CHAPTER-II

REVIEW OF RELATED LITERATURE

2.1.0 INTRODUCTION

Research is a systematic attempt to obtain answers to meaningful questions about phenomena or events through the application of scientific procedures. It can never be undertaken in isolation of the work that has already been done on the problem, which is directly or indirectly related to the study proposed by the researcher. Moreover, a competent professional must keep himself constantly abreast of the latest discoveries in his own area of knowledge. Therefore, review of related literature is an important part of the scientific approach and is carried out in all areas of scientific research whether in physical, natural or social sciences. "The review of related literature involves the systematic identification, location and analysis of documents containing information related to the research problem." According to Borg, "The literature in any field forms the foundation upon which all future work will be built. If we fail to build the foundation of knowledge provided by the review of literature our work is likely to be shallow and naive and will often duplicate work that has already been done better by someone else."

The researcher takes the advantage of knowledge that has been accumulated in the past as the result of human endeavour. A careful review of the research journals, books, dissertations, thesis, government documents, Internet and other sources of information on the problem to be investigated becomes one of the important steps in the planning of any research study after the researcher has chosen the problem. Thus, literature in any field forms the basis and foundation upon which all future work must be built. Very often the insight gained through the review saves the researcher's time in conducting his/her research.

2.2.0 SIGNIFICANCE OF REVIEW OF RELATED LITERATURE

The review of literature aims to describe the "state of play" in the area selected for study. An effective literature review represents a "distillation" of the essential issues and inter-relationships associated with the knowledge, arguments, theories etc. Already explored in any particular area. According to Turney and Robb (1971) "the identification of a problem, entire development of a research design and determination of size and scope of the study and intensity with which a researcher has examined the literature related to intended research depends on the review of earlier studies done on likely or related topics."

The review of the related literature is considered essential for many reasons. It helps to identify the unanswered questions in the concerned fields on the one hand and in locating the specific issues, which require immediate and pinpointed attention by the investigator on the other. Such an exercise enables the researcher to avoid unnecessary duplication of effort and focusing on the relevant aspects of the issue under reference. "Citing studies that show substantial agreement and those that seem to present conflicting conclusions helps to sharpen and define understanding of existing knowledge in the problem area, provides a background for the research project, and makes the reader aware of the issue." The review of related literature involves the systematic identification, location and analysis of documents containing information related to the research problem and serves various research purposes as:

1. Defines the limits of the field and helps to delimit the problem
2. Avoids unfruitful and useless problem areas
3. Avoids unintentional duplication of well-established findings
4. Provides insight into the various statistical methods through which validity of results is to be established
5. Helps to know about the recommendations of the previous researchers
6. Provide various ideas, theories, explanations and hypotheses valuable in formulating the problem
7. Locating comparative data useful for the interpretation of results and
8. Contributes to general scholarship of the investigator.

2.3.0 STUDY RELATED TO LEARNING PROGRESSION

Learning progressions are one of the most important assessment design ideas to be introduced in the past decade. The importance of their use in other countries, such as Australia and the Netherlands, reflects their fundamental characteristic, which is a much closer linkage between assessment and instruction than is true for typical large-scale assessment programs. In the United States, several committees of the National Research

Council (NRC) have argued for the use of learning progressions as a means to foster both deeper mastery of subject-matter content and higher-level reasoning abilities.

Consideration of learning progressions is especially important in the context of the new Common Core State Standards (CCSS) and Next Generation Science Standards (NGSS) that attend specifically to the sequencing of topics and skills across grades to ensure attainment of college and career expectations by the end of high school. Given the centrality of the CCSS and NGSS for current educational reforms, and the emphasis in these documents on the sequential deepening of content mastery and skill development over time, the question arises: Should more formally developed learning progressions be considered for the future design of the National Assessment of Educational Progress (NAEP)? In this paper, we provide a brief overview of the research on learning progressions and explain the combination of expert knowledge and empirical fieldwork needed to develop and test instructionally grounded learning progressions. We describe the idealized model whereby shared, instructionally grounded learning progressions—once developed—could be used to link classroom-level assessments with large-scale assessments such as NAEP. At the same time, we also consider potential problems. In particular, learning progressions—which require agreed-upon instructional sequences—could be problematic in the context of a national assessment program intended to be curriculum neutral (i.e., not favoring one state's or district's curriculum over another). Due to the potential appeal of learning progressions as a way to illuminate the substantive meaning of achievement results, in this report we consider the possibility of constructing "quasi learning progressions" as a reporting device. We call them quasi progressions because they are developed after the fact, rather than being jointly constructed and field tested as a continuum of instructional and assessment tasks.

