

**The Effectiveness of Using Flipped Learning Strategy in The Academic Achievement by Eighth Grade Basic Students in  
The Subject of Science and Developing Their Reflective Thinking**

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**ABSTRACT:**

The research aims at investigating the effectiveness of using flipped learning strategy in the academic achievements by eighth grade basic students in the subject of science and developing their reflective thinking. To reach the objectives of the study, two null hypotheses have been constructed by the researcher. The population of the study was limited to the eighth grade basic students for the academic year (2019-2020) at (Trooska Basic School for Girls) which has been chosen intentionally. The researcher relied on the experimental design, with control and experimental groups by adopting pre-test and post-test to the variable of reflective thinking, and post-test to the variable of Academic Achievement. The experimental group has been taught according to the Flipped Learning Strategy, while the control group according to the Traditional Teaching Method. The sample consists of (41) students, distributed between two groups; experimental group (21) students, and control group (20) students. The equivalence between the two groups was conducted in a number of variables. The researcher has prepared two tools, the first one an academic achievement test to measure the academic achievement, which consists of (30) multiple choice question items extracting difficulty coefficient, discriminatory strength and effectiveness of wrong alternatives, second tool is reflective thinking scale which consists of (35) items distributed to five dimensions (Visual vision, Paralogisms revealing, Conclusion, Providing convincing explanation, Proposed solutions). The validity and reliability of the tools have been duly confirmed. After completing the application of the tools, the data has been obtained by using statistical means, by using (T-test). Results have shown that using Flipped Learning Strategy in teaching the science subject has positive impact on increasing students' academic achievement and developing their reflective thinking, but using the traditional teaching method did not show any developing in their reflective thinking. In the light of research results the researcher has recommended the importance of using the flipped learning strategy which is considered a modern strategy, also procedures for some further future studies have been suggested.

**Keywords: Flipped Learning, Academic Achievement, Science Subject, Basic Education Grade, Reflective Thinking.**

**1. DEFINITION OF THE RESEARCH**

**1.1 Introduction**

The challenges that are grappling the humans today, and the rapid change that has occurred in all areas of life, have made it a requisite for educational institutions to take on modern educational technologies with their means and facilities, as claimed by (UNESCO, 1991), which assured the necessity of developing education by introducing modern educational technologies through its various forms and making changes in the its curricula and teaching methods to suit the technical nature of this era. This technology occupies a prominent place in educational inputs, and it has great importance for teachers and educational planners because of its role in motivating students and satisfying their needs to learn. Technology also helps to fix ideas, information and knowledge in students' minds, and does not let this information be forgotten easily. Furthermore, other stuffs like, trips, models, educational films, maps, computers and the Internet offer various experiences from which each student takes, what interests him/her, and achieves his/her goals (Haji and Aldershewi, 2019).

The impact of E-learning and what has added to the educational process is clear and apparent. E-Learning has become the phenomenon of the era as it replaces the traditional classes and changes the methods of teaching that enable learners to learn what they want, whenever, and wherever they want. Mostly important, they will be able to assess what they have learned.

In addition, they are beneficial in developing student's positive role and enhancing their ability to participate and doing research. Therefore; it is necessary to use a modern teaching strategy that depends on the using of modern technologies in the educational process (Qeshta, 2016).

The best type of education is the one that generates the yearning for knowledge and makes the educational process more fun, active, and lively with a few traditional lectures and many projects and reading by focusing on student-centered learning, but not the teacher-centered one. Consequently, the number of teachers who want to teach their students in creative ways has increased as an outcome of the growing of the use of modern technology in the educational process (Strayer, 2007).

The fast elaboration of technology has expedited the speeding and innovated the modes how information is disseminated. Technology has not only changed the modern way of life, but it also has changed pedagogy and learning cultures. Modern students are called digital natives with every reason. Students of all disciplines nowadays have grown up surrounded by technology. They use laptops, tablets, mobile phones, MP3, the internet, Wi-Fi, YouTube, Facebook, etc. The convenience of technology has transformed the way contemporary students learn, they learn by discovering and doing not by measuring the activity practice or perception of lectures (Wolff and Chan, 2016).

The role of teachers in general and science teacher's in particular is no longer just to take the responsibility upon the entire educational process, by preparing for the lesson,

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presenting it, making questions and answers, preparing teaching tools, and other things. But, the teacher's role has become the role of a mentor and a guide for the educational process. Through teaching science, the teacher can connect the school with society, and encourage students to work manually and develop scientific and reflective thinking which is the pivot of the educational process. This can be achieved by employing appropriate technologies and tools in teaching science (Al-Samaraai, 2013).

