CHAPTER- I

INTRODUCTION

1.0.0 INTRODUCTION

Educational policymakers around the world are recognizing that students need a broad range of skills such as communication, collaboration, and problem solving in order to thrive in the future. However, what this means in practice is not clear. Revising curricula to include these skills does not address lack of understanding of the nature of the skills or how to teach the skills.

A first step is to understand how these transferable skills develop. The concept of learning progressions addresses this step. Learning progressions describe how the skills might be demonstrated, both in their early forms and in increasingly advanced forms. It is critical for teachers to be able to identify the behaviours that relate to these skills if they are to intervene at the appropriate levels of challenge. This means that teachers need to have access to descriptions of how skills progress over time so that they can design classroom tasks that are within the zone of proximal development for their students. In this way, teachers can scaffold the learning of their students.

By its very nature, learning involves progression," stated Margaret Heritage in a 2008 paper written for the Council of Chief State School Officers (CCSSO). Much learning tends to follow an expected path—or progression—where more complex skills are built on foundational skills. For example, gross motor development in the early years tends to follow a typical trajectory. First, children learn to sit on their own, then crawl, then stand, then take some steps before taking off and running. Not all children will do this of course—some may go from sitting to standing without crawling in between! Also, not all learning develops in a nice predictable linear pathway—sometimes a separate, but inter-related area of learning needs to act as a trigger for us in our current learning. Notwithstanding, in many areas of learning, such as science, we have been able to use knowledge of learning paths in traditional academic learning to structure curricula. And here is the rub. We don't know a great deal about the "typical" development of many of these 21st century skills in which society is currently interested. Much less is known about how 21st century skills progress from basic forms to complex forms than we know about literacy or numeracy. Therefore, we don't currently have the roadmaps for guiding teachers in what might be expected of students at different levels of skill, and how they might move students from one level to the next.

Although we develop many transferable skills naturally as we mature, the views of global organizations and employer groups are that many of our school graduates have not developed these sufficiently to contribute in a changing and dynamic world. Education systems now need to deliberately design a new teaching approach to ensure that not only the skills are modelled in the classroom, but that there is also an opportunity to provide more explicit teaching of these. We need to move beyond stating, "We want students to be good collaborators or good problem solvers" to asking, "What do we mean when we say collaboration or problem solving? What does that look like? How should we expect students to develop and change over time?" Learning progressions are typically categorized and organized by subject area, such as mathematics or science, and they map out a specific sequence of knowledge and skills that students are expected to learn as they progress through their education. There are two main characteristics of learning progressions: (1) the standards described at each level are intended to address the specific learning needs and abilities of students at a particular stage of their intellectual, emotional, social, and physical development, and (2) the standards reflect clearly articulated sequences—i.e., the learning expectations for each level build upon previous expectations while preparing students for more challenging concepts and more sophisticated coursework at the next level. The basic idea is to make sure that students are learning age-appropriate material (knowledge and skills that are neither too advanced nor too rudimentary), and that teachers are sequencing learning effectively and avoiding the inadvertent repetition of material that was taught in earlier grades.

1.1.0 CONCEPT OF LEARNING PROGRESSION

Learning progressions are sometimes referred to as learning continua or developmental progressions. Although standards and curricula are often prioritized in educational documentation, it is the progress toward the standards and meeting curricular goals that is important. This "progress" can be seen as a roadmap which supports instructional planning. Because curricula are typically written in discrete topics and for discrete year levels, it can provide the illusion that these comprise very separate sets of knowledge or skills. In fact, these topics need to be linked, with broad connections. Heritage refers to "sequence", "continuity", and "coherence" as implicit in the notion of learning progression. It is not sufficient for a teacher to know only the curriculum being taught in her grade—she must understand what the students learned before, and what they will need to engage with after—in order to ensure deep learning. Learning progressions can describe the sequence of learning in a domain over many years for "big ideas"; or just a term's work with a greater degree of specificity.

