CHAPTER I
INTRODUCTION

"If a child can't learn the way we teach, maybe we should teach the way they learn"

- Ignacio Estrada

1.0 Introduction

The present study entitled "**Peer Assisted Learning Strategies (PALS) for Learning Science at Secondary Level in Inclusive School**" is related to the effective use of Peer Assisted Learning Strategy to enhance learning of science subject. PALS are a structured peer tutoring programme. The techniques adopted as Peer Assisted Learning Strategy in this study were Partner Reading, Paragraph Shrinking Technique, Quiz Activity and Project work with partner. This study was experimental in nature where Peer Assisted Learning Strategy was used to enhance reading which is basic and fundamental for all learning, resulting in overall learning enhancement. In this study Peer Assisted Learning Strategies were experimented for learning of Science Subject among VII Grade Students at Secondary Level.

In this chapter, the details in respect to Origin, Concept and Definition of PALS, Origin of PALS, PALS Strategy in the Classroom, Different PALS Techniques, Advantages of PALS, Disadvantages of PALS, Educationist View on PALS, Students Learning of Science Subject, Methods of Teaching Science, Advantages of Peer Instruction in Teaching Learning of Science, Rationale of the Study, Statement of the Problem, Objectives, Hypotheses and Delimitation have been given in separate captions.

1.1 Concept and Definition of Peer-Assisted Learning Strategy

Concept and Definition of PALS are discussed under this heading.

1.1.1 Definition of PALS

Peer assisted learning strategies defined as "the acquisition of knowledge and skill through active help and support among status equals or matched companions" (Topping, 2005, p.631). The term has been used to describe a selection of approaches that involve

students teaching other students (Kirkham & Ringelstein, 2008). It is an instructional or learning support strategy which utilises students to provide academic support to struggling peers.

Peer Assisted Learning Strategies can be defined as "a class of practices and strategies that employs peers as one-on-one teachers to provide individualized instruction, practice, repetition, and clarification of concepts" (Utley, Mortweet, & Greenwood, 1997,).

1.1.2 Concept of PALS

PALS is a class-wide peer-tutoring program that addresses the different learning needs of every student. PALS was developed in 1989 by Dr. Lynn Fuchs and Dr. Doug Fuchs (2001) in conjunction with Dr. Deborah Simmons. The strategies were derived from the Fuchs' interest in developing a peer-mediated instructional strategy that incorporated elements of other research-based methods including Class-Wide Peer Tutoring, Classroom-Based Measurement, Cooperative Integrated Reading and Composition and Reciprocal Teaching. Developers used these methods to enable a wider range of students to participate and increase success in school.

Peer Assisted Learning strategies does have a "primarily academic focus" (Black and MacKenzie, 2008) with many curriculum benefits as outlined above, of equal significance it is argued are the "intangible" benefits, which the spaces or "niches" (Havnes, 2008) which the PAL collaborative learning communities create, "such as increased cohesion of the student group, reassurance about study concerns and increased confidence" (Bournemouth University). As has already been mentioned, evidence also reports wide ranging benefits to PAL Leaders, including cognitive, personal and instrumental progression (Micari, Streitwieser and Light, 2012)**.**

During the 30-35 minute peer-tutoring sessions, students take turns acting as the tutor, coaching and correcting one another as they work through problems. Pairs work together three or four times per week for reading sessions and two times per week. The designation of tutoring pairs and skill assignment is based on teacher judgment of student

needs and abilities, and teachers reassign tutoring pairs regularly(Fuchs, Fuchs, Thompson, Svenson, Yen, Al Otaiba, Yang, McMaster, Prentice, Kazdan, & Saenz, 2002).

The PALS strategies are designed to complement and not replace existing classroom curricula and instructional methods. In this structured peer tutoring program students pair off into player and coach roles to promote an equitable exchange.. The pairing of higher- and lower-achieving students is intended so students gain knowledge from each other through practice and reinforcement. Teachers must carefully describe how the PALS strategies are done and how they relate to a particular lesson; they must closely monitor the roles taken on by each student, and interject when instruction is needed (Fuchs, Fuchs, Thompson, Svenson, Yen, Al Otaiba, Yang, McMaster, Prentice, Kazdan, & Saenz, 2002).

PALS is a peer-mediated teaching strategy in which students work together to complete projects, worksheets, and practice skills (Kamps, Leonard, Garrison-Harrell, 1995) in a classwide setting. One peer-mediated teaching strategy that has benefited many beginning readers (Fuchs, Fuchs, Thompson, Al-Otaiba, Yen, Yang, & O'Connor, 2001) and has improved reading comprehension 4 skills is PALS. PALS is a scientifically based, supplemental, class wide peer-tutoring program that involves pairing higher and lower performing readers to practice beginning reading skills. Research has shown that PALS can have a positive impact in the beginning reading skills of many children (Rafdal et al., 2011) and can significantly increase the reading comprehension skills of students (Fuchs, Fuchs, &Kazdan, 1999).