The use of technology the Computer and the Internet has become an inevitable precept in the teaching of science. It is regarded as track to the teaching process in general and teaching science in particular. Recently, it has been noticed more attention and interest have been given by specialists and teachers to the use and contribution of the information and communication technology in the teaching process. So this is of course, due to the nature of the era in which we live in the present time, which is characterized by great technological and cognitive development (AmboSaedi and Alblowshy, 2009).

There are many modern strategies that rely on the use of modern technologies to activate the process of learning, among which is flipped learning strategy which is considered one of the types of blended learning that uses technology to transfer lectures outside the classroom and the flipped learning strategy is a popular idea nowadays where educators see this type as an example of a promising and exciting educational innovation (Al-Zain, 2015).

As the innovative technology gradually gets involved into the classroom, Flipped Learning takes more consideration in education settings. The Flipped Learning is a new approach in teaching that has been designed to flip the old-style learning classroom from Teacher-Centered teaching into Student-Centered learning (El-Senousy and Alquda, 2017).

Lately, a paradigm modification has taken place in education with the arrival of a model of teaching known as the flipped classroom. The flipped learning strategy incorporates any use of using the Internet technology to influence the learning in the classroom, in which accordingly teachers instead of lecturing can spend more time interacting with students. As students watch presentations of short videos of lectures at home, the biggest time will remain for discussing the content in the classroom under the supervision of the teacher (Bretzman et al, 2013).

Mainly the notion of a flipped class that is usually done in classroom is now done at home, in other words, what is traditionally done as homework at home is more to flipped classroom. According to the traditional approaches, students mostly confused about the homework problems from the previous night when they come into classroom. Therefore, much more class time will be spent on doing warming-up activities, and going over those problems to make them clear and understandable, then the teacher comes across the new content and presents it.

According to the flipped model during the first few minutes of the class the teacher will answer the questions which have been asked by the students about the content that has been delivered via video, this is done while the time is entirely restructured. Obviously, the focus will be on students (student-centered learning) not the teacher. The role of the teacher will be limited to be as an expert to provide feedback, and to help students, not to deliver information. On other hand, students are responsible for watching the videos and asking proper questions, besides completing and sharing their work. Thus, students are motivated to learn better not just to complete the assignments in a rote manner due to the availability of the solution guide (Bergmann and Sams, 2012). Students are trained on how to take information and bring up facts on tests. It is known that flipped learning is much deeper than filling in facts. By switching to mastery learning throws flipped class, students

take challenged to prove their understanding of the materials. (Bretzmann et al, 2013).

Flipped learning is a pedagogical strategy that changes the direction of the teaching process from the group teaching space to the individual learning space, and the resulting group space is transformed into a dynamic, reciprocal learning environment where the teacher guides students as they hold concepts and act creatively in the subject matter (Bsharat, 2017).

Flipped learning is rather a new notion for teaching, it is considered a form of learning that makes learning in the classroom easier and more comfortable by the use of technology, consequently instead of lecturing, it gives the teacher the opportunity to save all class-time into teacher-student interaction. Flipped learning is characterized by providing teachers extra time to get in touch with the students in classroom, transferring the lecture time to homes through pre-recorded videos. It is worth mentioning that using videos has long been in use both in micro-teaching sessions of teacher training and language teaching. However, flipped learning is to some extent one step ahead for using videos in classes (Demirel, 2016).

It is inevitable in the technological era for the current generation to be exposed to technological advancement. Thus, at the same time such advancement is considered a great demand for educators to keep up with the developments of the age. So a result it strengthens the connection between experiences inside the classroom and that in authentic real life situations. The objective of Flipped Learning is to equip graduates with information and knowledge. Technology skills are needed for schools, educational institutions and work. This is a proof that the educators and learners of the 21<sup>st</sup> century are obligated to constantly apply technological tools and programs to carry out and develop learning process (Camling, 2017).

Science is regarded as an important subject in any educational system globally. The importance of science emanates from the fact that it contributes greatly to the progress and development of nations. The developed countries have noticed this point long time ago. Therefore, they pursuit to improve and develop the science curricula, in the best way, they also tried to seek out the proper methods of teaching that are suitable to the nature of science. As a result many of them have appeared, and perhaps in our educational sectors there is an urgent need to develop science education, because unfortunately we are still under the classification of the developing world. Thus, the improvement comes by starting training courses for teachers to qualify them enough to use various techniques and modern methods of teaching that make the learner to be the pivot of the educational process. In addition to that, the curriculum content of science is produced in an interesting and effective way, also, it is trying to stimulate thinking of both teachers and learners about what is being presented efficiently.

