defined in terms of the revised blooms taxonomy that describes learning as a hierarchical organisation of multiple levels as against just recall as per the rote method which is found to be more in vogue in the current system of education. Therefore the revised blooms taxonomy of educational objectives is the model of learning on which both the systems are tested.

Learning and education goes hand in hand; education is integral in excelling human functioning and by and large in furthering better social standards of any nation. The findings of the study are expected to contribute valuable insights to the domains of
learning and education; drawing insights form the time-tested ancient Indian tradition.