Investigating the Impact of Using Cooperative Learning Strategies on Promoting Students' Science Learning in Private Schools in UAE.

دراسة للتحقق من أثر أستخدام أستراتيجيات التعلم التعاوني على تعزيز المستوى العلمي للطلاب في صفوف مادة العلوم للمدارس الخاصة في الإمارات العربية المتحدة

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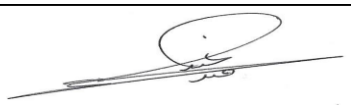
Signature 

Abstract

Since the 1960s, there has been significant attention given to small-group learning approaches in the educational process. Cooperative learning is one of the most significant teaching strategies to have a substantial positive effect. The purpose of this study is to clarify the impact of using cooperative learning strategies on promoting students' learning in science classes.

This study has two groups of participants comprising forty one teachers and one hundred and sixty nine high school students from different private schools in the UAE. A mixed method design was taken towards collecting sufficient data. A quantitative questionnaire was utilized in order to gather teachers' perceptions along with open-ended questions. Their performances were examined, alongside class observational visits.

Results specified that the participating teachers have good pedagogical knowledge about cooperative learning strategies. Furthermore, regarding the collected results which showed that the students gained satisfactory scientific skills but at the same time, they still might need further consistent practice in the direction of improving their academic learning. Consequently, students revealed their interest in learning science as a result of CL activities. Remarkably, the study showed that the teachers who had achieved a Master's Degree in Education had the ability to positively promote students' skills.

Keywords: Cooperative learning (CL) scientific skills, and learning outcomes.

الملخص

منذ عام 1960، كان هناك اهتمام كبير في نهج التعلم من خلال أنشاء مجموعات صغيرة في العملية التعليمية. يعتبر التعلم التعاوني من أهم أستراتيجيات التعلم لما له من أثر إيجابي كبير على الصعيد الدولي وفي دولة الإمارات العربية المتحدة من خلال تعزيز مهارات التعلم لدى الطلاب.

الغرض الرئيسي من هذه الدراسة هو توضيح أثر استخدام أستراتيجيات التعلم التعاوني على تعزيز تعلم الطلاب في صفوف العلوم. في هذه الدراسة هناك مجموعتين من المشاركين والتي تتألف من واحد وأربعين معلم و مئة وتسعة ستون من طلاب المدارس الثانوية من مدارس خاصة مختلفة في دولة الإمارات العربية المتحدة. وقد تم تطبيق طرق مختلفة في اتجاه جمع بيانات كافية من خلال استخدام الاستبيان الكمي لغرض جمع تصورات المعلمين بالأضافة الى أسئلة مفتوحة الاجابة. لقد تم تقييم أداء المدرسين المشاركين من خلال الزيارات الصفية القائمة على الملاحظة التدريسية الدقيقة. بالأضافة الى اجراء الاستبيان الكمي للطلاب لمعرفة أرائهم عن التعلم بطريقة أستخدام التعلم التعاوني.

النتائج الرئيسية لهذه الدراسة أوضحت أن المعلمين المشاركين لديهم معرفة جيدة عن الاستراتيجيات التربوية للتعلم التعاوني، وأن الطلاب لديهم مهارات علمية مرضية. وأظهرت الدراسة أيضا أن المعلمين الذين حققوا درجة الماجستير في التعليم، كان لديهم القدرة على تعزيز مهارات الطلاب بشكل إيجابي.

الكلمات والعبارات الرئيسية: التعلم التعاوني - المهارات العلمية - نتائج التعلم.

Dedication

Writing this dissertation has been one of the great challenges that I have had the chance to experience in my life. This achievement is lovingly dedicated to my parents, who strongly encouraged me to take this leap forward and to improve my career.

A special feeling of gratitude to my dear husband, Ammar, who supported and inspired me to successfully do my best in my career and life. I dedicate this work and give warm thanks to my lovely children Yoser, Omar, and Adnan for always making me smile. This experience would not have been possible without all the support provided by all of you.

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TABLE OF CONTENTS

ABSTRACT ……..……I

DEDICATION ……...…….III

ACKNOWLEDGEMENTS ……...…IV

TABLE OF CONTENTS ……..……..V

CHAPTER ONE (INTRODUCTION) ……1

1.1 Cooperative Learning (CL)...……..……. 1

1.2 The Effects of Cooperative Learning Strategies in Science Education...……..…...3

1.3 Background of the Research……5

1.4 Statement of the Problem…….7

1.5 Purpose of the Study……..…9

1.6 Scope of Work…….....10

1.7 Structure of Dissertation……10

CHAPTER TWO (LITERATURE REVIEW)…….11

2.1 Theoretical Framework ……11

2.2 The Pedagogy of Cooperative Learning……..…...….14

2.3 The Influences of Cooperative Learning on Effective Study Learning……...…….16

2.4 The Benefits of Using Cooperative Learning Strategies……...……...…..19

CHAPTER THREE (METHODOLOGY)……..……..21

3.1 Research Design……...……..21

3.2 Study Population and Sampling……...……24

3.3 Instrumentation……...…..25

3.3.1 Science Teacher Questionnaire (STQ)……...…25

3.3.1.1 Validity and Reliability of the Teachers' Questionnaire……..……26

3.3.2 Classroom Observation ……..……28

3.3.3 Students' Questionnaire……..29

3.3.3.1 Validity and Reliability of the Students' Questionnaire ……..…….30

3.4 Ethical onsiderations……...……..30

CHAPTER FOUR (RESULTS AND DATA ANALYSIS)……..……32

4.1 Demographic Information ……...……...……32

4.2 Teachers' Perceptions of Cooperative Learning Strategies……..…32

4.2.1 Teachers' Perceptions About the Effects of Using CL Strategies on Teaching Instructions……...……..…33

4.2.2 Teachers' Perceptions About the Effects of Using CLS on Students' Learning.34

4.2.3 Teachers' Responses to the Qualitative Data…..……...…34

4.3 Classroom Observations for Cooperative Learning Strategies……...…36

4.4 Students' Perceptions of Cooperative Learning Strategies…….39

4.4.1 Students' Perception about the Effects of Working in Small Groups in Science Classrooms …….....40

4.4.2 Students' Perceptions about the Effects of using CLS on Students' Learning Outcomes ……..40

4.5 Teachers' and Students' Perceptions of CLSQ Based on Gender……..…….….41

CHAPTER FIVE (DISCUSSION AND CONCLUSIONS)…….……43

5.1 Discussion……..…..…….…..43

5.1.1 The Perceptions of the Teachers…….…….…..43

5.1.2 The Classroom Observations……..……..…….45

5.1.3 Students' Perceptions…….…….47

5.2 Conclusion…….…….48

5.3 Limitations ……49

References ……50

Appendices 68

Appendix 1: Schools Permission 68

Appendix 2: Participants Research Consent Form 69

Appendix 3: The Teachers' Questionnaire 70

Appendix 4: Classroom Observation 73

Appendix 5: The Students' Questionnaire.....75

List of Tables

Table 1: Percentage of teachers' demographic information……..…….32

Table 2: Teachers' Responses to the Effect of Using CLS on Teaching Instructions……33

Table 3: Teachers 'responses to the effect of using CLS on students' learning…….34

Table 4: Summary of CLS that were observed in different science classes……..…..37

Table 5: Students' perceptions about working in small groups….…….40

Table 6: Students' perceptions about the effects of using CLS on their learning outcomes ……41

Table 7: Teachers' and Students' Perceptions of CLSQ Based on Gender…….……..42

List of Figures

Figure 1: UAE Federal Higher Education Applications 2004……..… 8

Figure 2: Locating the ZPD – (Lui 2012: 3) …… 13

Figure 3: The research design of the study…….……...24

Chapter 1: Introduction

Autonomous, cooperative learning (CL) represents the essential factors that improve the latest teaching methods (Teng Z et al. 2015). Cooperative learning is one of the most accomplished methods to play an important role in the area of instructional modernization (Slavin 1999). Since 1980, it has been an active pedagogical method and its importance has increased especially in the 21st Century as one of the appreciated instruments in educational institutions during modern times (Johnson, Johnson, and Smith, 2007) CL affords welfare for both schoolchildren and teachers (Shimazoe and Aldrich, 2010). Tsay and Brady (2010, p.78) confirmed that cooperative learning has a significant effect in students' learning through their interaction with each other. In other studies during the last fifteen years, carried out by (Cohen, 1994; Gillies, 2006; Johnson & Johnson, 2009; Slavin, 1996; Tsay & Brady, 2010) they reinforced the role of cooperative leaning in developing positive self-image, community skills and academic success along with the schoolroom atmosphere. Moreover, CL has multi-dimensional advantages, for instance improving students' interactive personal skills in addition to developing low-achievers' self-confidence by sharing different responsibilities (Joyce, Weil & Showers, 1992). Additionally, schoolchildren's mental capabilities will increase towards making better progress along with motivation (Kim, Kim and Svinicki, 2012) as well as their societal progress (Gillies, 2004; Jordan & Le Metaias, 1997).

1.1 Cooperative Learning (CL)

CL is an education that is grounded on a two people or a small-group approach towards schooling that grasps learners responsible for individual as well as team achievement. CL arranges for distinctive learning capabilities designed for students in addition to offering an alternative to competing models of teaching (Johnson and Johnson, 2014). While (Doymus 2008; Hennessy and Evans 2006; Johnson et al. 2007; O'Leary and Griggs 2010) agree that cooperative learning is one of the learning techniques where the students work as a group with the purpose of achieving their targets. Working cooperatively enhances students' thoughts towards knowledge through their engagement with peers or in small groups (Lafont et al. 2007; O'Leary and Griggs 2010). Slavin (1995) considered cooperative learning to be one of the most important strategies to represent an ideal of collaborating groups, building knowledge and to clarifying any misunderstanding in students' thoughtfulness. According to Cheng (2010), CL is a method where a small group of

individuals argue and communicate about their own personal ideas in order to accomplish the goal of the lesson. In this way, each student has to have a role in the activity in addition to respecting others' opinions. Therefore under these conditions students will be able to structure knowledge in different ways by improving their work in a cooperative manner. Akinbobola, (2006) confirmed the previous definitions and he assumed that the schoolchildren with dissimilar levels of skill could participate in achieving the objectives of the topic.

There are many benefits of cooperative learning rather than solely the educational outcomes. One of them is promoting students' social skills positively in addition to the cognitive benefits (Willis 2007). According to Vygotsky's opinion (1987), human participation will help in understanding the progression of a learner through the use of their mental and socio-cultural system. These processes, especially the social ones, have a great effect on the students' development through their interactive cooperative skills. In this situation, there will be a significant value of social constructivism in supporting the implementation of working collaboratively, which will lead to developing the students' success attainment and creativity along with their communications skills in science classes (Johnson & Johnson, 1994; Hackling, Peers & Prain, 2007).

Working cooperatively represents a model of social life through cooperation where the individuals of the community are continuously interacting with each other in order to survive, for that reason these social skills will be valuable in solving some of the problems that students might face in the future. As a result of these social skills, students will be able to define themselves, take advantages from others' opinions and develop their personality along with their national consciousness positively so they can serve their country as effective citizens (Özer Aytekin and Saban, 2013). Additionally, CL strategies have a significant role in stimulating the aims of second language acquisition. This can be achieved via the use of the five necessary elements of cooperative learning activities (Johnson and Johnson, 1999).

Another benefit of using CL strategies which was demonstrated by Meng (2010) who explained the importance of the Jigsaw cooperative learning strategy in understanding many different science experiments as well as the students' interest towards English as a subject. Meng (2010) confirmed that this strategy improved the students' ability to read English correctly and to stimulate their

motivation to do so. This cooperative learning strategy is one of the best active techniques that represents a student-centered, teacher-assisted, affirmative interdependent communication even for the students who study foreign language in Universities. The same strategy had been used by other science teachers where they confirmed the benefits of using CL in their chemistry classes. These teachers concluded that there is a recognizable improvement in the students' academic level through using this strategy compared to the traditional method of teaching (Yasemin et al. 2010). Moreover, in a previous study which was done by Gradel and Edson (2010) in which they highlighted the importance of cooperative learning strategies in addressing both education and knowledge challenges that take place in schools. CL is not only important for students, but for teachers as well, because one of the important studies which has been carried out by (Angela and Rylee, 2013) whereby they support the essential use for a deep implanting of CL pattern language in many of the tutor preparation and professional development programs as well as focusing on the continuous challenge of translating a learning theory into actual training in a large amount of schools.