A lot of studies and research on teaching methods have confirmed the effectiveness of these new methods in improving students' achievement, attitudes, motivation and development for many mental and practical skills (AmboSaedi and Alblowshy, 2009).

The success of the process of teaching science and the performance of students depend on many factors. Specialists in science education confirm that the science teacher and the teaching method that has been chosen by the instructor are the cornerstone of the instructional process, also it is the main key in the process of both learning and teaching, the best books and curricula may not achieve their desired goals unless the science teacher is well prepared, and the method of teaching is appropriate to the nature of the science subject, thus turning the curricula and teaching strategies into educational experiences to make the students be interacted with, in order to build their knowledge and develop their cognitive thinking and mental capabilities from the contemporary perspective in science

curricula teaching to achieve science education and technology (Zaitoon, 2007).

Through flipping science classes more time and more opportunities will be created to include inquiry learning. Also, teachers who flip in science classes have time for students to be involved in more inquiry-based activities and to conduct more in-depth experiments. It is worth mentioning that a powerful tool for students to create conceptual understanding without direct instruction in science education is via the Process oriented Guided Inquiry Learning (POGIL) so the flipped learning is ideally set up for this type of learning (Bergmann and Sams, 2012).

The advantage of adopting flipped approach and its learning strategy in teaching science is that it obligates us as teachers to be very well prepared and organized with scientific content. Thus, the process includes writing down aims and creating suitable learning objects which demonstrate such a powerful process that teachers should implement regardless of whether they flip or not. Accordingly, this type of careful planning will give teachers the benefit to be more thoughtful about which resources and assessments best fit each objective.

Thinking and guiding are considered essential goals that cannot be postponed, and it should be the core of the educational objectives of any academic subject, because they are closely related to all subjects and what is associated with it like teaching methods, activities, teaching tools and evaluation processes, they all should be conducted in the process of teaching and learning, as they are regarded as one of the basic factors in a human life. It helps to guide and advance life, as they help in solving many problems and avoiding many dangers. (Habib, 2003).

The process of integrating students into the educational situation requires continuous following-up by the teacher through the process of review and meditation which they performed during the lesson. Reflective thinking is an organized process that goes according to the methodological steps that are performed by the teacher, which aim to improve student learning. So reflective thinking is deemed as an important practice that teachers have to practice during the lesson, and thus makes the student be able to change, rather than be an element that must be changed, because he/she acquires confidence in his/her ability to develop and improve his performance. Schon (1983) mentions that "the active teacher is the reflective teacher" as cited in (Ambosaedi et al, 2019).

Educators have been more aware of developing science curricula, general stage of education and developing their methods of teaching, due to what they have found in teaching science from the necessary knowledge experiences in developing different thinking, though learners' thinking can be developed while learning science by directing their attention to the necessity of identifying and determining the problems presented in accurate form, also delegating them to tasks and activities that require concentration that challenge their mental capacities. Moreover, it requires directing and guiding them during their thinking to the best solutions in order to exclude inappropriate solutions. In order to develop thinking through teaching science, it was necessary for the curricula to be incorporated into strategies and related educational methods which are designed specifically to develop thinking skills.

By reviewing the goals of teaching science in the stages of teaching, we find that it emphasizes on the importance of providing the learner with appropriate mental skills such as: basic science processes, scientific and creative thinking skills, reflective thinking, and problem solving (Abadlh, 2013).

Science educators emphasize that one of the goals of educating science is to teach students how to think, not how to memorize school curricula by heart without understanding, absorbing, or using them in life. To achieve this, teaching science should focus on helping students to acquire the scientific method in thinking, or scientific method in research and thinking.

Furthermore, reflective thinking is deemed to be one of the patterns of thinking, and it always makes the individual plan and evaluate his method in the processes and steps that he takes to make an appropriate decision. Reflective thinking depends on how to face problems and change phenomena and events. And the person who thinks reflectively has the ability to realize relationships, make summaries and make use of information to support his point of view, analyze introductions, review alternatives and search for them. Reflective thinking also includes many skills and components, the most important ones are the skill of visual vision, reach conclusions, disclosure of fallacies, development of proposed solutions, evaluating and adhering to the correct logical relationships, and extraction of conclusions and phrases (Qeshta, 2016).