Clements and Sarama (2007a) used this extensive program of research to develop the Building Blocks curriculum and computer software to support learning in both early numeracy and geometry. The impact on student learning of carefully designed interventions tailored to specific levels of learning progressions was documented in a comparative study conducted in preschool programs serving low-income families (Clements & Sarama, 2007b). Within stat funded preschool and Head Start school sites, classrooms were assigned to treatment or control groups. Control classrooms continued to receive the existing preschool curriculum. Participants were assessed at the beginning and end of the school year using individual interview protocols designed to cover the same topics as the curriculum but without mirroring the instructional activities. The statistical and practical significance of the effects was dramatic. For the Number and Geometry outcome measures, the effect-size differences between the treatment and control groups at the time of the post assessment were .85 and 1.47, respectively. Similar effects were also obtained for differential gains from pre- to post-assessment for the treatment group compared with the control group. The fact that instructional supports targeted to each level of the progressions were so effective provides additional evidence as to the validity of the progressions. Clements and Sarama (2009) describe their progressions as developmental progressions,meaning that they represent natural sequences that are affected by biology. They use the example of infants and children first learning to crawl, then walk, then run, skip, and jump. Although biological readiness may also affect the order of skill development in mathematics and other early learning, Clements and Sarama (2009) emphasize that development may be fast or slow depending on learning opportunities. Many decades ago psychologists believed that development proceeded at a fixed pace and could not be hurried. On the contrary, contemporary learning research has demonstrated that learning affects and interacts with development—hence the interest in instructional moves specifically targeted to developmental stages. Virtually all researchers studying learning progressions recognize that development is strongly affected by learning opportunities and specific instructional contexts. As noted by Masters and Forster (1996), a learning progression is "NOT a description of 'natural' sequences of development only. A progress map is the result both of 'natural' sequences of student development and common conventions for the content and delivery of curricula, and may be elucidated by systematic research into student learning" (p. 11). In addition to guiding instructional interventions, other potential benefits of learning progressions are more directly applicable to large-scale assessment applications.

Mosher (2011) noted that LPs can provide evidence to the education system on what is reasonable to expect from most students, which may not only inform standards, but can also facilitate discussion of what kinds of resources and instruction are realistic to help most of them meet higher standards.

However, Foster and Wiser (2012) clearly described the challenges in using LPs to inform standards, citing the standards revision process undertaken by the Massachusetts Department of Education in 2009. For example, one key challenge was establishing the upper anchor because there was tension between aspirational statements regarding what students should know at certain points in time and empirical evidence showing what students can realistically master in those timeframes.As LPs represent hypotheses about the instruction and experiences that should effectively enable students' conceptual development, they can be used as a framework for curriculum development by helping curriculum developers understand when, and in what order and intensity, specific content and skills should be taught (Corcoran et al., 2009). In addition, student misconceptions can be linked to specific curricular activities enabling teachers to probe student understanding and address those misconceptions.

Alonzo et al. (2012) provided other cautions in implementing an LP-based approach to large-scale assessment systems, citing key conceptual and procedural differences in item development, item analysis and evaluation, the design of operational assessments, and scoring and reporting. For example, large-scale assessment items are typically developed using pre-determined specifications. Conversely, an LP-based approach to item development requires an iterative proces whereby items are developed and pilot tested, and data are used to refine both the items and the LP itself. In addition, large-scale assessments typically have broad content coverage and items are developed to adequately cover the content domain. In contrast, LP-based assessments require overrepresenting specific or discrete content areas to get adequate measurement for each achievement level on the LP.LPs provide great potential as the basis of formative assessment and instruction. Heritage (2008) promoted LPs for their promise in supporting and enhancing teachers' formative assessment by enabling them to focus on important learning goals and see connections between those goals. Compared to formative and interim assessments used by teachers today, assessments based on LPs could provide information that is more easily interpreted and allows teachers to make better informed and more precise decisions about student needs and appropriate instructional responses(Corcoran et al., 2009). For an LP to be useful for teachers, it should be linked to appropriate assessment tasks that reveal students' reasoning along the progression, and it should also be linked to instructional tasks specifically designed to address students' learning needs at various locations on the LP (Battista, 2011). Classroom teachers need LPs at a relatively fine grain size in order to evaluate and respond to questions and ideas raised in classroom discussion or on assessments, but not too fine a grain size to become overwhelmed with the number of levels of achievement to understand and address.

The method and approach taken to develop an LP is based on certain epistemological assumptions, or a theory of how students learn. Duschl and colleagues (2011) distinguished between "evolutionary" and "validation" LP models, according to the underlying theory of conceptual change. Validation LPs are based on a misconception or "fix it" view of conceptual change (p. 156) and typically have upper anchors that represent scientifically or mathematically correct understanding. Evolutionary LPs are based on an intuition or productive misconception-based "work with it" view of conceptual change (p. 156) and have lower anchors reflecting learners' personal perspectives and views, as well as intermediate levels that used to help students "bolster meaning making and reasoning" (p. 157).LPs can be developed using one of two different approaches. LPs developed with a top-down approach, or the "curriculum and instruction" road (Shavelson & Kurpius, 2012, p. 17), are based on domain expert sequencing or curriculum aligned sequencing of domain topics, content, and knowledge and often result in a single or linear pathway that experts expect student learning to follow. This approach is aligned with Duschl and colleagues' (2011) validation LP perspective. Conversely, the bottom-up approach, or the "learning and cognition" road (Shavelson & Kurpius, 2012, p. 19) begins with a psychological analysis of the cognition underlying the content domain. It focuses on structuring and sequencing domain content based on research about how students' thinking changes as they gain increasing sophistication. The bottom-up approach, consistent with the evolutionary LP perspective, sometimes identifies multiple pathways that student's thinking may take as their sophistication increases. LPs developed using a bottom-up approach are generally supported by the research literature on how students learn in a domain, while this support may or may not be present for LPs developed using a top-down approach.