Progressions have been developed based on drawing data from multiple sources. A scientific approach would include developing a set of hypotheses about how an area of expertise develops, followed by collection of data to identify the degree of fit of evidence to the theory. In reality, many progressions have emerged from a more historical approach, due to common knowledge about learning sequences. With 21st century skills, we lack the latter and there are limited resources available for the former.

In this blog series, we will see some current examples of how learning progressions are being used from early childhood settings, to secondary education, and to global metrics. We need to apply some of the learnings from these applications to support our educators to address demands for change in education goals. Learning progressions, progress maps, developmental continuums, and learning trajectories are all terms that have been used in the literature over the past decade. While many variations on the definition exist, the concept generally refers to research-based, descriptive continuums of how students develop and demonstrate deeper, broader, and more sophisticated understanding over time.

A learning progression can visually and verbally articulate a hypothesis about how learning will typically move toward increased understanding for most students. There is currently a growing body of knowledge surrounding their purposes and use, as well as ongoing research in identifying and empirically validating content-specific learning progressions (Hess, 2010).

A conceptual view of learning progressions is one of overlapping learning zones along a continuum of learning. At the lower end of the progression are "novice" performers (at any grade level), who may (or may not) demonstrate the necessary prerequisite skills or understanding that is needed to be successful (e.g., essential skills/concepts that can be built upon over time). At the other end of the continuum are "expert" performers. Learning progressions descriptors help to "unpack" how learning might unfold for most students over time, moving from novice to expert performance (Hess, 2008).

Formative assessment is often mentioned in conjunction with learning progressions as well-designed interim assessments can "uncover thinking to show how student understanding is developing along the continuum of learning/learning progression." proponents of the Lp approach display a minimal engagement with previous theories of learning, and their ideas have been criticised as being "the latest manifestation of a much older idea, that of regularity in the development of students as they learn a certain body of knowledge or professional practice" (Wilson, 2009, p.716). this suggests that Lp proponents should also consider the similarities of their theory with previous work to derive an approach that is most likely to attain its desired objectives.

1.1.1 LP IN SUPPORT OF TEACHING AND LEARNING

Learning-progressions information can be especially helpful for teachers of students who are underperforming. These teachers can find it "quite depressing" to view their students' performance only through a standards-based test lens, says Oláh. "You talk about things like, 'Oh, 80 percent of my kids are not meeting the standards.'"

On the other hand, learning progression tests can show that students do have some precursor skills and may be making progress so teachers can see areas of understanding from which to build. However, not all — or even many — teachers know about learning progressions, says Caroline Wylie, Research Director at ETS. She says the subject is not often taught in schools of education, although ETS sometimes does professional development workshops for teachers on the topic. "Often when we show learning progressions to teachers, there is this moment of recognition — 'Oh, right! I've seen that!' — but maybe they haven't had a name for it," says Wylie. "For me, essentially that's what learning progressions are, a way of providing teachers with these schemas for not just how the topics connect together, but showing how expertise within the topic develops."

ETS is working on developing more "teacher-facing" educational material about learning progressions, says Wylie.

"We want teachers to shift from, 'This is a correct answer; this is an incorrect answer,'" she says, "to more nuanced thinking: 'OK, so this is the kind of understanding that students have right now; how do I build on that understanding to move them along to deepen their learning? The ratio example shows how using developmental research can help teachers plan curricula better. Teachers also can gain information about their students' progress that can help them better differentiate instruction.

In addition, assessments developed through a learning-progressions model can more accurately identify areas in which students may be struggling. This process helps teachers better understand what students need so that they can apply an appropriate intervention.