## 1.2 Statement of Problem

The survey of the practical reality of teaching general science in the overall education stages in general, and particularly in the stage of basic education, through individual interviews with a number of general science teachers in Kurdistan Region, it is assured that the teaching of this area still depends on the traditional method of teaching and based on the information from the teacher and receive the student conversation and memorization without understanding, thinking, questioning or linking to reality, which produced a negative tendency towards this subject among students as a result of neglecting and misuse of the real role of the general science.

Through the work of the researchers in the field of education as a science teacher in schools of the Basic Education Grade, they noticed a lack of students' achievement with the subject of science, they are not motivated, moreover, the teachers of the material suffer from the lack of time and the difficulty of completing and covering the whole course book, due to the traditional way in teaching them. For instance, the teacher explains the scientific material to the students, then he gives homework to the students, like questions, problems solving and training to work them at home, but in reality most of the students forget what the teacher has explained during the lesson to do their homework, especially most of the students do not pay attention to note-taking during the teacher's explanation.

In flipped learning, the opposite is true; students rely on watching educational films at home quickly and at their convenient time, as according to this type of learning they can re-watch them to explain a certain point more than once, or speed up the display to get what is needed, with the possibility of viewing through computer or mobile devices. This allows student to be engaged and involved in any educational processes at any time, and it gives them the opportunity to record notes during viewing, keeping in mind, that students are not required to understand everything, but only to understand basic concepts. The available and appropriate technology has helped to transform the lesson or lecture style which is limited to teaching within the classroom, by relying on the technique and the method of teaching of the teacher. From this point of view and with the scientific and technological progress that has been achieved and emerged. The field of modern teaching strategies seeks to reform the educational process, to be changed especially the role of traditional practice of the school and home, where the learner will take more active role in assuming responsibility and learn among these strategies that seek to reverse learning strategy.

The current research problem can be framed with the following question:

***(What is The Effectiveness of Using Flipped Learning Strategy in the Academic Achievement by Eighth Grade Basic Students in the Subject of Science and Developing their Reflective Thinking?)***

### 1.3 Aims of the Research

The aim of this research is to study the effectiveness of using Flipped Learning strategy in teaching the subject of science to 8<sup>th</sup> grade students. It is also aims to achieve the following objectives:

1. Identify the effectiveness of using Flipped Learning Strategy on the academic achievement of 8<sup>th</sup> grade basic students in the subject of science.
2. Identify the effectiveness of using Flipped Learning Strategy on developing reflective thinking of 8<sup>th</sup> grade basic students.

### 1.4 Research Hypotheses

The following hypotheses are formulated according to the aims of the research:

1. There is no statistically significant difference in the significance level (0.05) between the average degrees of the students in the experimental group which taught according to the Flipped Learning Strategy and the average degrees of the students of the control group which taught according to the Traditional Method in the academic achievement.
2. There is no statistically significant difference at the significance level (0.05) between the average difference for the degrees of students of the experimental group which taught according to the Flipped Learning Strategy and the average difference for the degrees of students of the control group which taught according to the Traditional Method in developing Reflective Thinking.

### 1.5 Importance of the Research

The current research derives its importance from the following points:

1. The results of this research may help the educational staff to use a modern strategy which will increase the effectiveness of the outputs of the educational process.
2. Teachers may benefit from various educational courses and all educational stages, with a realistic vision to the extent that students will benefit from the use of Flipped Learning Strategy.
3. It may help curriculum developers to reconsider the possibility of including some topics in the curriculum within this strategy.
4. Encourages educational supervisors to develop training programs and materials based on this strategy, and teacher training.
5. This research is based on the researcher's understanding that this is the first educational research applies the effectiveness of using Flipped Learning Strategy in the academic achievement and developing reflective thinking by eighth grade basic students in the Subject of Science in Iraq in general and Kurdistan region in particular.

### 1.6 Limits of the Research

This research is limited to:

1. Eighth grade in the basic schools in the center of Soran City.
2. First semester of the academic year (2019-2020).
3. Units: (A. Simple Organisms, Fungi, and Plants, B. Animals, C. Earth's History) of the subject of science for 8<sup>th</sup> grade for the schools of Kurdistan Region of Iraq for the academic year (2019-2020) (pp. 6 -158).

### 1.7 Definition of Basic Terms

The following are the main terms used in the current study according to these definitions:

#### 1.7.1 Strategy

According to:

- **Atiyah (2008)** strategy is: a plan which includes goals, methods, techniques, and procedures that the teacher undertakes to achieve specific goals (Atiyah, 2008).