Cooperative learning has a great effect, not only for schoolchildren and adolescents, but even for college students. Thus a number of authors have been tried to enhance CL in some classes of engineering because it has the ability to improve learning implications (Smith et al. 2005; Terenzini 2001; Pimmel 2001; Haller et al. 2000; Hsiung, 2010; Kaufman et al. 2000; Ohland et al. 2005; Prince, 2004). According to Slavin (1990) there are many methods and strategies that represent CL such as Group Investigation (GI), Student Teams-Achievement Divisions (STAD), Academic Controversy (AC), Problem-based learning (PBL), Think–pair–share, Teams-Games Tournament (TGT), Team Assisted Individualization (TAI) in addition to Jigsaw, Cooperative Integrated Reading and Composition (CIRC) and more. All these approaches help the students to work together as a group towards a better understanding.

1.2 The Effects of Cooperative Learning Strategies in Science Education

Cooperative learning strategies play a vital role in promoting student's knowledge as well as their societal skills which are related to conventional/traditional whole tutorial methods of education (Adeyemi, 2002; Kolawole, 2008; Adesoji and Ibraheem, 2009). CL administers greater

knowledge outcomes in science classes through improving learners' thinking and constructing their thoughts about science content via building up and spreading the topic's knowledge (Lin, 2006). In addition to stimulating learner engagement as well as improving their scientific thinking progressions, particularly for young schoolchildren who are under eighteen years old (Souvignier & Kronenberger, 2007). Many studies illustrate the advancement that students achieved in science classes through their cooperation and collaboration together. These accomplishments include schoolchildren's creative thinking and community skills (Johnson & Johnson, 1994; Hackling, Peers & Prain, 2007).

In other research, carried out by Saka (2010) indicates that cooperation skills between the students which take place before the teacher's intervention have the capability to improve student's aptitudes in learning science by themselves through their arguments and cooperation. Learning through arguments and conversations lead practitioners on the way to success in science knowledge procedure (Chin & Osborne, 2008). In addition to providing deep learning via developing the students' abilities as well as their thoughts, then using these skills in different steps in the scientific methods and other approaches. These results, which are related to working cooperatively and to guided discussion in science classes are confirmed in many different studies such as those carried out by Hogan et al. (2000); Zohar & Dori (2003); Liang & Gabel (2005); Schaal & Bogner (2005); Dymond & Bentz (2006); Hourigan (2006); Cammarata & Tedick (2007); Fitzgerald et al. (2008).

Andrew and Alexandria (2015) confirmed the schoolchildren's positive outcomes by using Think-Pair-Share cooperative learning strategy. Using this method, students are able to discuss and solve different types of questions with sufficient time, which will help the students to improve their learning skills, (especially the low achievers) in addition to reducing their anxiety in answering challenging questions. Furthermore, CL has the aptitude to be responsible for providing more opportunities to improve better collaborative abilities, interactive skills plus enhancing the pupils' achievement in the direction of a higher level (Bobbette, 2012). CL strategies are considered as one of the most effective ways in understanding physics topics. Schoolchildren's skills are developed by using many of these strategies along with the help from stakeholders in coaching the

students especially at secondary school. This method showed a noticeable improvement for the students in physics classes (Adetunji, 2010).

Demirci (2010) proved as a result of his research study that teaching by using cooperative learning methods progressed the students' attitude as well as their accomplishment towards science. Demirci's results have been confirmed with other studies by Candaş Karababa's (2009) and Doymuş (2009). Additionally, these instructional strategies will also increase the students' motivation successfully towards a better result in the future (Huang et al. 2010). The human societal survival, which builds positively through working in groups will be beneficial for every individual in a group and this will lead to a better performance for the students in different topics (McLeish, 2009). The students' interaction helps them in sharing the knowledge of the lesson, consequently the reciprocal dialogues between the students will support them in clarifying their thoughts in different ways of thinking (Gillies, 2004).

1.3 Background of the Research

The statement, "What the child is able to do in collaboration today, he will be able to do independently tomorrow" (Vygotsky, 1987) is of important value in forming a rationale for CL. Slavin (1992, p.162) elucidated that, ''Students will learn from one another because in their discussions of the content, cognitive conflicts will arise, inadequate reasoning will be exposed, disequilibrium will occur, and higher quality understandings will emerge''

Many researchers have completed their studies in different areas of cooperative learning strategies whereby they explained the affirmative effects of these approaches in students' achievement, skilled communication as well as their psychological health (Slavin, 1995) and (Sharan, 1980) in addition to (Johnson & Johnson, 1989). These results were also confirmed by (Bossert, 1988) and (Cohen, 1994). In this type of strategy where the students work together, they are receiving a great experience through debating, arguing and explaining their understanding about different types of notions between the members of their group through giving and taking new information. As a result, they will be able to build a strong base for their knowledge by relying on each other without waiting for the teacher's explanation (Cohen, 1994). The previously referred to authors believe

that when the students work cooperatively they experience the means of gaining the correct language along with their capacity to discuss and argue with others in any educational field.

Moreover, Johnson & Johnson (1989) explained in their study that students are not born with interaction abilities but they can gain these social skills by working together. These skills play an important role in the schoolchildren's future. Slavin (1990) recognized that the students with confident feelings towards themselves have the ability to decide their own future in school, in addition to spending a longer time on their task. They also have a developed level of cooperativeness, humanitarianism and selflessness.

The resulting effects are that the students achieve positive educational accomplishment and have a higher level of self-confidence and self-respect towards each other along with their social skills, as confirmed by the research study for (Slavin, 1983). Additionally, Newmann and Thompson (1987) have improved and documented a high percentage of progress in the schoolchildren's outcomes where CL strategy is taking place. This confirmed that cooperative learning strategies have a significant pedagogical effect in many areas. Another positive evidence that agrees with this method occurs via the students' involvement in small groups while carrying out their activity in any chosen task. These students must share their ideas with other members and this will enhance their thinking skills in addition to conversation that will promote their ability to gain further information and achieve the target of the lesson (Matthews et al. 1995; Noddings, 1989).
Working cooperatively in activities affords the students more detailed clarification. Furthermore, students in CL schoolrooms enjoy the topic parts and doing better and moving further than other learners (Slavin, 1990) when they work in small groups or with peers. In addition student-centered strategies motivate them to develop their ability to think critically through argumentation (Johnson et al. 1973.) Together with immediate feedback regarding the students' thoughts in order to contribute to the conversation (Peterson & Swing 1985). Also, interpersonal communication talents can be developed clearly through the CL strategies accompanied by positive emotional feelings towards the group members and their tutors through working in cross-cultural situations. These relationships between the groups can be developed and continued outside the classroom as well through their positive beliefs in the direction of upcoming communications. Additionally, students have the capability to appreciate their classmates and friends' perspectives. Their positive

ability towards negotiation and solving issues with others, along with developing methods to manage conflict in advance represents a vital part of this progression. In regards to, psychosomatic health, students who have the aptitude to work with others cooperatively are much healthier than others. At the same time, they have greater self-esteem and confidence (Slavin, 1983). Moreover, schoolchildren who work collaboratively have better feelings about themselves, while other students who cannot work together will have negative feelings about themselves. This happens especially in classrooms with traditional methods of teaching.

1.4 Statement of the Problem

At the present time, in the 21st Century, most countries have a significant concern in regards to students' learning. One of these countries is the UAE. According to His Highness Sheikh Zayed bin Sultan Al Nahyan, President of the UAE (1971-2004), "The wealth of any nation is its intellectuals; and the progress of peoples and nations is judged by the level and extent of education they reach." The UAE's target is to remain viable in the evolving global knowledge-based economy. This is a challenging aspiration and emphasis needs to be given to the quality of education where many important factors should be included, such as cooperative learning strategies, critical thinking, motivation, self-study and reasoning skills. These factors will play a positive vital role in students' achievement (KHDA 2013) as well as in the requirements of the job market. The amount of institutions representing higher education in the UAE is increasing gradually with noticeable progress. This is taking place as a result of the educational transformations in UAE's schools.

Lecturing and memorizing present a weak technique in education. This has to be changed into other appropriate teaching methods where brainstorming, working in small groups and creativity are involved to develop the students' outcomes. Most of the elementary and secondary schools in the UAE are trying their best to embrace other teaching methods, particularly in the main subjects in addition to engineering and science education (Daniel, 2004). If schoolchildren do not succeed in reaching this goal, their opportunities in finding a suitable job in the future will decrease. The United Arab Emirates is one of the countries that has made a great effort towards this target, in order to prepare their students for a better higher education and to develop the students' career in the future.

The Ministry of Education has recognized that a low percentage of the students in the UAE are willing to enter University because there is a lack of preparation especially in the main subjects in schools; Science, English and Math. Therefore the UAE is spending a great amount of money (more than 300 million dirhams), for the students' preparation programs (Meraj, 2004) otherwise students will choose non-technical majors as their career in college (See Figure 1). The Minister of Education said, "We want students to think creatively and not just memorize to pass exams. We want to develop their skills, and we want students to be active partners in the educational process" (Nowais, 2004).

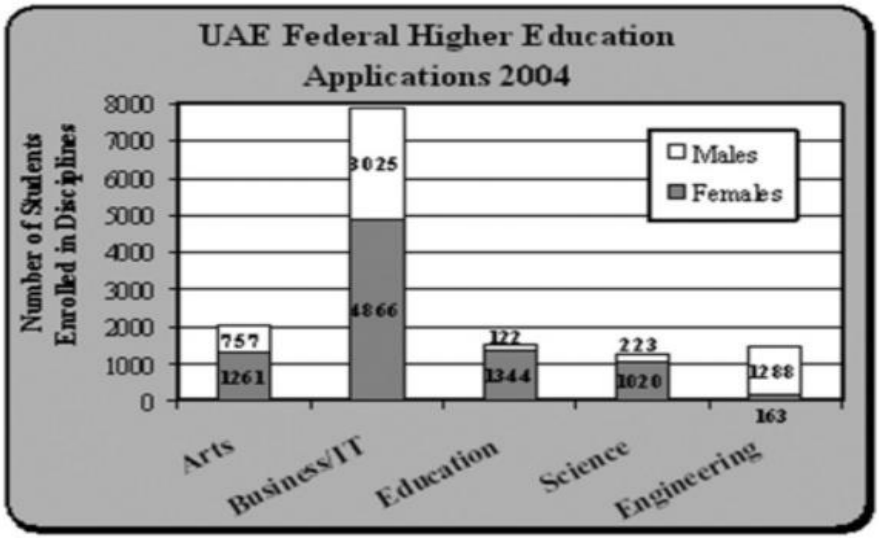

Figure 1: UAE Federal Higher Education Applications 2004.

Cooperative learning strategies have a major role in educational transformation. By using this strategy, mixed abilities of students can work together and benefit from each other and through their conversation they will be able to gain social skills, which will improve their personalities and help them to express their thoughts in different ways with confidence. Moreover, they will keep individual responsibility as well as enhancing the interdependence between them positively (Johnson & Johnson, 2008; Millis, 2010). Another reason for the importance of CL in learner's education is that each member of the group has a vital role in helping other classmates to understand the objectives of the lesson thus generating an atmosphere of success. Learners work together until all the participants of the group effectively and successfully understand the topic (McLeish, 2009). More than one school will participate in this study, in order to ensure that these

schools are implementing cooperative learning strategies and to check the different ways of implementation in their Science classrooms. This will create a true result from a variety of points of view. According to the KHDA's high standards, students should collaborate enthusiastically, in addition to their full participation in the topic and they have to express their ideas confidently. Moreover, various research has presented the negative outcomes of the conventional method on a large number of the schoolchildren (Sotayo, 2002; Gok & Silay, 2008).

1.5 Purpose of the Study

The target of the study is to investigate the impact of using cooperative learning and guided discussion on promoting students' learning in science classrooms. The study will take place in different science classrooms in Dubai schools in the United Arab Emirates. Classroom observations, teachers' perceptions as well as students' perceptions will be taken into consideration in this study.

The study is being conducted to answer the following main question:

What is the impact of using cooperative learning strategies on promoting students' learning in science classes?

In a previous study which was carried out by Özer Aytekin and Saban (2013), they found that some teachers do not have enough information about cooperative learning strategies and how to use them in advicing students' learning. Therefore there is a major need to conduct this study in order to illuminate some of the points that are not clear for a number of teachers. Additionally, since 1970 there has been significant interest in CL because of its importance in enhancing and increasing the scientific literacy and the academic achievement of the students (Lewis et al. 2013). Capar and Tarim (2015) confirmed in their study that CL strategy is one of the successful methods that has a positive effect on both students' learning and their attitudes as well.

1.6 Scope of Work

According to the writing above, there is great importance given towards implementing cooperative learning strategies in science classes with the aim of developing students' education. The target of this study is to explore and explain the impact of using cooperative learning strategies on promoting students' learning in many and different levels of science classrooms. Moreover, learners' experience and knowledge in the light of their opinions of cooperative learning activities will be examined as a lens to observe and discover the impact of CL implementation on their achievements in science topics. In order to collect data and to reach the correct results, mixed method design will be embedded in this study.