1.1.2 DEVELOPMENT OF LEARNING PROGRESSION

Developing learning progressions is a time-consuming and painstaking process that can take several years. First, researchers explore existing research. They look to see if a progression in a particular area needs to be added or revised. ETS researchers create an initial draft, then submit it for internal review. They take feedback from this step to create another draft, which they submit for review by content-area experts within ETS as well as recognized experts outside ETS. Researchers take these experts' comments into account to revise the progression further. Then, they generate assessment tasks that denote each level in the progression and give those tasks to small numbers of students in the ETS Cognitive Testing Laboratory or in schools. Researchers study how students respond, which helps them further refine the learning progression and the tasks before being used in a large-scale assessment. Researchers also do statistical analyses to make sure the tasks are accurately measuring the progression and that the progression is a plausible pathway toward mastery. Another part of ETS's research into learning progressions maps them to standards, such as the Common Core State Standards or alternative state standards. Learning progressions and state standards are not the same, says Oláh. "The standards are where you need to get to," she says. "The learning progressions are a way to think about how students get there."

It can be challenging to align to the standards sometimes, because there is "not a grade-to-grade equivalent" with learning progressions, says Cara Laitusis, Senior Research Director at ETS. Students may be expected by the Common Core to know particular elements of fractions by a certain grade, for example, but conceptually that might be more challenging than other aspects at a later grade. Going forward, ETS researchers are looking at how to identify and expand lower levels of progressions to help underserved and underperforming students, says Bennett. When a learning progression is created, it describes the skills and understandings that students are expected to have at each stage on their path to mastery. Bennett would like to see the skills and understandings broken down into more specific information about what the student has mastered and what he or she still needs to know.

"We'd like to be able to try and differentiate students who are at level one more finely," says Bennett, "so that we can better describe to teachers what it is they know, and are able to do, and what it is that might be valuable for them to work on next." ETS is developing systems that deliver tests and tools for students from grades 3–12 in mathematics and English language arts, says Oláh. In the future, more content areas will be provided. "We have resources for teachers that articulate what learning-progression skills are and how they develop," says Wylie. "And we have tasks to give teachers that go along with those resources that are not just worksheets for rote learning — but problems that students can more deeply engage with. A big advantage of learning progressions is that they reflect student abilities "across a wide continuum of achievement levels, whether a student is on grade-level or not," says Laitusis. "You can't advance education or assessment without the building blocks of where you are going and what the purpose is. "Learning progressions," Laitusis continues, "provide a framework for identifying and arranging those building blocks."

Learning progressions have been demarcated by some for-science education, or only concerned with levels of sophistication in student thinking as determined by logical analyses of the discipline. We take the stance that learning progressions can be leveraged in mathematics education as a form of curriculum research that advances a linked understanding of students learning over time through careful articulation of a curricular framework and progression, instructional sequence, assessments, and levels of sophistication in student learning. Under this broadened conceptualization, we advance a methodology for developing and validating learning progressions, and advance several design considerations that can guide research concerned with engendering forms of mathematics learning, and curricular and instructional support for that learning. We advance a two-phase methodology of (a) research and development, and (b) testing and revision. Each phase involves iterative cycles of design and experimentation with the aim of developing a validated learning progression. In particular, we gathered empirical data to revise our hypothesized curricular framework and progression and to measure change in students. thinking over time as a means to validate both the effectiveness of our instructional sequence and of the assessments designed to capture learning. We use the context of early algebra to exemplify our approach to learning progressions in mathematics education with a focus on the concept of mathematical equivalence across Grades 3-5. The domain of work on research on learning over time is evolving; our work contributes a broadened role for learning progressions work in mathematics education research and practice.

1.1.3 HOW LEARNING PROGRESSION ARE BEING USED TODAY

There are a variety of ways that learning progressions are being used by districts in their states to help teachers align instruction with new standards and equip them to make the shift to competency-based systems. The examples shared during the convening suggest that learning progressions have the potential to help teachers improve their practice and empower students to plot and monitor their own academic progress. This potential arises in three areas of activity:

1. ***Connecting research and practice***. The study of learning progressions is an opportunity to tighten the relationship between research and practice. Convening participants noted that many practitioners are not currently versed in what is known about how children learn, though they are expected to ensure that all students achieve lofty learning goals. Appetite to dive into the detail of learning progressions research will vary, but all teachers benefit from a clear understanding of the research base. Marge Petit explained that when the Ongoing Assessment Project (OGAP) first began delivering professional development for teachers, the team quickly realized that teachers wanted more time to understand the research that underpins learning progressions. In response, OGAP trainings increased from three hours initially to four to five days per content area. By contrast, state team members from Oregon noted that many of their teachers have felt overwhelmed by the volume of materials that accompanied the new state standards and assessments and were best

able to absorb the learning progression content if progressions could be presented in 45-minute professional development chunks.