- **Zaitoon (2005)** Strategy is: a set of teaching procedures chosen by the teacher that are planned to be used during the implementation of the lesson in order to reach teaching aims and as effectively as possible (Zaitoon, 2005).

- **Haji and Aldershewi (2019)** state that strategy is basic steps which are planned by teacher to achieve and reach the objectives of the lesson, so that learners be able to perceive, realize and implement the content of the subject of lesson (Haji and Aldershewi, 2019).

**Adopts the above definitions the researcher defines strategy theoretically as:** It is a plan which includes the desired educational goals, methods, techniques, styles and procedures that are performed by the teacher in order to achieve the educational goals of students.

#### 1.7.2 Flipped Learning

Defined by:

- **Bergmann and Sams (2012):** As an instructional strategy that is basically means that what is traditionally done in the class is now done at home, and that what is traditionally done as homework is now completed in the class (Bergmann and Sams, 2012).

- **Wolf and Chan (2016) as:** a strategy which provides pre-recorded lessons for students in the form of (video or audio) which contains activities inside the class, students can see the videos at home or out of the class and after students come back to the class, they will devote their time to interact with each other such as Q&A sessions, debates, exercises or other learning activities. The flipped classroom 'inverts' activities inside the classroom and outside the classroom (Wolf and Chan, 2016).

- **DeLozier and Rhodes (2017) as:** an educational strategy in which the lessons are designed and pursued outside the class, and the class time is devoted to various learning activities (DeLozier and Rhodes, 2017).

- **According to Mehring and Leis (2018):** Flipped Learning is intercommunication among the numbers of the learning environment; in this strategy student are responsible for carrying out educational activities, it is a combination of teaching from the teacher and constructivist learning; and students participate actively to achieve learning outcomes (Mehring and Leis, 2018).

**The researcher defines Flipped Learning Strategy procedurally as:** an educational strategy that aims to employ the technological developments represented by recording lessons in the form of an educational video on (CDs) in the educational process, and replay changing roles between what happens in the class and what happens before coming back to it, by preparing the topic of the science subject and sending it to learners of grade eight of basic education about science subject in the class, before the teacher explains the process it will be available to her/him over time, and then the teacher performs activities and duties in the classroom, which enhance her/him subject of the lesson in this case students come to the class and have the complete readiness to apply those concepts and participate in the class.

#### 1.7.3 Academic Achievement

It is defined by:

- **Abu Hatab and Fahmy (2003) as:** the information and capabilities acquired by the students or reach it in school subject, in educational field, or in school performance (Abu Hatab and Fahmy, 2003).

- **Collins and O'Brien (2003):** as a measurement of students' achievement on a standardized test to compare individual growth in a subject area against a standard; an evaluation of something accomplished, such as an athletic skill or academic test (Collins and O'Brien, 2003).

- **Dhull (2017):** as the extent to which a learner is profiting from instructions in a given area of learning, achievement is

reflected by the extent to which skill or knowledge has been imparted to him (Dhull, 2017).

**The researcher defines academic achievement procedurally as:** the amount of the degree which is obtained by female students in the academic achievement test prepared by the researcher to measure the amount of female students retaining information, concepts and knowledge during their learning of the material that is subjected to the experiment from science of the eighth grade, and it is measured by the degree which is obtained in this test.

#### 1.7.4 Reflective Thinking

It is defined by:

– **Kitchener (1994) states that:** as the meditation works, situations and problems that are faced by students, formulating appropriate title for them, analyze procedures, draw up appropriate plans to achieve goals and evaluate results (Kitchener, 1994).

– **Kember et al (2000) as:** the process of internally examining and exploring an issue of concern, triggered by an experience, which creates and clarifies meaning in terms of self, and which results in a changed conceptual perspective (Kember et al, 2000).

– **Al-Halaq (2010):** as that thinking which an individual meditates the existence situation that is facing, and analyzing it into its elements, and draws the essential plans to understand it in order to reach the required results by the situation, and evaluate the results in the light of the advance plans (Al- Halaq, 2010).

– **According to Porntaweekul, Raksataya and Nethanomsak (2016):** Reflective thinking, that sort of thinking which is mentally-engaging in cognitive processes for understanding conflicting factors in a situation, is a critical component of the learning process (Porntaweekul et al, 2016).