1.7 Structure of the Dissertation

This study consists of five main chapters. This chapter shows the key to the study, which includes the meaning of the essential notions, rationale and the purpose. Together with the importance of the study in focusing on the research question, as well as placing emphasis on the scope of this work. The second chapter will focus on the literature review that clarifies the results of what has been found and written about cooperative learning strategies and its forms, and also its impact on students' outcomes. The third chapter explains the different types of methodology, which will be used to collect the data. This chapter also includes the practical work which will represent the means of collecting the data. The next chapter will explain all the details that are related to the data analysis and the results, whilst the last chapter summarises the whole study through the conclusion and the discussion of the study along with the findings and the recommendations.

Chapter 2: Literature Review

The main target of the present study is to inspect the impact of cooperative learning strategies that the science teachers are implementing in their classes on students' learning. Different points of view will be represented by a literature review that is related to the effects of CL on students' knowledge. The literature review includes four key sections; the first one focuses on the theoretical framework, whilst the second section covers the pedagogy of the cooperative learning, followed by the way that CL influences effective study learning in section three. The last section shows the benefits of cooperative learning.

2.1 Theoretical Framework

The statement, "What the child is able to do in collaboration today, he will be able to do independently tomorrow" (Vygotsky, 1987) is of substantial value in founding a basis for CL. The important features that play a vital part in children's learning are collaboration, cooperation and communication (Vygotsky, 1978) and (Piaget, 1959). According to Williams and Sheridan (2006: 84) "children learn through, among other things, collaboration and togetherness". These factors boost students' capacities in both learning and increasing their educational successes positively, as they practice in both confidence and a helpful educative environment (Lovat & Toomey, 2007). Through working in groups, this will lead to achieve the idea of the area of proximal growth which is based around the notion that a more advanced peer teaches a less advanced peer in a societal environment (Vygotsky, 1978). Piaget (1926), evidenced that working cooperatively with varying abilities of students will lead to benefits such as a higher level of value understanding and cognitive conflicts between the learners that expose the group members' mistaken belief. Another opinion from a famous scholar is that there are several chances for the students, through cognitive learning, where they can make advantages from other classmates with the purpose of achieving a sophisticated cognition (Bandura, 1971). While according to the theory of Vygotsky (1978) where he put his attention to stimulating the cognition of the students through the interaction between them, which should happen in a healthy learning environment and via collaboration with their peers as well. This interaction can be created and applied by the use of many CL activities, for instance: Numbered Heads together, Think-Pair-Share (TPS), jigsaw, etc. Consequently, students

have to construct a related actual and communicative framework, which is considered as one of the crucial factors to have a great effect on students' interaction with different individuals along with numerous features like constructive peer interaction in addition to an energetic education as well (Ovando et al. 2006). There is a great opportunity of increasing and developing the constructive interactions between the learners by the use of cooperative learning training for a short period of time (Golub and Buchs, 2014). Cooperative learning is considered as a constructivist strategy that is correlated to the active education which had been substantiated by Forawi (2014, p. 41) in which he contends that, "Constructivism is the dominant paradigm of learning in science, and a large amount of science education research has been carried out from a constructivist perspective." CL recommends that schoolchildren should play an important role in their learning process through participating in it independently without depending on lecturing which comes from the teacher in the class. This method makes the educational journey more beneficial and meaningful for learners. In addition to enhancing the level of the cognitive growth for the learners by conflict decisions (Murray, 1994) along with gaining the experienced attention conflict (Hsiung, 2012). According to the theory that is connected to the development of cognitive ability, it is essential that cooperation must be ahead of cognitive progression. A number of varied and different opinions come from many individuals' efforts to achieve shared aims to help in cognitive growth. Additionally, CL has the capability of developing constructive interactions, which will lead learners to build knowledge. CL can support learners in asking a lot of meaningful questions in addition to supporting and assisting their classmates (Golub and Buchs, 2014). Vygotsky and Piaget saw CL improve the ability of peers and trainers as well. As a result of this plan there will be a cognitive improvement as well as intellectual development (Johnson, Johnson, & Smith, 1998). Fogarty (1999) reveals that, "Vygotsky's theory states that we learn first through person-to-person interactions and then individually through an internalization process that leads to deep understanding" (p.77). The Zone of Proximal Development (ZPD) represents the theory that Vygotsky developed, related to the procedure of education via the CL strategy. Vygotsky (1978) clarified the ZPD as, "the distance between the actual development level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or collaboration with a more capable peer" (p.86) where it is explained in figure 2. There is a difference between the actual development and the potential development, the first one consists of the student's abilities individually, whilst the second one

represents some skills that the learners will gain through working with peers in different groups (Lui, 2012). Vygotsky (1978) gives emphasis to the significance of the ZPD along with the social interaction that is applied in the procedures of learning with the presence of the students. One of the researchers that benefits from Vygotsky's theory is Roosevelt (2008) where he proposes to keep the students in the ZPD through providing them with the exciting, motivational and substantial learning.

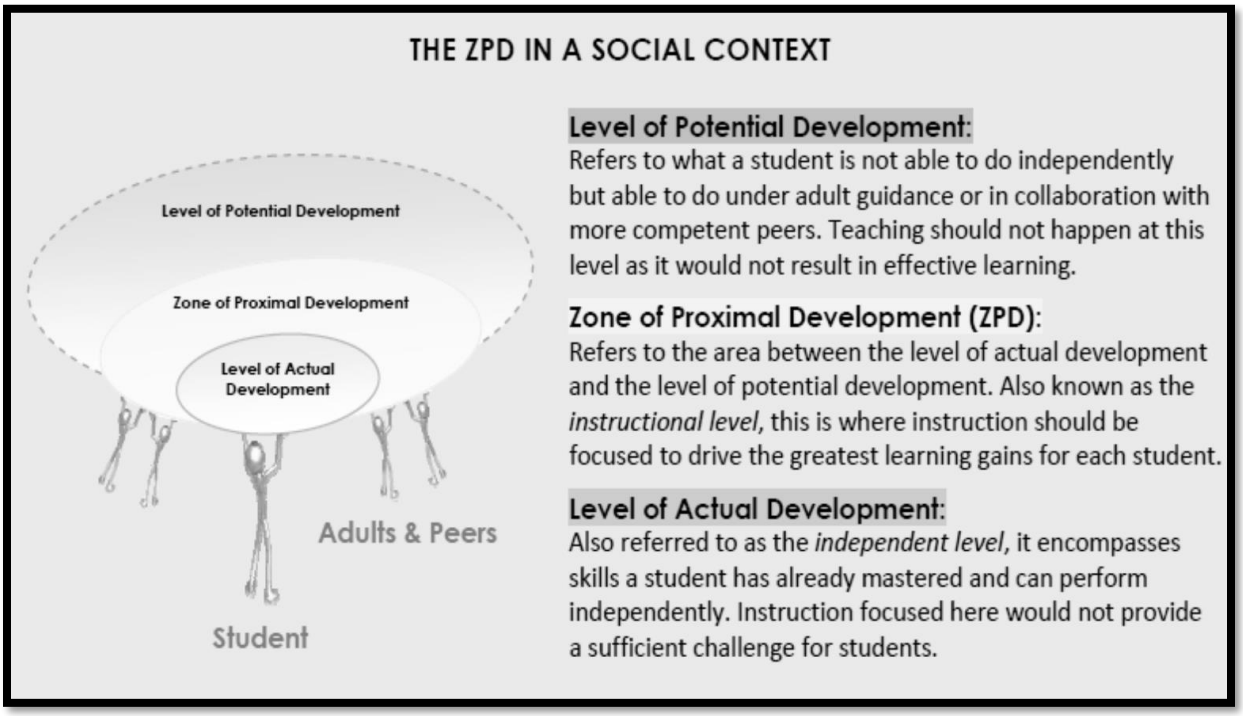

Figure 2: Locating the ZPD – (Lui 2012: 3)

In his study, Vygotsky (1978) depended upon children's interaction accompanied by their environment, whereby he assumed that these factors play an important role in helping children learn and grow. Vygotsky advised that during the educational period, the child has many opportunities to gain a variety of skills and assistance from teachers and colleagues where they can promote the child's ZPD. The support procedure is named scaffolding. This term refers to the help that the children receive in order to complete the tasks that they are not able to do without assistance. This enhances the students' learning positively through developing knowledge (Li and Lam, 2013).

2.2 The Pedagogy of Cooperative Learning

Pedagogy is one of the main factors that are correlated to the quality of teaching and learning along with the faculty recruitment and the quality of education (Abaalkhail and Irani, 2012). Quality pedagogy has a great effect on the requirements of quality education because it measures the necessities that are of paramount importance. Henard and Roseveare (2012) clarified quality teaching as a practice of pedagogical skills in order to generate the appropriate educational results for the learners. These methods subsequently produce active and positive teaching outcomes. In pedagogy, there is significant attention given towards a particular schooling methodology, which many educators are searching for in order to get the best out of learning. This can happen through the construction of students' understanding when they are vigorously and enthusiastically involved in a topic (Gradel and Edson, 2010) and (Mestre and Cocking, 2002). CL symbolises one of the teaching and learning strategies. It started three hundred years ago and has since developed through the years to become one of the most important techniques that many tutors are searching for. According to Sharan (1980), CL is presented as a number of different instructional and educational plans, in which a small number of students are sitting and cooperating in a group with the purpose of understanding a topic. In this process, students will give attention to the knowledge of each member of the group, in addition to collaborating together in the direction of working for a specific shared target (Sharan, 1980; Johnson & Johnson, 1999). Slavin (1980, p.315) defined cooperative learning as, "the term that refers to classroom techniques in which students work on learning activities in small groups and receive rewards or recognition based on their group's performance." From another point of view, Cooper and Mueck (1990) specified CL as a guarantee system that targets the essential education environment through a particular instructional policy where small groups of different levels of students are working together to grasp a common objective.

Roon, et al. (1983) clarified that cooperative learning is one of the most important education structures where students' aims for success are positively associated. This strategy has the ability to promote creative thinking where the students produce new thoughts and schemes as well as solutions (Johnson and Johnson, 1989). In addition to the positive effect that had been evidenced by Roon through using CL strategies in the courses that he implemented in his laboratory for his students that he taught in their first year (Roon et al., 1983). It is an investigator's opinion that CL has the capacity to increase the students' intellectual capability. Felder (1996) realized that many

of the learners come to be so trained in the direction of working in teams and the gained data that was implemented adapted into other courses. In the same study, Felder concluded the high average of the gained knowledge through the use of cooperative learning strategies. He confirmed via his research study that this procedure had the goal of altering the ethics of the students' work through relying on pedagogies of engagement between the students, which is considered as one of the important factors for CL strategy where the teacher's role was represented in developing the learners' experience (Felder and Brent, 2005). Sharan (1980) proved in his research study that the procedure of collaboration and cooperation by connecting to each other in the same group has a great positive effect on both the educational acquisition for the students in addition to their cognitive leaning as well. Moreover, the self-evaluation maintenance model which was carried out by Tesser and Campbell in 1982, whereby they evidenced that the students developed an attitude towards comparing their performance and critical thinking skills with other classmates in their cooperative group. This will positively promote the behaviour of the students.

One of the benefits of this strategy is the knowledge and the understanding that the students can gain in the journey of education. In this case, teachers will play a vital role towards providing the students with a framework via clear and direct training of social interface, allocating duties along with the essential sub-tasks when they are working as a group (Hartman, 2002). Additionally, CL confirms the significance of "communicative capacity" (Lovat, 2005), which has the ability to construct a strong connection between the members of the group depending on a trust established between them by inspiring each other. In the near future, this allows children to explore the thoughts and views for them and for their classmates as well (Lovat & Toomey, 2007). Large studies were released and accordingly revised the literature that is related to CL (Slavin, 2014; 2008, Johnson and Johnson, 2014; 2009). As a result of all these research studies, there is significant evidence about the positive learning outcomes for the students, which inspire the teachers in all schools to put the cooperative learning strategy into operation. Specific results came from Johnson & Johnson (1989) when they illustrated in their study the improvement of the students' attitudes towards professors and topic parts as well. Furthermore, students will have the capacity to reach a higher level of critical thinking skills along with understanding.

CL is considered to be one of the common methods that is connected to effective pedagogy, which had been ascertained in the research study by Mina and Miranda (2010) whereby they showed that involving the students in the cooperative learning strategy represents a robust predictor of a learner's academic achievement. Moreover, there is an important progressive relationship between the students' degree and his/her academic achievement with the positive contribution in cooperative learning strategy in the schoolrooms, which symbolises as a strong indication of the learner's performance on willingness valuation exams. According to Williams and Sheridan (2006) cooperation is indicated as a crucial component of "pedagogical quality." Therefore, teachers must think seriously about implementing the cooperative learning practices in their preparation for their classes in order that students will be able to focus on these positive skills in the direction of progression.