2. ***Personalizing the learning experience.*** A teacher's understanding of learning within a content area equips him or her to analyze effective strategies to help students meet content standards. Learning progressions help teachers use formative assessment practices, make strategic decisions about the ways they group students, and assign tasks and support to individual students. In recent years, efforts have been undertaken to help teachers apply learning progression-based professional development to their classroom practice. Donna Donnell, math coordinator, Sanborn Regional School District, noted that teachers in New Hampshire have become more comfortable with content through training on learning progressions but are able to convert their knowledge base to student outcomes only if they can decipher student work daily to see evidence of the best next steps. Awareness of learning progressions can also help students develop a stronger sense of strategy and purpose as they learn. Despite high postsecondary aspirations, many students struggle to academically advance in relation to their goals. When students are able to see that they can take smaller steps to achieve mastery of big ideas, they become empowered to better prepare themselves for postsecondary education and work.
3. ***Focusing on "big ideas."*** Standards are not meant to be taught in isolation from one another. For teachers to move students toward the goals of several content standards at once, they need to understand how the standards are designed to ensure that students ultimately master core concepts within and across subject areas. For example, the CCSS and Next Generation Science Standards (NGSS) include supplementary material that is designed to highlight big ideas across grades, topics, and standards. Such descriptions of how the content standards serve as landmarks along the way to core concepts prepare teachers to use those big ideas to connect each part of the learning experience. Teachers armed with an understanding of learning progressions that lead to the core concepts are then equipped to connect day-to-day instructional planning with annual learning goals and longer-term goals that extend beyond the current grade level or course. Learning progressions can empower teachers to be creative in their instructional design and can free teachers up from relying on textbooks or allow them to skip an element of instruction that does not apply directly to a content standard.

1.1.4 ROLE OF LEARNING PROGRESSIONS

Learning progression is an essential tool for understanding student's progress in learning. In the classroom, learning progressions enable teachers to identify where students are at in their learning and convert student assessment results into meaningful descriptions of their learning progress. This understanding is essential for informing next steps in teaching and learning, to ensure that every student is making progress, whatever their ability.

In Australia, the value of learning progressions as a tool for improving teaching and learning has been endorsed in a recent major report, Through Growth to Achievement: Report of the Review to Achieve Educational Excellence in Australian Schools. One of the report's key recommendations is the adoption of learning progressions in Australian classrooms, along with real-time monitoring of student progress. If implemented effectively, this will represent a major step forward in enabling Australian teachers to respond to the diverse range of abilities of students in their classes, and thus help them to ensure that all students are progressing in their learning, irrespective of their starting points.

Another advantage of learning progressions is their ability to bring together multiple forms of assessment. Effective education systems use multiple forms of assessment, including teacher judgments and standardized tests. Each of these assessments should be informed by a clear understanding of how students' learning develops in the relevant domain. Learning progressions provide a clear conceptual framework with which to interpret results from multiple methods of assessment. They also extend understandings of student learning progress beyond the constraints of year-level curriculum or assessment, which is essential when classrooms may contain students whose learning is far above or below year-level standards. Just as learning progressions can be used in classrooms to understand the learning progress of diverse students, they could also be used by the international assessment community to understand the progress of learners in diverse countries and reach consistent understandings of that progress across international borders.

The Australian Council for Educational Research Centre for Global Education Monitoring is working to develop a global set of learning progressions for use in reporting against Sustainable Development Goal (SDG) 4: Quality Education. This complements the substantial program of work led by the UNESCO Institute for Statistics and the Global Alliance to Monitor Learning, to develop strategies for monitoring learning against SDG 4. This program of work includes sophisticated statistical strategies for comparing results from different countries using different assessment programs, as well as conceptual strategies to create shared understandings of reading and mathematics—two of the SDG 4 learning domains. ACER-GEM's work on learning progressions will help bridge the gap between statistical and conceptual approaches, enabling learning assessment data to be translated into meaningful descriptions of student learning.