1.1.3 Origin of PALS

PALS is an acronym for peer-assisted learning strategies which was developed approximately 30 years ago at Peabody College of Vanderbilt University as a supplemental, class- wide peer-mediated reading program implemented by classroom teachers. However, PALS has a long and rich history dating back to such notable philosophers as Socrates, Plato, and Aristotle. The Greeks argued for the effectiveness of a program similar to PALS in that they advocated for work done in small groups or pairs. Students of notable psychologists such as Piaget, Rogoff, and Vygotsky have also contributed to the modern beginnings of the program indirectly as their followers

employed theories that are now in place within the program. Peer-Assisted Learning Strategies (PALS) is a reading intervention developed in the 1990s by Fuchs and Fuchs with their colleagues at Vanderbilt University (Fuchs & Fuchs, 1998; Fuchs et al., 1997; Fuchs et al., 2001; Sáenz, 2007). The purpose of PALS (Fuchs et al., 1997) is to increase strategic reading behaviors, reading fluency, and comprehension (Sáenz, Fuchs, & Fuchs, 2005). PALS were also developed to help teachers differentiate instruction in inclusive classroom settings (Fuchs et al., 1997; Sáenz et al., 2007), and originally was a supplement to a primary reading curriculum (What Works Clearinghouse, 2012).

The PALS strategy has been researched in experimental and quasi-experimental studies. Research indicates by a wide margin that the PALS students raised their performance levels in comparison to non-PALS students in several reading measures (Fuches et al., 2001Mathes, Howard, Allen & Fuchs 1998; McMaster, K.., Fuchs, D., & Fuchs, L. 2007; Morgan et al., 2006). It is recognized as an effective practice by the U.S. Department of Education and also by the What Works Clearinghouse. The original PALS programming guide PALS 5 was revised in 2008. Major contributors include Douglas Fuchs, Ph.D., Lynn s. Fuchs, Ph.D., Deborah C. Simmons, Ph.D., and Patricia G. Mathes, Ph.D. (Fuchs).

1.2 The PALS Strategy in the Classroom

The first step towards implementing the PALS strategy in the classroom is to obtain a baseline of all the students' strengths and weaknesses. They are then ranked according to their skills and abilities. This information is used to carefully form student pairs- a student with a higher achievement/skill rating is paired with a student who has a low or average score. The pairing is put into place to encourage students to learn from each other through teaching and practicing. Following the principle of Reciprocal Teaching, each student takes turns being a Tutor and a Tutee. Tutors are instructed to observe, assist and provide constructive feedback to the Tutees and are even given guidelines to follow. The pairs are regularly shuffled to give students the opportunity to learn and interact with others. The PALS technique is typically a 25-35 minute activity, conducted at least 2-4 times a week. It enables students to participate in various activities

and allows the teacher to observe, supervise and give individual intervention when needed. When equipped with peer reviewing techniques, students can rate each other on their effectiveness as a Tutor. Teachers can determine the effectiveness of the strategy by observing the students' behavior and learning behaviors such as student motivation and participation.

1.3 Different PALS Techniques

The PALS strategy is often used for two main subjects including reading and math. Different implementations of these strategies are available for all age groups. These strategies are developed by Lynn and Doug Fuchs (1997) to enhance the given curriculum and help develop stronger reading and math skills.

1.3.1 Reading PALS

According to Drs. Doug & Lynn Fuchs (2001), Reading PALS consists of a set of structured activities which students are trained to implement with their partners. Teacher use a set of brief scripted lessons to train all students. The training lessons for each activity last 30 to 60 min per session and take 2 to 4 weeks to implement. Each week, teachers incorporate three 35-minute PALS sessions into their allocated reading time, implementing PALS with all children in their classes. Teachers begin by conducting seven lessons on how to implement PALS.

Reading PALS pairs students in a systematic way. First, students are ranked according to reading competence. Next, each student in the class is paired with another student. The pairs consist of one higher- and one lower-achieving student. The higher-achieving student always reads first, as a model for the other student. Students are monitored as they engage in the lessons.

There are three activities in PALS session, as follows:

a. The first activity in every PALS session is Partner Reading. Each students reads connected text aloud for 5 minutes, for a total of 10 minutes. The higher performing student reads first; the lower performing student rereads the same material.

b. The second PALS activity, Paragraph Shrinking, is designed to develop comprehension through summarize and main idea identification. Continuing to read subsequent sections of text, students read orally one paragraph at a time, stopping to identify its main idea. Tutors guide the identification of the main idea by asking readers to identify who or what the paragraph is mainly about and the most important thing about the who or what. After 5 minutes, students switch roles.

c. The last activity is Prediction Relay. It extends Paragraph Shrinking to larger chunks of text and requires students to formulate and check predictions. Prediction Relay comprises five steps. The reader makes a prediction about what will be learned on the next half-page; reads the half-page aloud while the tutor corrects errors, (dis) confirms the prediction, and summarizes the main idea. After 5 minutes, students switch roles.

1.3.2 Math PALS

Math PALS can be applied to many diverse learners at varying skill levels. According to Drs. Doug & Lynn Fuchs (2001), this approach uses structured interactions between students to encourage high-level feedback while in pairs. These interactions increase the level of participation on topical areas through verbal rehearsal, until the process becomes routine, and verbal rehearsal is no longer needed. In these activities students learn that strategies can be applied to other content areas. Students get step-by-step feedback through their interaction during tutoring sessions. The tutoring sessions are reciprocal with students taking turns as tutor and tutee.