Julia Svoboda Gouvea, in her study, "*Recent Progress in Learning Progressions Research*" found that, learning progressions (LPs) are hypothetical models that describe how learning in a domain may unfold over time. Over the past decade, LPs have grown in popularity. At the same time, there have been advances in LP research. In this instalment of Current Insights, I bring together three recent articles that examine the validity and utility of LPs as models to guide research and instruction. In this instalment of Current Insights, I bring together three articles that capture some of the recent progress in LP research. The first article, by Jin and colleagues, presents a conceptual framework outlining the validity considerations that arise as researchers develop, evaluate, and ultimately attempt to use LPs in instructional contexts. The second and third articles offer extended treatments of one or more considerations of LP validity and use. Sikorski questions the validity of assumptions that underlie how sophistication is defined during initial LP development. Alonzo and Elby explore the intersection of LP evaluation and use, arguing that despite their limited empirical validity, LPs may still be useful for instructors.

J, Shin, N., Stevens, S. Y., & Short, H. (2009) *Using Learning Progressions to Inform the Design of Coherent Science Curriculum Materials*. Paper presented at the Annual Meeting of the American Education Research Association, San Diego, CA. Science standards and pre-packaged curricula often focus on numerous disconnected topics that are treated with equal priority. Topics that receive broad coverage with little integration provide a fragile foundation for integrated knowledge growth. In order to support integrated understanding in science, coherent curricula should be developed to emphasize not only the learning of individual topics, but also the connections between ideas and across topics and disciplines, and how these ideas develop over time. Empirically tested learning progressions should be fully articulated for curriculum developers to use as a ready-made artifact in developing coherent curricula. Well-developed coherent curriculum materials should be designed, implemented, and tested for the development of empirically tested learning progressions as well. In this paper, we discuss the requirements needed for learning progressions to inform the development of coherent curricula over the span of K-12 science education based on our experience and what we have learned from the literature. We report how these requirements are used to develop learning progressions and a coherent curriculum. We conclude by stating major challenges for the development of a coherent curriculum based on LPs.

Mohan, L., Chen, J., Anderson, C. W. *Developing a Multi-year Learning Progression for Carbon Cycling in Socio-Ecological Systems.* This study reports on our steps toward achieving a conceptually coherent and empirically validated learning progression for carbon cycling in socio-ecological systems. It describes an iterative process of designing and analysing assessment and interview data from students in upper elementary through high school. The product of our development process—the learning progression itself—is a story about how learners from upper elementary grades through high school develop understanding in an important and complex domain: biogeochemical processes that transform carbon in socio-ecological systems at multiple scales. These processes: (a) generate organic carbon (photosynthesis), (b) transform organic carbon (biosynthesis, digestion, food webs, carbon sequestration), and (c) oxidize organic carbon (cellular respiration, combustion). The primary cause of global climate change is the current worldwide imbalance among these processes. We identified Levels of Achievement, which described patterns in the way students made progress toward more sophisticated reasoning about these processes. Younger learners perceived a world where events occurred at a macroscopic scale and carbon sources, such as foods and fuels, were treated as enablers of life processes and combustion rather than sources of matter transformed by those processes. Students at the transitional levels—levels 2 and 3—traced matter in terms of materials changed by hidden mechanisms (level 2) or changed by chemical processes (level 3). More advanced students (level 4) used chemical models to trace matter through hierarchically organized systems that connected organisms and inanimate matter. Although level 4 reasoning is consistent with current national standards, few high school students reasoned this way consistently. We discuss further plans for conceptual and empirical validation of the learning progression.

Paul D. Nichols(2012) Learning progressions describe in words and examples what it means to move over time toward more expert understanding. Learning progressions depict successively more sophisticated ways of thinking about an idea that might reasonably follow one another as students learn. Learning progressions have

been referred to by many different names, including progress variables, learning trajectories, progressions of developmental competence, and profile strands. Learning progressions should be developed around the big ideas of a domain. These big ideas are the coherent foundation for the concepts, theories, principles, and explanatory schemes for phenomena in a discipline. In science, organizing principles would include evolution and kinetic molecular theory. Ideally, learning progressions should be based on research about how competence develops in the domain. Using research on children's learning, learning progressions can be identified that trace the path that children might follow as instruction helps them move from naïve ideas to more sophisticated understanding.

2.4.0 CONCLUSION

After reviewing the related literature, the investigator found that a number of studies have conducted in abroad on the learning progression and its impact on secondary education. In Indian context majority of the researcher conduct study on the less related topic to learning progression in-school education. Many of the researchers conducted research on effects of different teaching method indirectly emphasises learning progression. Researcher also found that, there is no research conducted related to the topic in India yet and a research gap has been found. Realising the current scenario researcher decided to conduct this research.