1.2.0 ATTITUDE

An attitude is more than a state of mind. It is a generalised tendency to think or act in a certain way in respect to some objects or situations, often accompanied by feeling. It is an enduring predisposition or readiness to behave in a particular way towards a given object or situation. Attitude has been defined by others in the following ways:

Young defined Attitude as "an essentially a form of anticipatory response, a beginning of action not necessarily completed".

According to Britt "An Attitude is a mental and neutral state of readiness, exerting directive or dynamics influence upon the individual's response to all objects and situation with which it is related."

Kerch and Crutchfield defined Attitude as an enduring organisation of motivational, perceptual and cognitive processes with reference to some aspect or the individual's world. In this way attitudes are to a great extent responsible for a particular behaviour of a person towards an object, idea or a person. But by this it should not be concluded that one's behaviour is an absolute function of one's attitude. Behaviour by all means is a function of both characteristics of behaving person and the situations in which he behaves. Hence a person may hold strong attitude and yet under circumstances, may behave in quite contradiction to those attitudes.

1.2.1 SCIENTIFIC ATTITUDE

Scientific attitude can be defined as, "open mindedness, a desire for accurate knowledge, confidence in procedures for seeking knowledge and the expectation that the solution of the problem will come through the use of verified knowledge". Scientific attitude are the most important outcomes of science teaching. Though some people view the scientific attitude as the by-product of teaching science, yet a majority of the people consider them as equally important as the knowledge aspect. Science should be taught directly and systematically because developing scientific attitude has a number of characteristics features which distinguish it from other attitudes.

1.2.2 THE CHARACTERISTICS OF SCIENTIFIC ATTITUDE

A man with scientific attitude has following qualities-

i. Is critical in observation and thought,
ii. Respects other's point of views and is ready to change his decision on presentation of new and convincing evidence,
iii. Is curious to know more about the things around him wants to know whys, what's and how's of things he observes,
iv. Does not believe in superstitions and false beliefs4,
v. Suspends judgments until suitable support is obtained,
vi. Believes in cause-and-effect relationship,
vii. Accepts no conclusions as final or ultimate,
viii. Seeks to adopt various techniques and procedures to solve the problem and
ix. Seeks the facts and avoids exaggeration.

1.2.3 DEVELOPMENT OF SCIENTIFIC ATTITUDE

The sole responsibility of developing scientific attitude among the students lies on the teacher who can manipulate all the situations to instil in pupils the characteristic features of scientific attitude and at the same time present himself as an example to the students for his intellectual honesty, respect for the other points of views, unbiased and impartial behaviour in his dealings and the like. This will create a favourable and permanent impression on the students to adopt the same attitude which their teacher has.

1.2.4 ATTITUDE TOWARDS SCIENCE

It refers to the mental state of readiness to respond. Science is one of the important subjects taught in schools. The use of science as the object or the stimulus of these feelings delineates that a set of attitudes known as attitude towards science (Rao, 2004). Attitudes are mental predisposition toward people, objects, subjects and events. In science, attitudes are important because of three primary factors (Martin, 1984). First a child's attitude carries a mental state of readiness with it. With a positive attitude, a child will perceive science objects, topics, activities and people positively. A child, who is unready or hesitant, for whatever reason, will be less willing to interact with people and things associated with science. This readiness factor occurs unconsciously in a child, without prior thought or overt consent. Second attitudes are not innate or inborn. Contemporary psychologists maintain that attitudes are learned and are organized through experiences as children develop. Furthermore, a child's attitude can be changed through experience. Third, attitudes are dynamic results of experiences that act as directive factors when a child enters in to new experiences. As a result, attitudes carry an emotional and an intellectual tone, both of which lead to making decisions and forming evaluations. These decisions and evaluations can cause a child to set priorities and hold different preferences.