During PALS sessions, the program developers encourage teachers to assist students in making connections between the material presented and math concepts. They indicate that with structure and guidance from teachers, students can move past basic concepts and questions into conceptual knowledge. Methods that have enhanced conceptual math knowledge include: providing real-life examples, discussing meaning and answers to problems, and the use of manipulative or concrete representations.

Below is a typical format for a Math PALS lesson:

There are two parts to PALS sessions in which the students work through math problems and activities.

Task 1:

Coaching each of the partners to work on math problems in a specific area (i.e. addition and subtraction). The "coach" questions the "player" in order to guide the activity. The "coach" has been trained in how to correct the "player." This activity should last 15-20 minutes.

Task 2:

Practice all students receive a worksheet containing problems they just went over, some as difficult and some less challenging problems. Once they have completed the worksheet, they exchange papers and score them. This activity should last 5-10 minutes.

1.4 The Advantages of Peer Assisted Learning Strategy (PALS)

Capstick, Stuart. (2004), PALS is effective for students with learning disabilities, low-performing students without learning disabilities, average- and high-achieving readers, and English language learners. They are also pleased to learn that PALS is an effective means of differentiating reading instruction. Unlike whole-group instruction in which teachers have limited ability to tailor instruction to their students' needs, peer-mediated instruction allows teachers to Individualize reading material for each student pair and vary the instructional pace for each student pair. In other words, teachers have the ability to provide more individualized lessons to accommodate students with a wider range of instructional needs.

Besides accommodating the needs of students of various academic abilities and actively including all students in reading activities, PALS boasts a number of additional benefits for teachers and students. Specifically, the approach is easily implemented and cost-effective. It accelerates student achievement in reading and encourages on-task behavior and student participation. Moreover, it allows students more opportunities to read and receive corrective feedback, motivates students and promotes collaboration and

positive social interaction between students. The goal of PALS is to ensure that all students succeed in reading and comprehension. Other advantages of PALS include:

a. It allows students to work and interact independently without the necessary guidance of the teacher, thus promoting learner independence.

b. It allows teacher time to work with one or two pairs while the other students continue working.

c. It recognizes the old maxim that 'two heads are better than one' and in cooperation helps the classroom to become a more relaxed and friendly place.

d. It is relatively quick and easy to organize.

1.5 The Disadvantages of Peer-Assisted Learning Strategy

There are some disadvantages of peer assisted learning strategy. They may be:

a. Pair-works is frequently very noisy and some teachers and students dislike this.

b. Students in pairs can veer away from the point of an exercise, taking about something else completely.

c. It is not always popular with students, many of whom feel they would rather relate to the teacher as individuals than interact with another learner who may be just as linguistically weak as they are.

d. The actual choice of paired partner can be problematic, especially if students frequently find themselves working with someone they are not keen on.

1.6 Educationalists View on PALS

Peer-Assisted Learning Strategy and Reciprocal Tutoring may be used as a tool for reading instruction. Tutoring, as either one-to-one or small group instruction, is an effective instructional strategy (Bums et al., 2008; Greer et al., 2004), (Slavin, Lake, Davis, & Madden, 2010; Topping, Miller, Thurston, McGavock, & Conlin, 2011). The studies (Bums et al., 2008; McCombs, Kirby, & Mariano, 2009; Slavin et al., 2010; Topping et al., 2011) have also identified tutoring as an effective means of helping

struggling students. For example, McMaster, Fuchs, Fuchs, and Compton (2005), found that difficult-to-teach students responded better to formal tutoring than to any other reading intervention.

However, not all studies have found tutoring effective. Miciano (2006) designed a study to examine the effectiveness of college-aged tutors on the reading levels of elementary students. Twelve tutors participated by working with 70 students who scored lowest on a standardized reading assessment. Eleven tutoring sessions were conducted for 3 hours each Saturday. In the end, the tutoring design did not lead to substantial reading gains for students. Miciano did, however, find the program to be beneficial for the tutors—a common finding in tutoring studies, sometimes referred to as the tutor learning effect (Roscoe & Chi, 2007). This learning effect has been consistently achieved especially when used in a reciprocal peer tutoring situation (Cheng & Ku, 2008).

Stenhoff and Lignugaris/Kraft (2007) highlighted four variations of PALS:(a) heterogeneous grouping in which tutees are taught by tutors in the same grade level with a higher level of knowledge or skill, (b) homogeneous grouping in which tutees are taught by tutors with similar skills, (c) cross-age tutoring in which a tutor teaches a younger tutee, and (d) reverse-role tutoring in which students with disabilities tutor other students with or without disabilities. Although the results on the effectiveness of peer tutoring have been mixed, the majority of studies have resulted in evidence in support of peer tutoring as an effective instructional method (Boudouris, 2005; Greer et al., 2004; McMaster et al., 2006; Stenhoff & Lignugaris/Kraft, 2007; Veerkamp et al., 2007). In addition, some studies have shown increased reading achievement for both the tutees and the tutors (Roscoe & Chi, 2007).