2.3 The Influences of Cooperative Learning on Effective Studying of Learning

Science has become a part of our daily life. People nowadays are paying a lot of attention to developing scientific culture from its first stages where the researchers are involved in it, to the changing and growing stages where individuals can benefit from it (Gransard-Desmond, 2015). Therefore, science is important not only within school time but outside of it as well, where it can produce the potential to create an environment in which schoolchildren have the capacity to participate in different activities that are focused on the scientific field, linked to their endless interests (Polman and Hope, 2012). Science plays a vital part in several different countries where they use it to teach younger (preschool) children because of its importance. This enables children to gain an understanding of many concepts and ideas, which are related to scientific language. As a result of this, children will have a great opportunity to stimulate the growth of scientific notions on the way to scientific thinking (Andersson and Gullberg, 2012). According to a research study which had been clarified by Eshach (2006) and Sjøberg (2000) in which they evidenced that there is an interest and enjoyment, especially for young children in discovering, examining and studying their environments. This interest will help them to improve their abilities in the future along with developing their skills towards differentiation, discovering, documenting, and posing inquiries that are related to discussing science. (Lpfo¨98 revised 2010, p. 10).

There are various strong indications that cooperative learning has an active effect in developing and improving the gained skills and results for the students as well as increasing the value of the academic learning (Gillies, 2003; Johnson et al. 1981; Johnson & Johnson, 1994; Johnson, Johnson, & Smith, 2000b; Slavin, 1995, 1996). Through working as a team in order to accomplish shared aims (O'Leary and Griggs 2010) and searching for clarifications, understanding, definitions and constructing a product by working in pairs or in small groups (Erlandson et al. 2010). An important result which had been collected by (Yildirim & Girgin, 2012), they substantiated that the teaching method which relies on working cooperatively and creating student-centered groups has an additional positive outcome on the learners' academic success compared to the teaching method which depends on following the teacher-centered method. In this case, schoolchildren will be able to maintain sustainability as well as improved performance particularly in their homework and tests (Hsiung, 2012). This strategy can also develop the harmony between the students in the schoolroom along with their self-esteem and it will be easier for the learners to connect with the topic (Li, 2012). One of the strategies that showed a significant progress in students' outcomes is the "Think-Pair-Share" strategy where the learners can make a positive advantage from thinking and working cooperatively in pairs then sharing the results which will help them to save time as well as explaining the findings to their peers. Furthermore, it will decrease the students' anxiety, particularly for the learners who are below the average level of success (Andrew and Alexandria, 2015). Another strategy of CL called Jigsaw, has the ability to enable all the students to become experts in a particular part of the topic within the group. Then each learner has to take the position of the teacher to clarify and explain his/her part of the lesson for other learners in the same group. As a result of this strategy, students will gain the benefits of varied skill, knowledge and an understanding group working (Slavin et al. 2003) along with avoiding a lot of other difficulties for the learners that are working in a team (Doymus et al. 2010). Karacop and Doymus (2012) indicated the positive outcomes of increasing the academic achievement for the learners by using this strategy especially in chemistry classes. Problem-solving strategy is another successful strategy that has been proved to have a lot of advantages towards students' learning. A proven finding, which had been collected by Femi (2010) found the vital positive effect on learners' achievement at secondary level in science and practically in physics through using this strategy. The results from this examination indicated that all physics teachers must use CL strategy in their education process. Additionally, it is recommended that teachers of other subjects should

implement this strategy in their programs. Cooperative learning strategy has been reinforced also by Tsay and Brady (2010) where they evidenced that there is a noticeable progression in the learners' academic results when they work cooperatively with peers or in small groups. This strategy will help them to obtain a higher score in their assessments and their final tests as well as gaining valued knowledge and experience. According to Saka (2010), using CL along with the guided discussion methods in different science classes afforded the learners with a higher level of educational achievement growth. Thereby gaining the opportunity for eliciting ideas as well as developing the students' qualified abilities in association with the skills that are related to the scientific procedures about active science education. This process of teaching should take place in the Faculty of Education before the real educating in classrooms where Angela and Rylee (2013) found that the level of information and knowledge for each teacher plays an important role in deciding the significant effective factors that will be implemented in the tutorial room and lead to developing the students' learning. Furthermore, training of the faculty members will translate the learning philosophy into an adequate process on a greater range in schools in addition to providing specialized development courses. Orlich et al. (2011) showed that qualified teachers have the ability to provide their learners with different types of teaching strategies with the purpose of developing their academic outcomes. They highlight that, "reflective teachers incorporate social aspects in their instructional planning. They cognitively make the necessary adjustments in their instruction so that all students have an opportunity for success." (Orlich et al 2011, p 17).

When students work in cooperative teams, they increase their abilities in regards to improving their social competence. This will have a significant effect in improving their educational success as a result of receiving knowledge from other classmates (Bratt 2008; Lafont et al. 2007; Thurston et al. 2010). Further studies have been implemented in order to find out the effects of using CL strategies on learners' achievement. Effandi & Zanaton (2007) revealed that this strategy has the ability to put the students in an active situation containing more ideas to share together with working and cooperating with each other on the road to completing educational tasks. Additionally, when the learners are working together, they have an opportunity to support other classmates with the aim of improving their personal knowledge and that of others (Johnson & Johnson, 2001; Jolliffe, 2007). Bobbette (2012) focused on increasing learner's appreciation of literature, together with strengthened societal abilities of working cooperatively through the CL approach. He proved that teachers can teach cooperation as a key skill through using specific

methods that include age suitable resources addressed on the cooperation subject. Consequently, there will be a noticeable positive effect in enhancing and reinforcing cooperative learning strategies in the schoolroom. Several trained teachers have demonstrated students' development outcomes where they considered these findings as a result of implementing CL strategies in their classrooms (Sears and Pai, 2012). The opinion of several teachers has been surveyed and studied in search of the opportunity of a successful application for CL where the conclusion of this study specified the affirmative possibilities and expectations for the teachers when applying CL (Al Yaseen, 2011).

2.4 The Benefits of Using Cooperative Learning Strategies

According to Orlich et al. (2011), the main goal of teaching and learning is to assist and support all schoolchildren to be effective citizens in the future through increasing their positive abilities to gain important skills and talents. This can be achieved by supplying them with the important information, abilities, performances and helpful working practices to support them to acquire an occupation, which will help them to be a part of society's progression. Using cooperative learning strategy can assist students to become motivated, take part in educational activities and raise their attention span, along with supporting them in acquiring the skills to view different aspects in the surrounding world through other individuals' perspectives (Ebrahim, 2011). Accordingly, the students capability to empathize with others increases and they will be able to accept and help other students with different needs such as special education and guidance. Moreover, it offers the students lots of opportunities to obtain further information by learning others thinking, in addition to assisting them in developing leadership capabilities through respecting other classmates thoughts, accepting differences and debating with other students. Therefore, they will have the ability to communicate with others in a democratic society (Özer et al. 2013). Creating, working cooperatively and evaluating is considered as part of the essential factors required for 21st Century skills where learners can build higher-quality reasoning. By changing their individual effort into group work assists in producing the strategy of critical thinking and problem solving through collaboration and teamwork (Gradel and Edson, 2010). Furthermore, cooperative learning strategy has the ability to provide the students with a great experience by learning from each other's trial and error and the affiliation to a team (Dietz-Uhler and Lanter, 2011). As a consequence, students

will be more active in participating in the particular subject in addition to turning the learning context into a student-centered context and this will become regular instruction in the tutorial room (Schul, 2011). This might aid the students in minimizing their concern and the anxiety of making errors, which will lead to developing their confidence and self-efficacy. As a result of the students assured contributions in class, a healthy educational environment with diversity in the learning method where thoughts and notions can be stated along with developing understanding, imagination, awareness and decision-making talents will be produced (Andrew and Alexandria, 2015). Additionally, this strategy can help learners who are below the advanced level to obtain a higher level of positive skills that are related to critical thinking skills along with the problem solving. It assists the teacher in immediately helping students who are suffering from difficulties with the learning process because he/she will more easily notice the learners who need support. (Özer Aytekin and Saban, 2013) The students who learn by using cooperative learning strategy show a positive attitude to progression in their science classes (Demirci, 2010). The author confirmed the effective use of this approach in improving the learners' attitude along with increasing their success. A lot of researchers had established this result in their study: Doymuş et al. (2009), Demir (2008), Arslan et al. (2006), Doymuş and Şimşek (2007) and Doymuş, Şimşek and Karaçöp (2007).

Chapter 3: Methodology

Based on the literature review, there is a necessity for further investigation of the cooperative learning in the UAE. Two private schools in Dubai that are following the American curriculum were involved in this study. The study put a spotlight on the impact of the cooperative learning strategies on students' learning. Different types of instruments have been applied to target this goal in order to measure the development of the students' learning abilities (Lai & Viering 2012) which might have a significant effect on their success in the future. The study took place in different grades of science classes in the secondary level over a period of three months with participation from forty one teachers who have experience in implementing the strategies of cooperative learning in their science classes. Students also participated in the study. The methodology will describe and include the key points of the research approach that represent the outlines of the study. In addition to clarifying the methods of the data collection and of the result's calculation (Howell, 2013). This branch of pedagogics will utilise the research design, together with the methods in order to make the correct methodology.

3.1 Research Design

This section refers to a set of procedures that are used in conducting this study. In order to target the purpose of the study, a mixed methods research paradigm (Luck et al. 2006; Yin 2009) on pragmatic grounds (Creswell 2012) has been chosen to investigate the impact of cooperative learning strategies and to determine its effects on students' learning. In this research study, a mixed method approach has been used in order to answer and elucidate the study question in addition to fulfill its purposes. Therefore, there is a rationale for choosing the use of a mixed method which has been represented through philosophical assumptions where there is a noticeable positive result in covering every solitary method. This is accompanied by gaining a high level of advantages via using qualitative and quantitative benefits in order to reach into further range and depth by understanding as well as cooperation (Johnson, Onwuegbuzie & Turner 2007). This rationale provides the intention of increasing both the validity and reliability of the outcomes (Creswell 2009). Thus, the research interpretive outline relies on the philosophy of pragmatism where their applications have a priority of attention on the research outcomes (Creswell 2014). This study

requires implementing many approaches to collect adequate information to best address the research problem, and deeply understand all its aspects (Creswell 2014; Fraenkel & Wallen 2012). Additionally, both teachers and students are involved in this study where their perceptions play an important role. For that reason incorporating several measures by using a mixed method approach in gathering statistics is suggested on the way to a complete acknowledgement (Creswell 2008). This study will rely on the results from two different schools in Dubai by using the mixed methods approach which is defined as "an approach to inquiry that combines or associates both qualitative and quantitative forms" (Creswell 2009, p.4). Through this method, the research question can be clarified to justify the purpose of the study. The analytical outline of the mixed methods rely on the philosophy of pragmatism which deals with solicitations that have the ability in solving problems in addition to concentrating on the conclusions and the outcomes more than other previous situations (Creswell 2014). Therefore, the main reasoning behind executing a mixed methods design is having the logical norms that can provide many advantages via using quantitative and qualitative methods as well.

A concurrent embedded approach will be used in order to assemble data through both qualitative and quantitative methods, which enable a mixed method approach with the aim of determining any convergence in the process of comparing two databases (Creswell 2009) which is considered important in the, "concurrent triangulation approach" (Cresswell 2009, p. 213) aimed at justification, affirmation or cross-validation goals (Steckler et al. 1992). The concurrent embedded strategy offers both guidelines and support in its processes along with two diverse images that arrange for a complete composite assessment that is related to the problem of the study (Creswell 2013 , p. 214). Furthermore, this strategy has the ability to provide affirmative results when the researchers choose to apply more than one method in order to study various groups or levels (Creswell 2013, p. 215). At the present time, this strategy is known as, "convergent parallel mixed methods design" (Creswell 2014, p. 219). The target of this strategy is to measure the difference between qualitative and quantitative evidence through a variety of perspectives.

There are several stages that will be included in this study. Firstly, the data will be collected by asking the science teachers about their perceptions via quantitative method at the start of the first term using the teachers' questionnaire. Secondly, classroom observation will be used as a qualitative tool, on the types of the cooperative learning strategies that the teachers are

implementing in their classrooms. The data from both qualitative and quantitative methods will be collected at the same time in the second stage of the study. The last stage will be related to the secondary students' perceptions about the CL strategies that they are using for their learning. The collected data will present adequate information with the purpose of answering the question of the study, 'What is the impact of using cooperative learning strategies on promoting students' learning in science classes?

There are two types of data in this study. The first one is the quantitative statistics, which illustrate the guidelines of the study and is represented as the primary data. Whilst the second type of data is represented as a supplementary procedure through conducting the quantitative data (Creswell 2009). Hence, the quantitative data in this study presents more weight than the other data which will assist in reporting the predictable results, despite the fact that the other data is inserted within it in order to discover the cooperative learning strategies that are applied in the science classes. According to Johnson & Christensen (2012), the amalgamation of more than one type of data has the capacity to help the researchers in providing a full general image for evaluating the problem of the study by gaining different perspectives. This figure represents all the steps that have been used to gather the data for the study.