**The researcher defines it procedurally:** as purposeful mental activity that the learners perform when they are facing an educational situation, a problem, or imagining a subject in which they are practicing some of mental thinking skills through it, such as (visual vision, paralogisms revealing, conclusion, providing convincing explanation, proposed solutions) to reach an explanation of the educational situation or a specific solution to the problem that they face, which is measured by the degree that the students get in the Reflective Thinking scale that is prepared by the researcher.

## 2. THEORETICAL BACKGROUND AND RELATED PREVIOUS STUDES

### First: Theoretical Background

#### 2.1 Overview

This chapter contains theoretical background about the independent variable which are related with is related to the Flipped learning strategy, and the dependent variables which are the academic achievement and reflective thinking. It also reviews previous studies related to the research variables which are the flipped learning and reflective thinking.

#### 2.2 Flipped Learning Strategy

The revolution of technologies, computer, and information has changed all the educational data, and it has turned its system, concepts and methods upside-down, mastery of education became urgently required, but not choice. Traditional methods are no longer appropriate to the new generation. This is obvious through Students' addicting to their tablets, smart phones, and other different devices. Therefore, educational institutions should think about the needs and requirements of the era, through providing an exciting and attractive educational environment which meets Students' interest. So, in the light of what is mentioned, educational foundations have become to face huge challenges that need to be responded by new educational notion and developing modern strategies until

educational foundations can prepare generation to have skills of dealing with variables of twenty first century (Abdulhamid, 2010).

From this point, several strategies have appeared that use modern technologies in the process of teaching; the main one is the flipped learning strategy.

Flipped learning is a pedagogical strategy in which direct instruction moves from the group learning spaces to the individual learning space, and the results are the group space is transformed into a dynamic, interactive learning environment where the educator guides students as they apply concepts and engage them (students) creatively in the subject matter (Talbert, 2017).

The origins of the flipped classroom can be traced back to 2007 when two high school chemistry teachers in Colorado, Jonathan Bergman and Aron Sams, became concerned with students who often missed classes to attend competitions, games or other events. They began to record lectures, demonstration and slide presentations which they then posted on YouTube for students to access (Wolff and Chan, 2016).

#### 2.2.1 Pillars of Flipped Learning Strategy

The definition of the flipped learning describes it in term of the use of time, space, and activity. It also lays out four pillars of flipped learning, conveniently arranged as the acronym FLIP:

1. **Flexible environment:** Flipped learning is based on allowing learners to learn in different ways and at different speeds, and to give learners choices in how they demonstrate evidence that they have mastered the course content.
2. **Learning philosophy:** It refers to overlapping from teacher centered-teaching into student-centered learning.
3. **Intentional content:** The teachers manage technological means to develop a cognitive understanding of students and provide smoothly education.
4. **Professional Educator:** the educator always gives more attention to engage students in the course learning, evaluate and feedback them than traditional approach (Talbert, 2017; El-Senousy and Alquda, 2017; Al-sherman, 2015).

#### 2.2.2 The Main Factors that Helped Flipped Learning Strategy to appear are:

The following are the factors which helped flipped learning strategy to appear:

1. **Rapid evaluation of technology:** the main development is the global information network and its intervention in humans' life, the big development that happens in information technologies and communication contributed in changing many life patterns. smart phones become the most important personal items which occupy large space in individuals days' life even in working places, it becomes possible for the students to interact with the educational content whenever and wherever he/she wants with accordance to the situations that suit with him/her, thus it becomes clear that the emergence of flipped learning as a result to such a development.
2. **Knowledge accumulation** that focuses on the necessity of variety of the methods of learning and facilities: traditional method remains unable to achieve learning requirements objectives for periods of time perhaps for a long time; therefore it is possible to use different effective styles and approaches to transfer knowledge which helps to keep information for a long time relatively.
3. **The rise of students' number** in a classroom and for having overcrowded classrooms, and sometimes the teacher spends much more time to explain the educational materials for some students who cannot get the information as it is required (Al-Sherman, 2015; Al-ugaili, 2019).

### 2.2.3 Principles of Designing a Flipped Learning Unit

There are several principles the teacher has to follow when using flipped learning as follows below:

1. Give students a chance to learn basic information outside of the class.
2. Hold students accountable for pre-class preparation.
3. Assess pre-class and in-class learning.
4. Provide well- defined and structured guidance to students during in-class activities.
5. Make a clear connection between in-class activities, pre-class materials, and learning objectives and goals.
6. Allocate sufficient time for students in the class to perform the in-class assignments.
7. Maximize opportunities for faculty to interact with students.
8. Give one free pass to students who do not complete the pre-class assignments (Roehling, 2018).