Hammond, Bithell, Jones, & Bidgood, (2010) examined PALS among college freshmen. Although the majority of students reported enjoying the social aspects of PALS and thought that it helped them clarify basic concepts and understand the subject matter of the course, the majority of students also reported that the PALS had no effect on preparing them to do better on class assessments, improving their study skills, or clarifying complex concepts.

Mastropieri et al. (2003) claimed, "PALS has gained popularity over the years and is backed by some very impressive research evidence to support its use to improve academic performance". Stenhoff and Lignugaris/Kraft's (2007) review of research on secondary peer tutoring among learning-disabled students examined five studies related to reciprocal tutoring. Three of the five were found effective and two of the five were considered minimally effective. Stenhoff and Lignugaris/Kraft concluded that PALS at the secondary level was an effective practice. Veerkamp et al. (2007) examined the effects of Class Wide Peer Tutoring on the reading achievement of 71 sixth-grade students in three classes by specifically assessing the progress of three low-achieving students. One teacher taught three novels switching between three different methods—traditional, teacher-led instruction, and two forms of reciprocal peer tutoring, one of which included tangible incentives that students could win. On average, both reciprocal teaching formats consistently resulted in better test/quiz scores than either the pre-test or the traditional reinforcement as the most effective types of feedback. It was emphasized that not all feedback was positive or had the same amount of influence, indicating that the form and manner of feedback is crucial to its effectiveness (Gielen, Peeters, Dochy, Onghena, & Struyven, 2009).

Hattie and Timperley explained that feedback about learning processes was the most effective and often worked best when slightly delayed. Similarly, Brookhart (2008) described effective feedback as "timely", thus given at a time when it is still relevant to the students; that is, they are thinking about the work and are thus able to make changes if necessary. In a study of Chinese English language learners, Yang, Badger, and Yu found peer feedback in writing to be even more productive than teacher feedback, hypothesizing that peer feedback lead to more discussion about the offered suggestions (as cited in Gielen et al., 2009). The other reason PALS may be effective is because it increases student opportunities to respond (Bums et al., 2008; Menesses & Gresham, 2009).Opportunities for responding. Opportunity-to-respond is the amount and quality of interaction a student has with the teacher, other students, or classroom materials, which allows the student to increase learning (Harper & Maheady, 2007).

Stenhoff and Lignugaris/Kraft (2007) examined multiple studies that showed PALS increased the amount of engaged time and opportunities to respond individually. Other researchers have examined the behaviors of students when given more opportunities to respond and had found an increase in students' on- task behavior and correct responses as well as a decrease in disruptive behaviors (Haydon, 2009; Moore Partin, Robertson, Maggin, Oliver, & Wehby, 2010). Neddenriep (2009) reviewed studies that have shown increased opportunities-to-respond to positively affect the speed and accuracy of oral reading. The PALS program has also been found to increase students' opportunities to respond (Sutherland & Snyder, 2007).

Peer tutoring is literary referred to as peer-assisted learning, peer education of child-teach-child, mutual instruction, and partner learning. Abaoud (2016), posit that the early PALS manifestation was associated with children acting as substitute to teachers whose aim was the transfer of information. Topping, Thurston, McGavock & Conlin (2012), Muhammad et al. (2020) have identified a contemporary PAL perspective as people from similar social groupings whom are not professional teachers that help each other to learn and learning for themselves by teaching. Accordingly, Muhammad et al. (2020), Wolfe (2018) view ALS as an instructional strategy that suggested the pairing of high-performing students with lower-performing once in a class-wide setting with the hope that they work together and function as tutors and tutees under the facilitation of a teacher. In particular, Alzahrani & Leko (2018), Tracey, Natasha and Johanna (2007) quote PALS as a teaching strategy in which the class is organized in pairs of 5-6 members that may be of different abilities to act as tutor and tutees in the learning process in order to obtain maximum benefits from each other. Meanwhile, Ansuategui & Miravet (2017) view PALS as bringing together two or more students to act as tutors and tutees in order to enrich their educational experience irrespective of academic ability. According to Ruegg, Sudo, Takeuchi & Yuko (2017), for PAL to occur, there needs to be a difference in knowledge between two individuals, so that the more knowledgeable individual can act as tutor to the less knowledgeable.

1.7 Students Learning of Science Subject

The world in the 21st century is technology and science based, and students need to possess the skills to read and comprehend scientific text to be successful in the workplace and navigate their lives (National Science Education Standards, 1996).In this scientific and technological age, and no citizen can survive in a developed society without basic scientific literacy and certain elementary skills. We depend upon scientific knowledge and understanding for economic and material advancement. Science is fundamentally concerned and interprets physical areas of Physics, Chemistry and Biology. One has to be trained to use it. This training comes from teaching which helps in developing power of thinking and reasoning, curiosity, open-mind, and ultimately to develop scientific temper.

The professional task of the teacher is to create effective, supportive and challenging learning environments in which students can learn skills to direct their lives successfully. Teachers are facing more diversity than before in their student populations. This will demand high-level ethical and pedagogical skills to cope with these new challenges.

Pedagogies are constantly evolving. Pedagogy must fit the audience, and focus on helping students develop an understanding of the material beyond basic memorization and surface knowledge. Students should be able to relate concepts back to the real world, and even their own lives. Over the years, pedagogy has been evolving to better support 21st-century skills and ideas, as well as the changing nature of teaching. The traditional classroom lecture is no longer as effective as it once was. Teaching has expanded to include new forms of learning, like interactive and collaborative projects and online and remote curricula, and to accommodate more flexible schedules (Persaud. C, 2019).