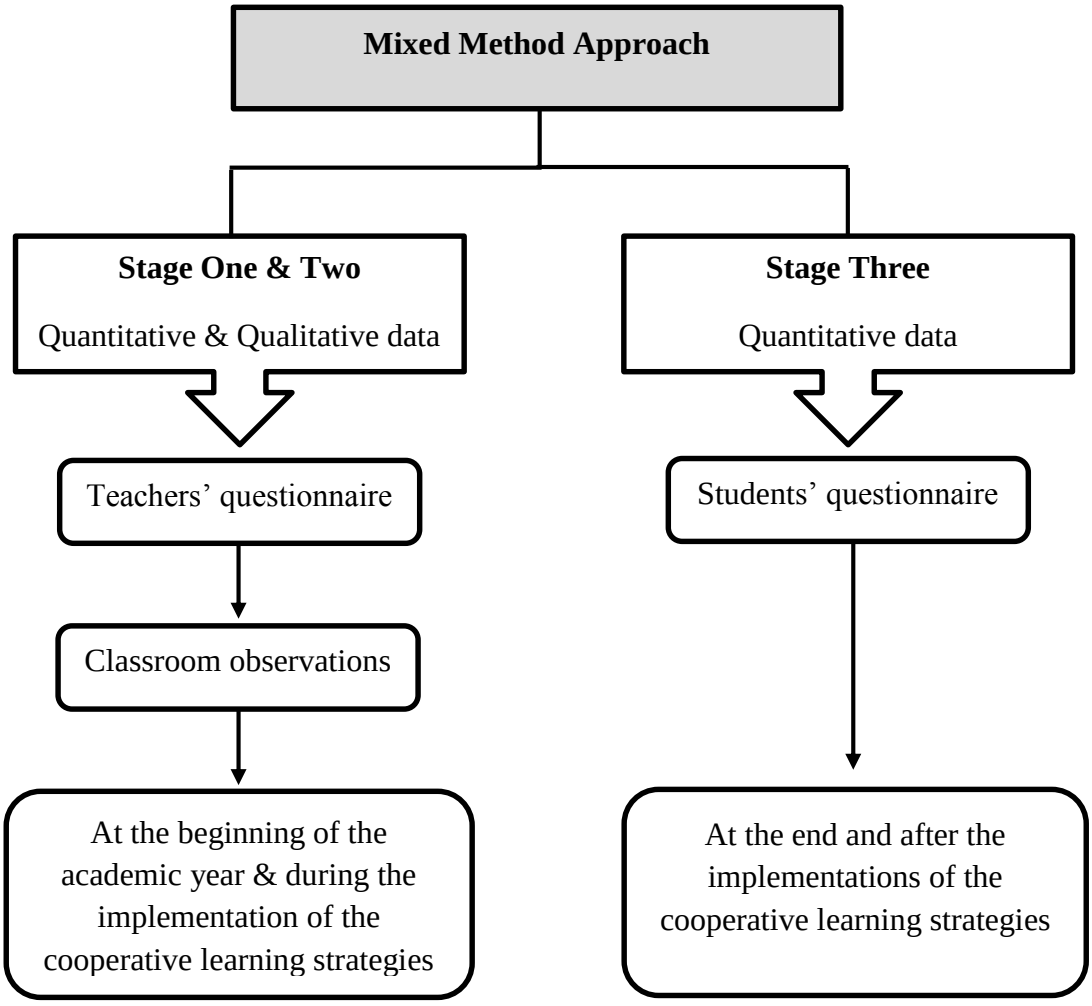

Figure 3: The research design of the study.

3.2 Study Population and Sampling

Study population is clarified as a full set of components that contains analogous features on the subject that is related to the standards of sampling (Mertens 2010). In this study, the investigator needs to deal with a subgroup of the entire subject population (Mertens 2010) which will be found in the, "accessible population" (Fraenkel & Wallen 2012, p. 97) where it is involved in this study and represented by two main groups. The first group consists of fifty science teachers from different grades, while the second group consists of eighty secondary students from two private schools in Dubai. These schools are recognized as implementing cooperative learning strategies in their curriculum, particularly in their science classes. Furthermore, it is possible with

unsymmetrical stratified sampling to select the participants of the study in order to signify the population of the study effectively, as well as arrange for sufficient evidence (Kalton 1983). Therefore, the sample represented and clarified as a non-specific group, in which there is a need for the essential information to be collected (Fraenkel & Wallen 2012). The sample that is used in the study has been chosen purposefully (Lodico et al. 2010).

3.3 Instrumentation

Instrumentation can be defined as, "the whole process of preparing to collect data, it involves not only the selection or design of the instruments but also the procedures and the conditions under which the instruments will be administrated" (Fraenkel & Wallen 2012, p. 118). There are numerous types of instruments that have been applied in this study in order to accumulate the necessary data. The first tool in the present study is a questionnaire for the science teachers. The second tool will be classroom observations for both teachers and the students in different secondary science classes. These two tools will be conducted during the beginning and mid-term, whilst the last tool will be implemented at the end of the term. This tool is represented by another questionnaire, whereby many students from different secondary classes will be involved with the aim of receiving their perspectives about the effect of using cooperative learning strategies in their science classes. The collected data will be examined, discussed as well as evaluated with the intention of giving awareness about the value related to the quality of education, which is implemented in the science classes in Dubai.

3.3.1 Science Teacher Questionnaire (STQ)

One of the three important tools that has been used in this study is the teachers' questionnaire which is considered as a type of "Written-response instructions" (Fraenkel & Wallen 2012, p. 122). A questionnaire is clarified as "a self-report data-collection instrument that each research participant fills out as part of a research study" (Johnson & Christensen 2012, p. 162). There are many purposes and ideas for each questionnaire. These aims are defined and built on the problem of the research study in the direction of providing the statistics and the evidence that are desired.

According to McMillan & Schumacher (2010), questionnaires can be unidentified. Furthermore, these types of study tools have many advantages, such as their uniform techniques in addition to the easy way to score them. Therefore they are considered to be beneficial and helpful tools.

In this study (Appendix 3), the questionnaire has been planned and designed for all the participating science teachers in both schools. This questionnaire has been adapted and modified from Al-Yaseen (2011) with the purpose of collecting the quantitative data that will show a clear image about the perceptions of the teachers, related to the cooperative learning strategies, which will improve the students learning in science classes. In addition to open-ended questions, which will support the study problem in gathering the qualitative data for additional elucidation and confirmation.

3.3.1.1 Validity and Reliability of the Teacher's Questionnaire

The questionnaire has been revised before submission with the help of five members who work in the College of Education. Opinion was measured and recommendations were added and accounted for in the course of the concluding modification for the information and the elements that will be included in the science teachers' questionnaire. Additionally, all the tools that have been used in this study were revised completely by an expert instructor to confirm the validity. In the future, there will be a significant improvement for employed teachers to create a solid relationship with several of the worried contributors which can develop the ease of access to formal documents vital in the study (Creswell 2008). The Coefficient Alpha Cronbach has been determined in order to gain a ratio of both reliability along with consistency of the implement tool for the entire items. The result of the reliability coefficients "Alpha" equivalents "0.887".

The questionnaire consists of three essential segments that meet the important scopes of the existing study, which are the cooperative learning strategies and the students' learning dimensions. The first segment contains, ''Closed-form items" (McMillan & Schumacher 2010, p. 197) in order to accumulate the demographic information for the participant teachers. By this means, it will be easy to categorize according to the contributor gender and nationality along with the name of school and the teaching experience in addition to the grade level that the participant has taught. Lastly, their educational experiences accompanied by any type of professional development

courses were taken into account. The second segment is related to the perceptions of the contributor teachers which show the significant strategies of the cooperative learning that they used in their science classes depending upon the, "Summated rating scale" (Johnson & Christensen 2012, p. 178). It is also feasible to rely on the Likert scale to specify to what extent the participants strongly agree, agree, undecided, disagree or strongly disagree (Bell 2005). The designed scale has the ability to offer an important flexibility which will provide vital help in reflecting the perceptions of the teachers (McMillan & Schumacher 2010). Additionally, the second segment covers twenty six items, which demonstrate many statements that are related to the study problem of cooperative learning where it signified frequencies as well as percentages distribution about the responses of the participant teachers. At the end of this questionnaire and in the third section, there are a number of open-ended questions in order to provide the teachers with further opportunities for free comment in their replies and reactions. The open-ended questions have the capability to clarify some of the confusing features that are problematic to measure. According to Johnson & Christensen (2012), the mixed questionnaire is one of the most beneficial ways to explain the different overall opinions of the teachers by offering them additional space. This method will play an important role in improving the quantitative data by increasing its validity (Fraenkel & Wallen 2012).

This questionnaire was conducted at the beginning of the academic year, due to the updated information that the teachers gained in their intensive workshops, which are provided by the instructors in their schools. These workshops were considered as a professional development program for the new academic year. This type of questionnaire had been sent via teachers' emails by using a website called, ''Jotform'' with the intention of gathering both types of data (quantitative and qualitative) regarding the participants' awareness, understanding and practices of cooperative learning strategies. There was a limited time of fourteen days for the teachers to complete this questionnaire. In addition a number of reminder emails were sent within the limited period of time in order to maximize the response percentage.

3.3.2 Classroom Observation

The Classroom Observational tool represented a "structured observation" (Bell 2005, p. 188) whereby a timetable was used in order to organize the correct timing for the classroom observations by utilizing a checklist which helped in the process of evaluation for the cooperative learning strategies. According to Creswell (2012, p.207) this, "naturalistic observation" helped as a, "purposeful sampling" (Lodico et al. 2010, p. 34) for the strategies that are implemented in the CL. These will take place in different levels of secondary science classes with the aim of discovering the practical strategies that might be unintentionally forgotten in the inquiry form in addition to gaining more opportunities for collecting further data which will support the researcher in the program setting (Cohen et al. 2000). The teachers' observational procedures required approximately seven to ten weeks with the purpose of collecting additional data about the teachers who applied the CL strategies. The observed teachers in this study agreed to be noticed only under complete confidentiality.

The students who participated in this study have the key elements of the basic abilities which are considered as a formal operational phase. These characteristics for the students who are above fourteen years old had been confirmed by Piagetian theory which is related to the students' cognitive progress. This development will support and assist the students in analyzing theoretical situations (Slavin 2012). Both students' attitude and their behavior are not compatible most of the time, therefore, there is a need to observe these social forms in the students' personality within the field in order to collect the qualitative data critically (Johnson & Christensen 2008). These wide-ranging transcripts were preserved to explore the entire characteristics which have the ability to change or affect the related phenomena precisely (Creswell 2008; Johnson & Christensen 2008). Furthermore, being a complete observer in this study is beneficial to have the chance of achieving the whole image that is related to the learning practices for the secondary level students in the school (Fraenkel & Wallen 2012).

There are three important sections in the second tool used to observe many science classrooms (Appendix 4). These sections will cover all the main elements that are related to the effectiveness of the lesson. The first section is the teachers' behaviors, which will include the teachers' instructions, challenging questions, working as a facilitator, encouraging students' motivation and critical thinking, in addition to moving around the classroom for checking, monitoring and

questioning as well. Teachers also have to facilitate meaningful discussions, asking for students' reflection either individually or as a group, encouraging students to consider multiple ways to solve problems and guiding students through meaningful real-world problems (Adetunji, 2010). While the second section investigates the students' role and behaviors, whereby they have to pose the question and investigate it, plan procedures, analyze results then draw conclusions. Additionally, students have to be engaged together in order to test a hypothesis and make predictions, as well as discuss the results from their experiments, sharing ideas along with communication. Moreover, students have to interact with other classmates and they require leadership, decision making and trust-building, assisting, praising, supporting and encouraging abilities (Andersson and Gullberg, 2012). Each group member is held accountable and an assessment is made of how groups are functioning to achieve a goal. Each group member depends on each other to accomplish a target and apply science to real world applications. The last section will be connected to the learning strategies, time given and the way of sitting; whether they sit in pairs or in small groups as well as examining if the way of sitting supports the activity goals or not (Erlandson et al. 2010). Seven classroom observations occurred randomly with the purpose of exploring, determining and investigating the impact of cooperative learning strategies on the students' learning.