### 2.2.4 Implementation Phases of Flipped Learning Strategy in Teaching

Flipped learning strategy applies according to the following phases:

- **Phase one: Pre- Class Tasks:** Input and preparation activities including (reading, watching, input videos, note-taking, and preparatory exercises) (Mehring and Leis, 2018). Students watch a short lecture video and take handwritten notes onto a printed outline with images. Videos generally less than 15 minutes long (Green et al, 2017).

Students are given CDs that are recording by teacher audio and video of situational conversations to listen before the class. The CD files are in MP4, in which it is easier to be downloaded in their computers, this audio is about the topics in the science book subjects that will be given to students before starting new lessons at least one day, students watch the videos at home and then check the questions that were guide to them in the video and also fill the watching, summarizing, questioning (WSQ) page which consists of some questions must answer at home. At the beginning of the class the teacher quickly checks the students' preparation of homework and the (WSQ) page then construction of the role-plays are ready to begin among students in groups.

- **Phase Two: In-Class Activities:** Feedback, discussion, and evaluation activities based on prior input (Mehring and Leis, 2018).

The lesson begins as soon as students walk through the classroom door; they choose playing cards from the box on the teachers' (researcher) table in the class. This determines students' group name which will change in every lessons to not give boring feelings to learners, these names are usually take from types of roses and colors like (red, yellow, white, pink, orange, etc...).

The teacher will review the last subject for the students at first then a new lesson is started, the class is warmed up by the students' presentation group for the subject and the teacher's questions that will guide the learners, in both cases the activity is related to the theme of the day (e.g., "fish" or "mammals"). The warming-up involves the whole class, which has been already divided into groups.

Example of easy warm-up activities includes:

- One student is in the "hot seat" and stands in the middle of the group. The other members provide hints to ask her questions like give the name of one of the mammal's animal by acting the sound of that animal. Learners switch roles after each correct answer.
- One student starts off by saying a name of an animal with a key piece of information (e.g., bear). The next student repeats the previous name and adds a piece of original information.

During the warm-up, the teacher walks around to each group to make sure they are using flipped chart, and also answered the questions that teacher presented to them in video; furthermore he fills the (WSQ) page or he lets students fill in the page while he goes around to help those students who have difficulties in dealing with the activity. Using a variety of easy warm-up activities helps students review the key concepts that they should have learned through the homework and also gives them ideas for their own science classes in future.

If students lead the warm-up activity for the class, each group is given the same activity rubric to follow when creating their presentation. This rubric can be determined by the teacher or by the students themselves after in-class discussion of what makes a successful warm-up activity.

The class warm-up is followed by a quick review of the homework, with more time spent on the explanation of questions that may have given the students problem.

After the homework review, learners break off into groups of four to create their original role-plays based on the video and textbook conversation. Again these groups are determined by playing cards down before class begins, thus eliminating any wasted time.

- **Phase Tree: Post- Class:** follow up activities, complete - assessments, which are done independently to allow for more time and development; follow up activities may further extend learning (Mehring and Leis, 2018).

### 2.2.5 Justifications for the use of Flipped Learning Strategy:

Flipping the classroom has transformed teachers teaching practice. Teachers no longer stand in front of their students and talk to them for 30 to 60 minutes at a time. This radical change has allowed teachers to take on a different role with their students, Accordingly, Bergman and Sams, (2012) have highlighted why teachers should consider flipping their classroom:

1. Flipping speaks the language of today's students: Today's students grew up with Internet access, YouTube, Facebook, MySpace, and a host of other digital resources. They can typically be found doing their science homework while texting their friends, and listening to music at the same time.
2. Flipping helps struggling students: In the traditional method the students who tended to get teachers' attention were the best and brightest students who would raise their hands first and ask great questions, but in flipped strategy teachers' role changed no longer walking in class among students. This is the most single important reason students thrive in flipped strategy, in addition teachers' attention directed to students who need the most help.
3. Flipping helps students of all abilities to excel: Special education teachers love this model as well, because all the direct instruction are recorded, students with special needs can watch the videos as many times as they need to learn the material, instead of taking notes and understanding it later, but with flipped learning strategy students can pause and rewind videos and make sure that they learn important concepts.
4. Flipping allows teachers to know their students better: The role of teachers at school is not only to teach content, but also to inspire, encourage, listen and to provide a vision for the students. This happens in the context of relationships, and it believes that good teachers build relationships with students, also students need positive adult models in their lives therefore flipping allows teachers to build better relationships with students.
5. Flipping is increases student-student interaction: One of the greatest benefits of flipping is that overall interaction increases, teacher- to- student, and student- to- student, because the role of the teacher has changed from presenter of content to learning coach.