Real-world scenarios and cultural differences are being taken into account, allowing students new ways to acquire, construct, and organize their learning. Pedagogy is shifting focus beyond basic memorization and application of simple procedures to aiding

students in higher-order learning, including critical thinking skills, effective communication, and greater autonomy.

Pedagogy can facilitate students not only in gaining deeper learning of subject matter, but also in applying that learning experience to their own homes and communities, and to their own personal experiences and situations. Teachers can work together with students to come up with the best way for subject matter to be studied. Develop course material and activities that are challenging for students and that will assist them in cognitive development, ensuring that they advance their understanding of concepts to higher levels. (Persaud. C, 2019)

With a clear understanding of pedagogy, students can follow the instruction and feedback clearly, know what they need to do and how to do it, and respond in kind. And it can encourage a healthy dialogue between educator and students, as well as among students themselves as everyone shares ideas, questions, and knowledge to explore concepts and deeper their knowledge. (Persaud. C, 2019)

Students not only expand their knowledge base, but also understand how to use that knowledge in authentic and relevant real-world scenarios and contexts, as well as connect concepts from lessons with situations in their own lives. They can draw on their own cultural knowledge as well, to come up with unique and personalized thoughts and opinions. Concrete evidence, facts, and data, are combined with the exploration of cultural differences of others to further expand knowledge, allowing the student to reflect more objectively on new concepts, and open their minds to different approaches. (Persaud. C, 2019)

Through the pedagogical process, students can also learn what approaches work best for them, which learning activities and learning styles they tend to gravitate towards, and how to develop concepts and build mental models to further their learning. Overall, active learning makes student engagement rise. Students get to participate in personalized teaching strategies, rather than be mere spectators in the classroom. (Persaud. C, 2019)

In order to be able to teach science effectively, teachers must acquire many different types of knowledge from their teacher preparation programs. In addition to learning science content, they must learn how to teach it, not only in general, but with knowledge of how to teach specific science topics at the appropriate level for their students. Furthermore, since science education standards advocate inquiry-based instruction, teachers need knowledge of both scientific inquiry and inquiry pedagogy. In practice, teachers need to integrate all these kinds of knowledge to design and implement classroom instruction. This is a demanding task, and it is hardly surprising that new teachers often struggle to manage it.

1.8 Methods of Teaching Science

1.8.1 Lecture-Cum-Discussion Method

This method is a combination of lecture method and discussion method. This is very helpful in building an active verbal interaction between the teachers and students. The teacher delivers the lecture and provides some time (10 minutes) after the lecture for discussion among the students and teacher in the classroom. The student's views, comments experiences, problems, difficulties in understanding any point or portion of the lecture come to teacher's knowledge and teacher replies, and clarifies the doubts. It is an important strategy in stimulating the students interest and assess their understanding of the concept. It is a process in which interaction goes on in between teacher and students, where in question and answer are asked and given by both the teacher and students making the process interactive, and effective. The basic purpose of this method is to disseminate information and attain educational objectives by learning. The discussion in the class is intended to be a give and take between teacher and students. This method helps students to apply critical thinking power in various situations. Higher learning skills like analyzing, synthesizing, generalizing are given front seat.

1.8.2 Laboratory Method

This method in commonly thought of as a hands on and minds on approach to teach science where in students have the opportunity to gain some experience with phenomena associated with their course of study. In this method either student participates

alone or in small groups. They produce or manipulate various variables that are under exploration. The degree to which student has control over exploration can vary over a wide range. Here the students learn by actual doing rather than my observing the experiments. As young children do it by themselves, the experience is impressed more firmly in their minds. Thus this method in psychologically sound as it satisfies the natural urge for activity. This method broadens interest of the students. They learn many virtues through laboratory activity. The experience in a laboratory is very rich in personal satisfaction as they gain it firsthand. The sense of excitement and challenge help them to achieve some tangible him.

1.8.3 Observation Method

In this method, the student observes and acquires knowledge. Through we cannot call this as a specific method of science teaching but as a matter of fact almost all science begins with observation the students observe nature, in groups, in lab at school at home or in gardens. The result of this process information of a concept of nature which in permanent in mind. The training of pupils in observation is really strong his mind with suitable experiences all thoroughly classified and digested. Science provides remarkable training in observation and reasoning. The learners' reasons from the once established facts and form concepts about further observed phenomena.

1.8.4 Project Method

This method was propounded by W. H. Kilpatrick. This method was perfected by J.A Sternson. The base of this method lies in the philosophy of pragmatism. This method emphasizes on building a comprehensive unit around an activity which may be carried out in school or outside. The essence of this method lies in the fact that a group of students do a purposeful task. This implies the students undertake the activity in a group or individually over a period of time. It may include a number of activities and the end product is in the form of written report or a display. "A project is a whole-hearted purposeful activity proceeding in a social environment"- Dr. William Kilpatrick. "A project is a problematic act carried to completion in its natural setting". –Stevenson. "A project is a bit of real life that has been imported into school. –Ballard. Thus, project is a

purposeful activity and planned activity which is achieved in social, natural situations created in schools.