3.3.3 Students' Questionnaire

One of the well-organized and effective methods used for research study is the methodological triangulation as there is an opportunity to use numerous instruments for progression in the data attainment and acquisition (Cohen et al., 2000). According to Carter et al. (2014) triangulation states the use of various method sources in qualitative research in the direction of developing a complete understanding of phenomena. The triangulation of tools that are found in this strategy which is called, "the traditional mixed method" is suggested as a valid, "technique of physical measurement" (Cohen et al. 2000, p. 112) in the direction of providing additional abundant information as well as to validate conclusions (Creswell 2009). For that reason, this questionnaire used for the students in the secondary schools is considered as the third instrument of this study (Appendix 5) which has been adapted from two reliable sources. The first source is from Enger and Yager (2009) while the second source is from Tawfik (2011, p. 19-27).

A Cross-sectional survey is used to gather the evidence for this questionnaire almost at the same time from a specific sample that is carefully chosen from a predetermined population (Fraenkel and Wallen, 2012). In the academic year of 2015 and for more reliable results, this questionnaire had been submitted and collected from the students at the end of term one. With the purpose of investigating the equivalent dimensions, this questionnaire utilized some of the same questions as those contained in the teachers' questionnaire. The target of the students' questionnaire examine the perceptions of the students about the impact of using cooperative learning strategies in their science classes.

3.3.3.1 Validity and Reliability of the Students' Questionnaire

The students' questionnaire was validated through the Coefficient Alpha Cronbach to gain a ratio of both reliability along with consistency of the implemented tool for the entire items. The result of the reliability coefficients "Alpha" equivalents "0.780". In addition to the face-to-face validity methods and the recommendations of an expert from the field.

3.4 Ethical Considerations

One of the essential concerns that the researcher should take into a consideration is the ethical issues. Firstly, a permission letter was sent to the school's principle and the Knowledge and Human Development Authority (KHDA) from the British University in Dubai (BUiD) with the aim of receiving a permit to conduct the research study (Appendix 1). Secondly and according to the university, all the collected data must be kept confidentially along with the identity of the voluntary participants. Moreover, the voluntary participants will be informed of the observational processes, which will take place in their classes for educational purposes only with a complete secure and individually numbered for them (Creswell, 2012). In any study, there might be an opportunity for introducing any kind of ethical dilemmas which need to be elucidated and resolved actively beforehand (Punch, 2005). According to Creswell, (2009, p. 87) ''there are five ethical basis which have been classified from both Ethical Principle of Psychologists and Code of Conduct'' These principles consist of beneficence as well as nonmaleficence, loyalty along with responsibility in

addition to the honesty, fairness, appreciation and respect for human rights and self-esteem. As a consequence, all the conceivable ethical acquiescences are taken into a serious. consideration. One of the important stages in this study was obtaining the agreement of the school administration related to the purpose of the study in addition to the procedures for collecting the data. These two points were discussed, explained and clarified with the responsible members of the school. As a result of this consent, all the science teachers who are represented as the participants of the study agreed to sign and contribute to this study after they were assured of their anonymity and privacy (Appendix 2). Lastly, the resulting report containing all the details of the study problem, together with its conclusions and recommendations depending on perceptions will be shared and discussed with the school's principles for the two private schools in Dubai that were involved in this study. It is hoped this report might assist these schools to improve and self evaluate. The next chapter will discuss and explain in details the amalgamation of both qualitative as well as quantitative conclusions with the purpose of the study along with its questions raised.

Chapter 4: Results and Data Analysis

The main purpose of this study is to determine the impact of using cooperative learning strategies on promoting students' learning in science classes. The current chapter presents the outcomes of both qualitative and quantitative data in order to discover and examine teachers' perceptions of CL and their responses towards open-ended questions, along with the classrooms observations and students' perceptions of CL.

4.1 Demographic Information

The target of this questionnaire is to measure the perceptions of many teachers who teach science in different schools in the UAE (N=41) about the strategies of cooperative learning. The table on the next page, illustrates the results of the demographic information which include gender, the level they teach, teaching experience, professional development training, and academic qualifications.

Gender	Male	26%
	Female	74%
Academic qualification	Master	28%
	Post-graduated diploma	11%
	Bachelor	60%
Grade level taught	Elementary school	26%
	Middle school	36%
	High school	38%
The teaching experience	1-4y	17%
	5-10y	53%
	< 10Y	30%
Professional development training	Yes	93%
	No	7%

Table 1: Percentage of teachers' demographic information.

4.2 Teachers' Perceptions of Cooperative Learning Strategies.

This is the first tool that was used in this study in order to clarify the teachers' perceptions about the effects of using CL on the learning process. It is divided into two clusters that represent the

effects and the impacts of applying CL in the science classrooms on both teachers and students from the teachers' point of view.

4.2.1 Teachers' Perceptions About the Effects of Using CL Strategies on Teaching Instructions

The first part of the questionnaire elicits the perceptions of all the participating science teachers from different schools. The figure below presents the teachers' opinions about the effects of applying CL strategies to their method of teaching. The highest three means is for preparing a more attractive and rich learning environment (4.15), apply both individual and group evaluation on the task outcomes (4.03) and explain the lesson objectives to students clearly along with involving all students in the learning process (4.02). Whilst the lowest mean (3.88) is for both supervising students during the activities and to wrap up the lesson with a summary of achieved educational objectives. The following table illustrates the means and standard deviations of participants' responses of the Cooperative Learning Strategies Questionnaire (CLSQ).

The effects of using CL Strategies on teachers' way of teaching	Mean	N	SD
1. Prepare a more attractive and rich learning environment.	4.15	41	1.236
2. Apply both individual and group evaluation on the task outcomes.	4.03	41	1.063
3. Involve all students in the learning process.	4.02	41	1.129
4. Explain the lesson objectives to students clearly.	4.02	41	1.084
5. Use the teacher's time effectively to follow groups' work.	3.98	41	1.107
6. Monitor students' performance during the activities.	3.98	41	1.012
7. Write the lesson plan easily.	3.95	41	0.865
8. Clarify the expected educational objectives.	3.95	41	0.973
9. Provide necessary educational resources.	3.95	41	1.024
10. Clarify the basic concepts of the lesson to students.	3.95	41	1.117
11. Use the class time effectively.	3.93	41	1.104
12. Supervise students during the activities.	3.88	41	1.100
13. Wrap up the lesson with a summary of achieved educational objectives.	3.88	41	1.042

Table 2: Teachers' Responses to the Effect of Using CL Strategies on Teaching Instructions.

4.2.2 Teachers' Perceptions about the Effects of Using CL Strategies on Students' Learning

The second part of the teachers' questionnaire reveals the perceptions of all the participant science teachers from different schools. The figure below explains the teachers' opinions about the effects of applying CL strategies on students' learning. The results indicated that all the item responses showed high means, indicating teachers' preference to forming groups for cooperative activities (4.15); training students on cooperative skills (4.10); explaining the cooperative tasks to students (4.07). Whilst the lowest mean (3.90) is for presenting group work clearly.

The following table shows the mean and standard deviations.

The effects of using CL strategies on students' learning	Mean	N	SD
1. Form groups to perform educational activities.	4.15	41	1.014
2. Train students on cooperative skills.	4.10	41	1.033
3. Explain the cooperative tasks to students.	4.07	41	1.081
4. Select students to form groups carefully.	4.02	41	1.037
5. Explain the cooperative roles of students.	4.02	41	1.107
6. Distribute the roles of students in groups easily.	4.02	41	1.025
7. Enhance individual cooperative responsibilities towards the group.	4.00	41	1.1095
8. Apply motivating learning styles.	4.00	41	1.095
9. Apply positive reinforcements.	4.00	41	1.000
10. Enhance cooperative responsibilities among the group members.	3.98	41	1.129
11. Provide students with clarifications on the performed tasks.	3.98	41	1.084
12. Put students in heterogeneous groups.	3.95	41	1.191
13. Present group work clearly.	3.90	41	1.114

Table 3: Teachers 'responses to the effect of using CL Strategies on students' learning.

4.2.3 Teachers' Responses to the Qualitative Data

The questionnaire that has been created and completed by the science teachers contained two open-ended questions in order to gather qualitative data, supporting preceding quantitative data, as well as pertaining to the key focus of the study.

Most of the participant science teachers specified a clear and complete answer about their definition of cooperative learning.

What is your definition of cooperative learning?

- "*It's a learning strategy that allows students to share their ideas and experiences to achieve one task in both homogenous and heterogeneous structures through developing a variety of educational and social skills."*

- "*Cooperative learning is an instructional method in which students work in small groups to accomplish a common learning goal under the guidance of a teacher."*

- "*Cooperative learning is a strategy of interactive learning in the class where students are divided into groups, with assigned roles and tasks for each group and in between group members."*

- "*Cooperative learning is an organized and structured way to use small groups to enhance student learning and interdependence."*

- "*Cooperative learning is a successful teaching strategy in which small teams, each with students of different levels of ability, use a variety of learning activities to improve their understanding of a subject."*

To what extent do you think that cooperative learning is effective in your science class?

- "*Cooperative learning is highly effective in my classroom as it gives an adequate chance for every student to effectively engage in his learning and support students to collaboratively gain more skills and have better learning outcomes.*"

- *"Cooperative learning improves students' thinking and helps them construct their own understanding of science content by strengthening and extending their knowledge of the topic.*"

- *"Taking conclusion and the student's feedback I think that cooperative learning is effective but the most important thing is that the waste of time in such style of learning many students get benefits from it especially if the teacher has active management and has good control on her class.*"

- *"The method is characterized by the following features, which are distinct from other forms of group work: - Learners positively depend on each other in a team to achieve a mutual learning goal. – Learners engage in face-to-face interactions. - Learners are assessed individually and held accountable for equally sharing and contributing to the mastery of learning goals - Learners use and develop appropriate collaborative and interpersonal skills to teach and encourage each other to learn. - Learners reflect and assess the effectiveness of group functioning for future learning.*"

- *"It is extremely effective because the idea that students learn more by doing something active than by simply watching and listening has long been known to both cognitive psychologists and effective teachers.*"

- *"Each member of a team is responsible not only for learning what is taught but also for helping teammates learn, thus creating an atmosphere of achievement. By having learners treat each other as resources and requiring learners to go beyond only superficial engagement with learning materials, cooperative learning provides the social context for students to actively learn and make deeper connections among facts, concepts, and ideas.*"

- "*Cooperative learning involves more than students working together on a lab or field project. It requires teachers to structure cooperative interdependence among the students. Without denying the significance of traditional lectures and instructor-led discussions in undergraduate education, an increasing number of teachers are recognizing the value of also assigning collaborative work to their students. Small group work, used both in and out of class, can be an important supplement to lectures, helping students master concepts and apply them to situations calling for complex applications of critical thinking skills.*"

- "*Cooperative learning is very important because it gives the students the chance to learn the scientific methods and experimental procedures easier and with a more comprehensive skill since they are all participating in the critical thinking process of the scientific investigations and sharing ideas and opinions. It encourages groups to share same experiences and help each other in the learning outcomes.*"

4.3 Classroom Observations for Cooperative Learning Strategies.

In order to understand the importance and the effects of using CL strategies, five class observations were conducted in classes and the laboratory in a random way. These observations included biology, physics, and chemistry classes for the participating teachers with different academic qualifications. Two of the teachers have a Master's Degree in Education and the third teacher has

a Bachelor's Degree in Biology. The table below illustrates the findings of these observations that concentrate on the implementation and the importance of cooperative learning strategies in each class.

Table 4, below shows the CL strategies that are implemented in biology, physics, and chemistry classes.

Instructions for the students	**Students' Questions**	**Interaction between the students**
- Different levels of questions were modelled by the class teacher to investigate the approach of student-centered as a main teaching instruction. - The think, pair and share strategy is represented as one of the CL strategies where the learners think through the exposed questions via three distinct stages, inspiring student participation. - Group Discussion had been used to present image of their scientific method stages which include forming a hypothesis, collecting data, conducting experiments, predictions, and conclusion.	- Realistic, different, and assessment questions and problems were examined towards enhancing students' thinking skills in order to maintain them on track. **- EX:** - How can you create different simple machines by using the same resources? - Recreate your simple machine by using other resources. - Predict the type of bond in each chemical compound. - Predict the products of a chemical reaction when given the reactants using chemical symbols and words.	- Students were working in CL groups with full attention in order to create their own simple machines. -Positive interdependence cooperative team effort was recognized depended on students' selections and levels to gather the data. - For explaining the results, students were debating with each other in the direction of showing and criticizing their outcomes. - Reflection on topics was conducted from both teacher and students with referring and connecting to the objectives of the lesson.