1.2.5 CHARACTERISTICS OF A PERSON WITH ATTITUDE TOWARDS SCIENCE

Science teaching directly inculcates the scientific attitudes among the students. So, the students should teach directly and systematically, every individual should be paid heed to ascertain that they develop the desired attitudes and practices in them. An individual with attitude towards science are,

i. Critical in observation and thought.
ii. Open-mindedness.
iii. Respect others points of view and is ready to change his direction on presentation of new and convincing evidence.
iv. Objective in their approach to problems.
v. Does not believe in superstitions and false beliefs.
ii. Believes in cause-and-effect relationship.

iii. Adopts a planned procedure in solving a problem.

1.2.6 IMPORTANCE OF SCIENCE ATTITUDE

Science attitude are important because of three important factors. First a child attitude carries a mental state of readiness with it. With a positive attitude, a child will perceive science object, topics, activities and positively. A child, who is unready or hesitant for whatever reason, will be less willing to interact with people and things associated with science. Second, attitudes are not innate or inborn. Contemporary psychologists maintain that attitudes are learned and organised through experience as child develop. Furthermore, a child attitude can be change through experience. Teacher and parents have the greatest influence on science attitude. Thirdly attitudes are dynamics result of experiences that act as directive factors, when a child enters into a new experience. As a result, attitude carries an emotional and an intellectual tone, both of which lead to making decision and forming evaluations. These decision and evaluation can cause a child to set up priorities and hold different preferences.

1.3.0 NEED AND JUSTIFICATION OF THE STUDY

Learning progression plays the essential role in students learning. In a classroom learning progressions enables teacher to identify the learning position the students and convert them into a meaningful description of their progressions. The purpose of this research was to devise a framework to understand and evaluate key features of an LP, including its structure, content, usability, and validity evidence. This understanding is required for informing the next step of teaching and learning process and also to ensure that every student is making progress.

1.4.0 STATEMENT OF THE PROBLEM

A study of learning progression in science of class VII grade students of Jharsuguda district, Odisha.

1.5.0 OBJECTIVES OF THE STUDY

The present study has the following objectives

1. To study the learning progression in science of class VII students of Jharsuguda district.
2. To study the attitude towards science of class VII students of Jharsuguda district.
3. To study the area, gender and their interaction on learning progression in science of class VII students Jharsuguda district.

1.6.0 HYPOTHESIS

1. There is no significant effect of Treatment on Achievement in Science Subject of Class VII students when their Pre–test Scores of Achievement in Science Subject was taken as covariate.
2. There is no significant effect of Gender on Achievement in Science Subject of Class VII students when Pre –test Scores of Achievement in Science Subject was taken as covariate.
3. There is no significant interaction of Treatment and Gender on Overall Achievement in Science Subject of Class VII students when Pre-achievement Scores of Overall Achievement in Science Subject was taken as covariate.

1.7.0 OPERATIONAL DEFINITIONS OF THE TERMS USED

EFFECTIVENESS: The ability to be successful and produce the intended results.

LEARNING OUTCOMES: They are the statements that describes the knowledge or skills students should acquire by the end of a particular course or program.

ATTITUDE TOWARDS SCIENCE: This is an aspect of a personality that requires rationality, inquisitiveness, and a need to investigate results.

1.8.0 SCOPE OF THE STUDY

This study on the learning progression can be employed in different subjects other than science. Also, it has broad implication at mass level. Based on the results of the study the learning process can be changed at educational level. Teachers can follow the constructive approach to enhance their teaching strategies. This study in learning progressions is an opportunity to tighten the link between research and practices. It will also help to analyse effective strategies to boost the content knowledge of the students.

1.9.0 DELIMITATION OF THE STUDY

The study will be conducted under the following constraints-

1. The students were selected randomly from the selected one school of Jharsuguda District.
2. The study particularly framed in one location only
3. Only 45 days treatment was provided
4. Self-made tool is used for the achievement test