1.8.5 Problem Solving Method

Science subject is one of the important subjects in school education. However, really the traditional teaching methods are challenged for their inability to foster critical thinking, holistic learning environment among children. The science subject must develop science process skills where children, observe, measure, classify, process information, interpret think on solving problems, analyze, synthesize, formulate conclusions, etc. but, it should be kept in mind that, creativity in an essential element of P.S. In a problem solving method, children learn by working on problems. This enables the students to learn new knowledge by facing the problems to be solved. The students are expected to observe, understand, analyze, interpret find solutions, and perform applications that lead to a holistic understanding of the concept. This method develops scientific process skills. This method helps in developing brainstorming approach to learning concepts. The students thinking on problem and their understanding of the science behind it is based on common sense. It does not start from textual knowledge. Rather it proceeds from experiencing to gradually forming concepts through books at later stage. It is a process from practice to theory not vice versa. Knowledge here is not a goal but a natural out came of working on tasks. Students live in the real world and like to deal with concrete things where they can touch, feel manipulate things then the method is useful in igniting the process of science learning.

Many students in classroom find science is difficult and challenging. Therefore, science teachers try to create a conducive environment to help their students meet this challenge. One way to achieve this is by giving students an opportunity to learn and study together in pair. Prior studies found that Peer Assisted Learning (PALS) as an effective supplementary remedial intervention in classrooms as together they can relate to each other better. PALS is the acquisition of knowledge and skill through active helping and supporting among status equals or matched companions (Topping, 2005).

1.9 Advantages of Peer Instruction in Teaching Learning of Science

Peer Instruction (PI) is a research-based pedagogy for teaching large introductory science courses Fagen and Mazur, 2003. It is a method created to help make lectures more interactive and to get students intellectually engaged with what is going on. It has been tested in many classes and found to be good for improving students' performance and also used to identify student difficult areas. PI has been used in different subjects in many countries. Peer Instruction is still a new method of teaching for teachers in many countries because of its unique feature of Concept Test. Peer Instruction is an instructional strategy for engaging students during class through a structured questioning process that involves every student Crouch, Watkins, Fagen and Mazur, 2007).PI provide a structured environment for students to voice their idea and resolve misunderstanding by talking with their peer (Gok, 2012).

Peer instruction is a cooperative learning technique that promotes critical thinking, problem-solving, and decision-making skills (Rao and DiCarlo, 2000). Research shows talking to peers forced them to organize their thoughts and reminded them of the concepts they had difficulty recalling on their own (Gok, 2012). Peer Instruction is an interactive approach that was designed to improve the learning process (Rosenberg, Lorenzo and Mazur, 2006). This method has the advantage of engaging the student and making the lecture more interesting to the student. It also has the tremendous importance of giving the lecturers significant feedback about where the class is and what it knows. PI is more effective at developing students' conceptual understanding than traditional lecture-based instruction (Lasry, Mazur and Watkins, 2008). According to Crouch, Watkins, Fagen and Mazur (2007), PI increases student mastery of both conceptual reasoning and quantitative problem solving. PI increase conceptual learning and traditional problem-solving skills (Lasry, Mazur and Watkins, 2008). According to Gok, (2012) PI encourages students to take responsibility for their learning and emphasize understanding. Peer instruction increased student conceptual learning and performance on quantitative problem-solving questions. PI is not a rejection of the lecture format, but a supplement that can help engage students who have a range of learning styles (Rosenberg, Lorenzo and Mazur, 2006). Peer Instruction involve students during class through activities that require each student to

apply the core concepts being presented, and then to explain those concepts to their fellow students. Unlike the common practice of asking informal questions during a traditional lecture, this typically engages only a few highly motivated students. PI incorporates a more structured questioning process that involves every student in the class.

Based on various reviewed studies that PI is a teaching pedagogy that engages students in active learning through the use of Concept Test. Concept Tests are described by Crouch, Watkins, Fagen and Mazur (2007) as the cornerstone of teaching with Peer Instruction. Apart from the use of Concept Test, the period of "convincing your neighbor" is peculiar to PI, and it is the most important aspect of the PI. One of the major significance of PI is that students teach themselves with the best language they could understand. PI engages students during class through activities that require each student to apply the core concepts being presented. Moreover, then to explain those concepts to their fellow students (Crouch, Watkins, Fagen and Mazur, 2007).PI has many advantages both for the teacher and the students if properly implemented. First and foremost, it has the advantage of ensuring no student is inactive during the lesson. One of the best ways to improve academic performance is to ensure no student is passive during the class activities. Experience has shown that participating in learning activity help student's memory. Secondly, it enables the teacher to get instant feedback from the students about their learning. Feedback takes place when the students give an answer to the Concept Test posted to the class. Feedback is very important in teaching and learning. PI assists the teacher to fix the learning problem, and remedial action is taken to help the students as the lesson is in progress. The various literature reviewed confirmed the effectiveness of Peer Instruction in improving conceptual and problem-solving skill of the students.