- Interdisciplinary between math, science, and Technology was implemented by means of the internet which can help to collect the needed information via videos. - Jigsaw method had been applied in order to permit learners towards taking charge of their education. - Teachers played an important role in scaffolding each team in the direction of recalling the students' bank of conceptualization as well as link their knowledge to unexperienced difficulties. - Numbered Heads Together is an instruction where each learner is accountable for learning the required material through working in groups. - Guided discussion had been used to gain the opportunity for eliciting ideas along with developing the students' qualified abilities in association	- Compare between a chemical and a physical reaction then explain your answer. - Create your own food chain by using six different consumers then predict which consumers can be predator and prey at the same time. - Classify each consumer according to the adaptation way that can help them to survive and explain why it cannot fit another animal. - In the case of a food chain that ends with the octopus then the shark, can we change the place of the predator with the prey? Why?	- Face to face interaction had been applied in heterogeneous groups in order to discuss different ideas from the students. - There was an active role between the students with the purpose of answering different questions that had been given as a further task at the end of the session. - Students were working in pairs in order to discuss their own point of view that is related to the given questions delivered in small posters. - At the end of the session, each CL team produced a question towards assessing the other team in order to understand the final correct answer.

with the skills that are related to the scientific procedures about active science education. - Problem-solving strategy was conducted and reinforced by assessment questions in order to promote the cognitive skills for the learners. - Differentiation between the academic levels of the students was taken into consideration during formative and summative assessments.		

Table 4: Summary of CL Strategies that were observed in different science classes.

4.4 Students' Perceptions of Cooperative Learning Strategies

The students' questionnaire is used to measure the perceptions of secondary school students (N=169) with 49% boys and 51% girls. It is divided into two clusters, the first one is related to the effect of working in small groups while the second one is related to the effect of using cooperative learning strategies on their learning outcomes. Consequently, this questionnaire is targeted to measure the students' perceptions of cooperative learning strategies, conclude their experiences and knowledge of the main scientific abilities that might be developed by this strategy.

4.4.1 Students' Perception about the Effects of Working in Small Groups in Science Classrooms

The following table indicates the secondary schools students' response towards working in small groups. The highest three means are for participating in cooperative learning activities, which helps to understand the concepts of the lesson topics easier (4.08), working cooperatively improves understanding of the experiment (3.89) and working in groups to conduct experiments improves the teamwork skills (3.87) while the least mean was for using the scientific methods easily when they work with other students (3.62).

The effects of working in small groups	Mean	N	SD
1. Participating in cooperative learning activities helps me to understand the concepts of the lesson topics easier.	4.08	167	0.895
2. Working cooperatively improves understanding of the experiment.	3.89	166	0.941
3. Working in groups to conduct experiments improve the teamwork skills.	3.87	161	0.936
4. I like working in small groups in science.	3.86	167	0.887
5. Cooperative learning enhances good working relationships among students.	3.86	166	0.921
6. I express my ideas more easily when I am working in a small group.	3.84	167	1.012
7. Cooperative learning can improve my attitude towards work.	3.83	164	0.957
8. When we work together in small groups, we try to make sure that everyone in the group learns the assigned material.	3.80	165	0.977
9. Learning cooperatively enhance my scientific skills better than working individually.	3.78	167	0.972
10. When I work with other students I achieve more than when I work alone.	3.75	167	0.991
11. When I am interested in working together in a group, I like to read more about the topic.	3.72	166	0.878
12. My work is better organized when I am in a group.	3.69	166	0.912
13. I can use the scientific methods easily when I work with other students.	3.62	167	1.022

Table 5: Students' perceptions about working in small groups.

4.4.2 Students' Perceptions about the Effects of using CL Strategies on Students' Learning Outcomes

The following table indicates the secondary schools students' response towards working in small groups. The highest three means is for working together in small groups, the teacher divides up the

material so that everyone has a part and everyone has to share (3.90), when working together, everyone's ideas are needed if they are going to be successful (3.89) and getting help from others understanding the content of the experiment (3.87) while the least mean was for preferring that teachers use more group activities / assignments (3.70).

The effects of using CL strategies on students' learning outcomes	Mean	N	SD
1. When we work together in small groups, the teacher divides up the material so that everyone has a part and everyone has to share.	3.90	167	0.939
2. When we work together in small groups, everyone's ideas are needed if we are going to be successful.	3.89	167	0.95
3. I would like to get help from others understanding the content of the experiment.	3.87	166	0.963
4. The best science classes are those when we work cooperatively.	3.85	165	0.964
5. Group activities make the learning experience easier.	3.85	165	0.941
6. When doing experiments, I prefer to work with my friends.	3.84	167	0.925
7. When we work together in small groups, I have to find out what everyone else knows if I am going to be able to do the assignment.	3.84	167	0.933
8. I like it when I have to explain the results of my own experiment to other groups.	3.83	167	0.992
9. I like helping others understanding the content of the experiment.	3.83	166	0.914
10. Working cooperatively increases and improving the ability of discussion with other classmates.	3.79	167	0.950
11. Cooperative learning leads to creativity.	3.78	166	0.895
12. Cooperative learning helps me to participate in class discussions.	3.76	166	0.825
13. I enjoy the material more when I work with other students.	3.75	167	0.949
14. Cooperative learning enhances class participation.	3.75	166	0.931
15. When working in small groups, my classmates share what they know with me which will promote my knowledge positively.	3.75	166	0.943
16. I like my classmates to help me in understanding the science concepts.	3.74	167	1.031
17. I prefer that my teachers use more group activities / assignments.	3.70	167	0.973

Table 6: Students' perceptions about the effects of using CLS on their learning outcomes.

4.5 Teachers' and Students' Perceptions of CLSQ Based on Gender

In the table below, the first two rows are ascertained from the teachers' questionnaire and the second two rows from the students' questionnaire. Means and standard deviations for each gender were reported. T-test values with associated p-values were reported indicating that there were no statistically significant differences between males and females, as p-values exceeded .05.

The negative sign of a t-value tells the direction of the difference in sample means. As can be seen, the t-values in the teachers' questionnaire were positive indicating that the mean score of the female group was higher than that of the male group. The opposite is true with the students' questionnaire. However, these differences are not statistically significant and cannot be attributed to being in the female or male group.

Variables	FEMALE		MALE		t-value	p-value
	Mean	Standard Deviation	Mean	Standard Deviation		
The effect of using CL strategies on teachers' way of teaching	4.01	.926	3.83	1.067	.480	.634
The effect of using CL strategies on students' learning	4.07	.961	3.78	1.101	.789	.435
The effect of working in small groups	3.78	.753	3.86	.649	-.735	.463
The effect of using CL strategies on students' outcomes	3.79	.746	3.82	.624	-.233	.816

Table 7: Teachers' and Students' Perceptions of CLSQ Based on Gender.

Chapter 5: Discussion and Conclusions

Cooperative learning strategies enhance science education positively through promoting the learners' conceptualization in addition to developing their scientific abilities. This chapter includes outcomes discussion, the final conclusion and recommendations for further inquiries in CL strategies area. The study limitations are also stated.

5.1 Discussion

The research study outcomes indicate a remarkable association between using the cooperative learning strategies and promoting the students' learning in science classes.

5.1.1 The Perceptions of the Teachers

Teachers' perceptions about the impact of applying the CL strategies were observed through the consequences of their questionnaire in order to answer the question of the study. Their replies revealed that they are remarkably aware of the CL strategies as well as the fact that they practice and experience scientific skills in different ways and types in their science classes.

Through both the first part of the questionnaire and the open-ended questions in the second part, many of the participating teachers had confirmed the successful development in the field of implementing the CL strategies. This is positively improved by providing teachers with yearly professional development workshops with the purpose of enriching and supporting their information and techniques. These workshops give attention to teaching strategies, cognitive skills, differentiation, and the 4Cs that represent the 21st Century skills, which are communication, creativity, collaboration and critical thinking. In addition to the classroom observations carried out to overcome any weaknesses in the process of teaching that might be found.

These results are apparent in the research study experience as well as evidence that professional development courses implemented in the first month of the academic year are essentially heading towards increasing the pedagogical knowledge of the teachers Roth et al. (2006), improving their experience, professionalism and effectiveness (Goe & Stickler 2008; Rockoff 2004), in addition

to stimulating the confidence of the teachers in a significant way (Furtado 2010). In order to reach the highest level of success in implementing the CL strategies in science classes and promoting the academic level of the students, teachers have to receive intensive courses combined with adequate demonstration classes related to cooperative learning strategies with the purpose of contributing efficient teachers' instructional practices Al-Shannag et al. (2013). Moreover, this will lead to avoiding teaching problems that are related to putting theories into action in science classes (Roehrig 2004) by remodelling the task's challenge (Leaman & Flanagan 2013) that might affect the timing of the class. As discussed earlier in the literature review, whereby Angela and Rylee (2013) confirmed that the number and the information of the courses that the teachers receive will play a significant role in determining the positive strategies that are implemented in class and lead to increasing the students' academic skills. In addition, training for the staff will convert the learning philosophy into sufficient process in a greater range in schools. Likewise, Orlich et al. (2011) indicated that teachers who received intensive courses in their field are more able to provide the students with many positive types of teaching strategies that aim to develop the students' academic outcomes.

According to the results, many teachers from both genders were familiar with the benefits of using CL strategies in their classes, which indicates that they have the same opinion about the importance of applying these strategies in their science classrooms. As previously mentioned in the current study by Al-Yaseen (2011) he surveyed numerous teachers in his study and they confirmed the affirmative expectations through applying CL. On the other hand, few teachers did not know about the importance and methods of applying these strategies. The statistics of this study exposed that the highest percentages from the teachers who strongly agreed with the use of CL were those whom decided that these strategies helped them in preparing a rich learning environment filled with discussion, activities, experiments, and critical thinking tasks, which will enable learners to improve their own knowledge through interaction and cooperation with each other (Golub and Buchs, 2014). A large number of teachers indicated that the students have to be trained to use cooperative skills in order to enrich the students' learning in a positive way through developing knowledge as mentioned earlier by Li & Lam (2013). In this study, there is an important outcome that had been reported in different points of view for the participant teachers based on their academic qualifications. The results indicate that the teachers who have Master's degrees have a higher tendency to implement CL skills and are aware of the significance of applying CL strategies

in their science classes. This result had been reinforced by Pea (2012) where he discusses important factors that are related to the teachers' competence and qualifications and their effect in the implementation of different teaching strategies. In addition to the ability of the qualified teachers in giving clear definitions and responses to the open-ended questions that had been applied in this questionnaire. A recent study by Ambrossa, Meiring & Blignaut (2014) indicated that the absence of collegiality among the teachers is considered to be one of the important impediments that will affect the students' improvement.

5.1.2 The Classroom Observations

Five class observations have been implemented in one of the American International Schools. These observations were in physics, chemistry, and biology classes in order to have clear results related to this study. The most successful classroom observation was in the physics period for grade ten where all the students were engaged together and worked cooperatively in order to create their own simple machines. In this period, the teacher was able to give clear instructions that helped most of the students to work independently until the end of the activity focusing on improving their scientific skills (Polman & Hope, 2012). In this period, students had opportunities to stimulate their scientific notions towards scientific thinking (Andersson and Gullberg, 2012). As discussed earlier, Femi (2010) confirmed the important positive effect on the achievement of the students at secondary level in science as well as practically in physics through using this strategy.

During the other two biology observational periods for grade eight, many of the students worked cooperatively but some of them were not able to participate with the other members of the group and as a result of this, they did not reach the expected results related to the lesson objectives. The lack of working in student-centered groups will affect the academic level of the students in an undesirable way (Yildirim & Girgin, 2012). In the biology periods, the teacher asked the students to follow the jigsaw cooperative learning strategy in order to gain information that could help them in their task. This strategy was helpful to the learners especially in increasing the interaction between them as well as improving their learning intention (Huang et al. 2014). In the same periods, guided discussion along with problem-solving strategies were applied in a positive way by the teacher's guidelines, which optimized the learning of the student, assisting them in

developing higher-order thinking skills in addition to enhancing the process of learning (Michaelsen et al. 2014).

In the last two chemistry observational periods, the "Think-Pair-Share" strategy and Numbered Heads Together were used in both sessions for grade nine. Numerous students had the capability to work cooperatively in pairs and many of the learners were able to responsibily carry out their task and shared their ideas with other pairs. These students will be able to promote their cognitive thinking, which will improve the students' outcomes in the future through increasing the interactions among them and enhancing their self-confidence. The CL strategy of "Think-Pair-Share" can foster the environment of the classroom with positive effects between the groups of the students and enhance the process of cognitive learning. The cooperative pairs had higher success motivation to attain the aim of the task. Furthermore, this strategy will avoid many problems and difficulties through working in teams as mentioned before in the literature review (Doymus et al. 2010). In this period and through this strategy, students were able to have more time to spend in discussion, the process of their thinking was boosted through self-reflection in order to reach a deeper understanding (Kwok & Lau, 2015). On the other hand, there was a lack of differentiation in the academic levels of the students which led to many difficulties in achieving the objectives of the lesson. These problems will affect the progression of the students. Karacop and Doymus (2012) specified the positive consequences of developing the academic achievement for the learners by using differentiation especially in chemistry classes.