1.10 Rationale of the Study

Designing effective teaching learning methods for a learner demands a teacher to be aware of what works better for an individual in a classroom. Vygotsky (1978) posited while both biological and social forces play a role in knowledge building, learning is essentially an interactive process that involves the use of language. It highlights the active role of students in obtaining the knowledge and the social construction of knowledge that can be achieved through practical work and experiential learning.

Another feature of his socio – cultural theory is the proposition that the potential for cognitive development is limited to a 'zone of proximal development'. The person can learn only that which is within their development level. His theory further indicates the 'zone of proximal development' is created only when learning awakens a variety of internal development process that are able to operate only when the child is interacting with people in his environment and in cooperation with his peers. The idea that knowledge is constructed via social discourse is integral to the process of peers learning from each other, reflecting the notion that social interaction facilitates more learning than that which would occur by students learning on their own. By interacting with others, students get the opportunity to share their views and thus generate a shared understanding related to the concept.

Prior studies found that Peer Assisted Learning (PALS) as a effective supplementary remedial intervention in classrooms as together they can relate to each other better. Topping K.J. (2005) stated that Peer Assisted Learning (PALS) is defined as the acquisition of knowledge and skill through active helping and supporting among status equals or matched companions. Research conducted by Fuchs D., Fuchs L.S., Mathes P.G. and Simmons D.C. (1997), and McMaster K.L., Fuchs D. and Fuchs L.S. (2007) indicates that by a wide margin that the PALS students raised their performance levels in comparison to non-PALS students. Parkinson M. (2009) reported that PALS had a very strong positive effects of tutoring resulting in student's better performance and progression.

PALS is not an much more experienced individual teaching the information, but the spread of this information via the learner's own peers . Topping K.J., Watson G.A., Jarvis R.J. and Hill S. (1996) suggested that though information and assistance are received from peers, there needs a close monitor to see the correctness of what pairs are doing, especially with weaker students, even if their help is not requested by the pair, who may be erroneously convinced that they are already correct. Wessel A. (2015) presented that Peer learning strategies provide ways for the teacher to take a step back and let the students do the teaching and talking for a little while.

Wessel A. (2015) believed that PAL is a method that can improve teaching and learning, provides a safe learning environment to promote learning and retention of knowledge. Students feel more comfortable asking questions to another student and in small or large group discussions, the students themselves have to hash out the different points that are brought to them while involved in PALS session.

Previous studies have identified many benefits of Peer Assisted Learning Strategy (PALS) in students learning. These benefits include the significantly greater progress (Fuchs D., Fuchs L.S., Mathes P.G. and Simmons D.C. (1997), keeps students actively involved and "on-task" (Fulk B.M. and King K. (2001), effective supplement to conventional teaching methods (McMaster K.L., Fuchs D. and Fuchs L.S. (2007) scientific thinking and doing increased dramatically (Diana S. (2017), students are able to learn practical skills in how to teach and give critical feedback (Wessel A. (2015) and PALS makes use of one of the greatest resources in the schools, and for the students themselves (McMaster K.L., Fuchs D. and Fuchs L.S. (2007) .

Study on PALS in Indian context is rarely noticed. One of main reasons for dropout of students is lack of appropriate teaching method. Hence an attempt was made to implement PALS in Indian schools. There had been ample of research being carried out on effectives of PALS in reading and mathematics in the Industrial countries, research in effectiveness in science is very limited. However, Greenwood et al. (1990) cited that PALS does consume organisational time in designing and effecting appropriate peer selection and matching, and it may also necessitate some adaptation to curriculum materials and can be designed to apply in science.

Many Indian students in classroom find science is difficult and challenging. Therefore, science teachers try to create a conducive environment to help their students meet this challenge. One way to achieve this is by giving students an opportunity to learn and study together in pair and this study was attempted in this direction and intended to present the method of implementation of PALS for learning Science subject. In this present Experimental study, the effect of PALS on Partner Reading, Paragraph Shrinking,

Quiz Activity and Partner Project work and ultimately the learning of the subject with comprehension were examined in relation to Gender a Medium of Instruction as Independent variables.

1.11 Statement of the Problem

The Statement of the Problem is worded as: ***"Peer Assisted Learning Strategies (PALS) for Learning Science at Secondary Level in Inclusive School".***

1.12 Terms Used in the Study

1.12.1 Peer-Assisted Learning Strategies

Peer-Assisted Learning Strategies (PALS) is a peer-tutoring instructional program that supplements the curriculum. Students work together in pairs on learning activities intended to improve reading accuracy, fluency, and comprehension. Students in the pairs who alternately take on the roles of tutor and tutee, read aloud, listen to their partner read, and provide feedback during various structured activities. Teachers train students to use the following learning strategies: passage reading with partners, paragraph shrinking (or describing the main idea), Quiz and Project.

1.12.2 Secondary School

Secondary school refers to the schooling offered after a primary school, and before higher, optional education. It is also known as middle school.

1.12.3 VII Grade Students

Grade seven is called Class 7 and forms middle school. Class 7 forms the second year in middle school. Pupils aged 11 to 12 attend class 7.

1.12.4 Inclusive Education

Inclusive education is when all students, regardless of any challenges they may have, are placed in age-appropriate general education classes that are in their own neighborhood schools to receive high-quality instruction, interventions, and supports that enable them to meet success in the core curriculum.

1.12.5 Partner Reading

This reading strategy is an activity in PALS in which each paired reader reads for 5 minutes. The better reader, also called the Tutor, helps the lower level reader with any unknown words; subsequently, the lower level reader, called the Tutee, retells the events in order.

1.12.6 Paragraph Shrinking

Paragraph shrinking was designed to develop comprehension through identification of main idea in the paragraphs.

1.12.7 Quiz Activity

Quiz activity aimed to test the comprehension ability of the students when involved partner reading.

1.12.8 Project with Partner

Tutor and Tutee work together to synthesize knowledge from Reading, Paragraph Shrinking and Quiz Activity and complete the given task.

1.13 Objectives

The Objectives of the Study were to:

1. Assess the effectiveness of Peer Assisted Learning Strategies on Learning of Science Subject among VII Grade students
2. Compare the Pre and Posttest scores of students in Control and Experimental Group with respect to Gender and Medium of Instruction
3. Assess the effectiveness of Partner Reading Technique of PALS on Reading Performance of Students in Experimental Group.
4. Assess the effectiveness of Paragraph Shrinking Technique of PALS on Summarization of Science Concepts among Students in Experimental Group.
5. Assess the effectiveness of Quiz Activity Technique of PALS on Learning of Science Concepts among Students in Experimental Group.

6. Rate the performance of the Project Activity when students involved in PALS session.
7. Study the influence of Gender and Medium of instruction on PAL Strategies viz., Partner Reading, Paragraph Shrinking, Quiz Activity and their interaction on PAL Strategies when considering pre score as Covariate.

1.14 Hypotheses of the Study

1. There is no significant difference between Control and Experimental Group in the Test scores before and after introduction of PALS
2. There is no significant difference between Pre and Posttest scores of students in Control Group
3. There is no significant difference between Pre and Posttest scores of students in the Experimental Group.
4. There is no significant difference between scores of Boys and Girls in the Pre and Posttest.
5. There is no significant difference between scores of students in different Medium of Instruction viz., Tamil and English Medium.
6. There is no effect of Partner Reading of PALS technique on Reading Performance
7. There is no effect of Paragraph Shrinking of PALS technique on Summarization of the idea/concepts of the content in the paragraphs.
8. There is no effect of Quiz Activity of PALS technique on the comprehension of the content in the selected Science subject.
9. There is no significant difference between Partner students in the performance of Project Activity when Project Activity is considered as PALS technique.
10. There is no significant influence of Gender and Medium of Instruction on PAL Strategies viz., Partner Reading, Paragraph Shrinking, Quiz activity and their interaction when considering pre score as Covariate.

1.15 Scope of the Study

- One of the most popular strategies that use peer mediated learning in interventions is PALS which was used in the present study. PALS can be introduced with any subject with no materials and very little teaching.
- The method adopted in the study can be used widely in India and in developing countries as well. Since this PALS does not require many teaching or sophisticated materials teachers in any school environment can introduce this model for learning enhancement.
- With the use of strategies adopted in the study, the teacher can supplement the instructions in which students can be paired to practice the skills taught or pinpoint errors. The study developed pairs who were in discussion, found solutions, traded roles and the activities were repeated for better learning. When teachers adopt this method, children can assimilate all the above mentioned attributes for learning enhancement.
- Many research results confirmed that PALS is a strategy that can improve academic performance, reduce disruptive behaviour and promote relations between classmates and the present study also proves and hence provides wider scope for reduction of disruptive behavior and therefore the strategies which are used in the present study that occupy peer mediated learning may promote inclusion of all children, as the needs of every child are met individually through the peer tutor. The study may help adopting this strategy to introduce PALS to different categories of Children with Special Needs in Inclusive setup.
- Indian classrooms are with bigger numbers of students and diverse learners. The strategies used in this study involved frequent and repeated feedback and discussions between the pairs. Hence PALS have the possibility to provide as good quality education as smaller classes due to grouping.
- Strategies adopted in the study may be beneficial to Book Writers and Researchers to sight/follow in their work.

1.16 Delimitations

The following were the delimitations of the study:

1. The present investigation being an Experimental study was confined to 188 samples.
2. The study was confined to only one district (Coimbatore in Tamil Nadu).
3. The study was confined to Science Subject.
4. The study was restricted to students for class VII studying in Government School (Public School).

1.17 Organization of the Thesis

The present study "**Peer Assisted Learning Strategies (PALS) for Learning Science at Secondary Level in Inclusive School"** is organized and reported under the chapters.

Chapter I: The first chapter presents Introduction, PALS, Origin of PALS, The PALS Strategy in the Classroom, Different PALS Techniques, The Benefits of PALS, Rationale of the study, and Scope of the study and Delimitation.

Chapter II: The second chapter presents the review of literature related to the present study.

Chapter III: The third chapter explains the research procedure, which includes the methods adopted in the study, construction of tools, selection of samples, administration of the tools and Data collection procedure.

Chapter IV: The fourth chapter deals with the tabulation, analysis and interpretation of the data in detail.

Chapter V: The fifth chapter reports the findings, recommendations and suggestions. This is followed by bibliography and appendices.

The review of related literature is presented in the next chapter.