In general, the classroom observations exposed some positive features of cooperative learning strategies in teachers' practices but these features did not have the same level by means of their lack of knowledge. Several learners had the ability to observe, make a use of their prior knowledge, and analyze data, in addition to discussing the consequences in two CL classes. Nevertheless, only two out of the five observed sessions demonstrated a clear indication of CL strategy in which students had the skill to achieve the objectives of the lesson completely in CL groups. As a result of these differences among the participating teachers of CL strategies, the acquisition of the learners related to their scientific skills would be affected. The literature related to CL strategies proved that this strategy can make a noticeable progression in the students' academic outcomes when they work cooperatively with peers or in small groups (Tsay and Brady, 2010).

5.1.3 Students' Perceptions

Secondary school students' perceptions together with their experiences in CL strategies were observed by the findings of their questionnaire. The students' opinions revealed that many of the secondary school students consistently practice various cooperative learning strategies. These results are consistent with the teachers' responses. The findings of this questionnaire revealed two different aspects; the first one illustrated that the majority of students confirmed that working in groups helped them to understand the concepts of the topic in an easier way, improving their discussion abilities and team work skills. The learning experience and having an opportunity to participate in every experiment, as well as promoting the way of expressing scientific ideas positively by working with other classmates was also increased. This method will lead students to achieve a higher level with better opportunities on the road to increase and develop the constructive interactions among the learners by the use of this strategy in a short period of time (Golub and Buchs, 2014). As discussed earlier by Yildirim & Girgin (2012) where they discovered that this strategy depends on building student-centered groups has a more positive consequence on the students' academic success than the old fashioned model which depends on the teacher only. It also provides and supports the students that have different academic levels and mixed abilities with various tasks which will promote a higher sense of both participation and accomplishment (Huang et al. 2014).

On the other hand, the second aspect illustrated that some of the students found that the CL groups assisted them in being creative, having a positive attitude towards work, searching for more information about the topic, and enjoying their work. These outcomes will play an important role in avoiding and reducing many difficulties that other learners are suffering from through working in a team (Doymuş et al. 2010). Furthermore, students will gain further experience as a result of learning from each other's error (Dietz-Uhler and Lanter, 2011). In addition to become motivated and supporting the members of their team in acquiring several skills that will help them in the surrounding world through other individuals' perspectives (Ebrahim, 2011).

5.2 Conclusion

This study was conducted in order to determine both teachers' and students' perceptions about the impact of using cooperative learning strategies on promoting students' learning in science classes.

The results of the study indicate that science teachers have a good knowledge about CL accompanied by the ability to practice different CL strategies in their classes. However, many teachers frequently combine both CL strategies and traditional strategies. This revealed the school's efforts towards developing the active strategies that will improve the level of the students and lead to promote a deep learning strategy by increasing the self-directed (Biggs & Tang 2007). Different activities had been done in science classes where many learners have gained several communicative as well as organizational skills. Schools need to increase practices that are related to the manipulative skills as they are considerably affected by the qualifications of the teachers. Therefore, it can be said teachers are affected by the method they were trained in addition to their own competence. One of the main important points that every school has to do, is to provide their teachers with a professional development programs with the aim of enriching their practice along with their pedagogical knowledge. Additionally, peer observation, cooperation between teachers, and group discussions will have positive effects in improving their implementations and enhancing many creative ideas. In order to develop the real spirit of CL, the social communication among groups, cooperation concepts, and cognition construction has to be stated in clear guidelines in addition to offering differentiated tasks for students that have mixed abilities. This might have a positive effect on assisting the students to reduce their concern and promote their self-efficacy (Andrew and Alexandria, 2015). This will help in establishing the self-confidence in different learning communities. Alternatively, teachers have to improve their skills and application abilities to deliver instruction in science classes. Through this application, rich resources and dynamic instruction may possibly stimulate learners and support their interpersonal communication along with the learning interests which will lead to enrich the learning consequences (Fu and Yeh, 2014) and they will have the ability to communicate with others in a democratic society (Özer Aytekin and Saban, 2013).

To sum up, CL strategy is suggested as an essential trend in science classes in the UAE. It is predictable that teachers will be satisfied through several outcomes which are not being presented

in a lecture-mode in class (Gordon & Aubrecht 2008), they are strongly aware of CL strategies as well as working on the way to develop the scientific skills of their students.

5.3 Limitations

This research study is limited for the reason that it represents a small sample in a short period of time accompanied by a small and limited number of observed classes. In addition to the difficulty in measuring the educational skills which have need of numerous tools towards collecting reliable data. However, it sheds lights on the importance of CL in enriching the effective teaching practice in science classes. For further reliable data in a large-scale as well as long-term studies, it is necessary to concentrate on investigating factors in pedagogy in conjunction with the organization of the seating plan of the students that can support the students' learning in science more effectively and collaboratively. Furthermore, one of the useful tools that can be used in the future is students' interviews.

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Appendices

Appendix 1: School Permission

الجامعة البريطانية في دبي
The British University in Dubai
www.buid.ac.ae

6 October 2015

To Whom It May Concern

This is to certify that **Mrs Mina Ghassan Radhwan with Student ID No. 2014101012** is a registered part-time student on the **Master of Education following the pathway in Science Education** programme in **The British University in Dubai,** from **September 2014.**

Mrs Radhwan is currently working on a dissertation as part of the programme requirements and her topic is about the impact of using cooperative learning strategies on students' academic level. She is required to gather data by conducting a questionnaire surveys, interviews and classroom observation. Any support provided to her in this regard will be highly appreciated.

This letter is issued on Mrs Radhwan's request.

Yours sincerely,

Student Administration The British University in Dubai

Amer Alaya
Head of Student Administration

An Icon of Excellence
مدرسة الدرة
AL DURRAH INT. SCHOOL

Appendix 2 – Participant Research Consent Form

الجامعة البريطانية في دبي
The British University in Dubai
www.buid.ac.ae

To Whom It May Concern,

I am conducting this research study in the specialization of Science Education from the British University in Dubai. The topic of my research is "Investigating the impact of using cooperative learning strategies on students' learning in science classes". This study will develop scientific tools for local use. As I receive your permission, I will give science teachers the link to my questionnaire, then I will give high school students a questionnaire to investigate their experience, and finally, I will visit high school science classes for observation purposes under school supervision.

The information collected from the teachers will be kept confidential and will be used only for this research. If you have any enquiries about this research study, please contact the undersigned. Thank you for your cooperation in this academic endeavor.

Best Regards,

Mina Radhwan
0557724665
mina.radhwan@yahoo.com

September 2015

Appendix 3: The Teachers' Questionnaire

This questionnaire is going to ask about essential elements in your teaching practices that might support cooperative learning strategies and students' learning in science classes.

Section 1; Teachers' demographic information.

School		Nationality	
Gender	Male ☐	Female ☐	
Teaching experience	1-4 years ☐	5-10 years ☐	More than 10 years ☐
Grade level taught	Elementary school ☐	Middle school ☐	High school ☐
Academic qualifications	Bachelor ☐	Diploma ☐	Master ☐
Professional development training	Yes ☐	No ☐	

Section 2: Strategies of cooperative learning practices that are implemented in science classes.

The questions on this questionnaire relate to elements of teaching practice in your science classroom. For all sections, please circle the choice that matches your perception.

Use the following rating scale for Questions 1-26

5=strongly agree Use it always	4= Agree Use it frequently	3= Not decided Use it occasionally	2= disagree Use it seldom	1=Strongly disagree Never use it

Teachers' responses on cooperative learning:

Teaching a lesson applying the cooperative learning strategy helps to:	**5**	**4**	**3**	**2**	**1**
1) Write the lesson plan easily.					
2) Clarity of the expected educational ohjectives.					
3) Explain clearly the lesson ohjectives to students.					
4) Clarify the hasic concepts of the lesson to students.					
5) Put students in heterogeneous group.					
6) Form groups to perform educational activities.					
7) Prepare a more attractive and rich learning environment.					
8) Select students to form groups carefully.					
9) Involve ail students in the learning process.					
10) Explain the cooperative roles of students.					
11) Explain the cooperative tasks to students.					
12) Distribute the roles of students in groups easily.					
13) Provide necessary educational resources.					
14) Supervise students during the activities.					
15) Use the class time effectively.					
16) Enhance cooperative responsibilities among the group members.					
17) Enhance individual cooperative responsibilities towards the group members.					
18) Train students on cooperative skills.					
19) Use the teacher's time effectively to follow groups' work.					
20) Present groups works clearly.					
21) Apply motivating learning styles.					
22) Apply positive reinforcements.					
23) Monitor students' performance during the activities.					
24) Provide students with clarifications on the performed tasks.					
25) Apply both individual and group evaluation on the task outcomes					
26) Wrap up the lesson with a summary of achieved educational Objectives.					

Section 3: Importance of cooperative learning strategies.

- Answer the following questions:

1. What is the cooperative learning?

_____
_____
_____
_____

2. To what extent do you think that cooperative learning is effective in your science class? Explain.

_____
_____
_____
_____
_____
_____
_____

3. Do you think that cooperative learning implementation help students improve their academic achievements in their exams? How?

_____
_____
_____
_____
_____
_____

4. Do you assess your students' scientific academic achievement? How?

_____
_____
_____
_____

Appendix 4: Classroom Observation

Teacher _____ Level/Class _____ Number of Students _____

Subject: _____ Lesson Title _____

1) Lesson Effectiveness			Comments/Notes
A. Teachers' Behaviors	Giving instructions.		
	Asking challenging questions.		
	Working as a facilitator.		
	Encouraging students' motivation and critical thinking.		
	Moving around the classroom and checking/monitoring/questioning.		
	Facilitating meaningful discussions.		
	Asking for students' reflection individually/group reflection.		
	Encouraging students to consider multiple ways to solve problems.		
	Guiding students through meaningful real-world problems.		
B. Students Behaviors	Posing the question and investigating it.		
	Planning procedures.		
	Analyzing results / draw conclusions		
	Engagement.		

	Test a hypothesis and make predictions.		
	Discuss the results from their experiments.		
	Sharing ideas-Communication.		
	Interacting with other classmates.		
	Leadership/decision making/trust-building.		
	Assisting/praising/supporting/encouraging.		
	Each group member is held accountable.		
	An assessment of how groups are functioning to achieve a goal.		
	Each group member depends on each other to accomplish a target.		
	Applying science to real world applications.		
C. <u>Learning Strategy</u> (group/ individual Tasks/ arrangement	Working individually.		
	Working in pairs.		
	Working in small groups.		
	Grouping arrangements were appropriate for the activity goals.		
	Individuals in the same group have different roles to complete one task.		

Appendix 5: The Students' Questionnaire

School		Grade	
Gender	Male ☐	Female ☐	

The questions on this survey relate to things that you may do in your science class when you are learning science in secondary school. For all sections, please circle the choice that matches your perception.

The impact of using cooperative learning strategies on students learning.

Use the following rating scale to answer questions 1-33:

5=Very Often,	4=Often	3=Sometimes	2=Seldom	1=Never

The impact of using cooperative learning strategies on students learning.	**5**	**4**	**3**	**2**	**1**
1) Participating in cooperative learning activities helps me to understand the concepts of the lesson topics easier.					
2) I like working in small groups in science.					
3) Cooperative learning helps me to participate in class discussions.					
4) Working cooperatively increases and improving the ability of discussion with other classmates.					
5) Cooperative learning enhances class participation.					
6) Cooperative learning leads to creativity.					
7) Group activities make the learning experience easier.					
8) When working in small groups, my classmates share what they know with me which will promote my knowledge positively.					
9) When we work together in small groups, we try to make sure that everyone in the group learns the assigned					

material.					
10) Cooperative learning enhances good working relationships among students.					
11) When we work together in small groups, I have to find out what everyone else knows if I am going to be able to do the assignment.					
12) When we work together in small groups, everyone's ideas are needed if we are going to be successful.					
13) I can use the scientific methods easily when I work with other students.					
14) Working in groups to conduct experiments improve the teamwork skills.					
15) Working cooperatively improves understanding of the experiment.					
16) The best science classes are those when we work cooperatively.					
17) When we work together in small groups, the teacher divides up the material so that everyone has a part and everyone has to share.					
18) When doing experiments, I prefer to work with my friends.					
19) Learning cooperatively enhance my scientific skills better than working individually.					
20) I express my ideas more easily when I am working in a small group.					
21) I prefer that my teachers use more group activities / assignments.					
22) When I work with other students I achieve more than when I work alone.					
23) I like it when I have to explain the results of my own experiment to other groups.					

24) I like helping others understanding the content of the experiment.					
25) I would like to get help from others understanding the content of the experiment.					
26) My work is better organized when I am in a group.					
27) When I am interested in working together in a group, I like to read more about the topic.					
28) I like my classmates to help me in understanding the science concepts.					
29) I enjoy the material more when I work with other students.					
30) Cooperative learning can improve my attitude towards work.					