6. Flipping allows for real differentiation: One of the struggles in today's school is accommodating a vast range of abilities in each class. Flipping the class shows how needy many of students and how powerful the flipped classroom is in reaching students all along this broad range of abilities.

7. Flipping changes classroom management: Under a traditional model of teaching, there are students who consistently did not pay attention in class and have affected negatively everybody else's learning, in flipped classroom many of the classroom management problems evaporated, because students will be busy with activities in groups (Bergman and Sams, 2012).

8. Based on the idea of flipped learning, the researcher concludes that flipping gives benefits in crisis: especially when there is a social crisis that hinders the process of movement and transference, or hinders human gatherings in one way or another, and this applies to what is happening nowadays as the world suffers from the spread of the corona virus epidemic, E-learning solutions and applications or distance education is the most appropriate means for the educational system to continue without interruption, and this is what is provided by the flipped learning environment.

Wolff and Chan (2016) mentioned the following arguments about using flipped learning strategy:

1. Improved Learning Experience: A number of authors suggest that flipped classroom and blended learning techniques in legal education lead to improved learning experiences. Particular advantages are seen in the possibility to promote active learning, to increase interaction between faculty and students, it improves collaboration among students, to allow flexible learning just-in-time, and to foster critical thinking.

2. Flexible Learning: One obvious benefit of flipped learning is convenience and flexibility. This suits the learning needs of digital native students who can in principle access learning resources whenever and wherever. Nevertheless, with the increase in flexibility, students can acquire their knowledge without attending any class which may result in a reduced face-to-face classroom attendance.

3. IT Literacy: The flipped classroom model is not only an effective way of learning. In contrast, this new model can also teach students information technology (IT) literacy which is crucial for success in the modern legal profession.

4. Improved Learning outcomes: Improved learning experiences also have positive effects on learning outcomes. In contrast, flipped classroom also helps to close the gap between the strongest and weakest students in the class and improve the class performance as a whole. Also students who participate in flipped course will score better in terms of success, attendance and withdrawal rates than their peers in traditional courses.

5. Students Feedback: Students evaluation result about flipped classroom in some studies showed a positive perception, students agreed that:

- The course increased their analytical and problem solving skills. The group work helped them understand the practice of law.

- Also, they mentioned that they were convenient and improved their comprehension.

- Students said the interaction with the faculty was better than in traditional course.

- They noticed two major changes in their learning experience, namely taking more responsibility for their learning and reflecting more on the assigned topics before coming to classes.

6. Issues with 'Flipping': In face-to-face setting teachers can observe students reaction and thus assess the level of understanding so that teachers may vary the amount and speed of teaching and provide instant feedback to students, the physical appearance of a teacher itself can be important for encouraging students' to learn. While in flipped classroom concept does not do away with in-class face-to-face teaching,

also flipped classrooms change the in-class teaching to a more interactive mode and add online lecture (Wolff and Chan, 2016).

### 2.2.6 Specification (Advantages) of Flipped Learning Strategy

The use of flipped learning strategy has several advantages, including:

1. Learning in the flipped classroom involves the construction of identities, a learning journey between master and disciple where students are engaged in both instructor and learner roles, essentially learning by doing.

2. This is an inherently social process where students interact with each other's and the content being taught, rather than the instructor as the focal point of the lesson.

3. In the flipped class, students encounter more opportunities to learn independently, as well as sometimes become mentors by helping struggling students and working together to solve issues/problems in class.

4. Shy students also get benefits from it, instructor needs to allow students a chance to just be an observer during the small group collaboration, with the understanding that they will have the opportunity to share first during the next class.

5. In the flipped classroom, learning can take place on two levels, one the individual level and one the group level.

6. Face to face class time involves not only changing methods but also adjusting the students' perception of how they are accustomed to learning and the teacher's role in the classroom.

7. Another point of benefit is that learners develop confidence in expressing the personal opinions that they have developed independently through the preparation process (Mehrig and Leis, 2018).

8. Class time can be used for more effective active learning activities.

9. Flipped learning improves the educational value of the course by increasing a broad range of learning outcomes such as higher-order thinking, engagement, and collaborative skills.

10. Companying of today's students culture in rapidly technology advanced (Roehling, 2018).

### 2.2.7 Obstacles to the Implementation of Flipped Learning

The obstacles that face the implementation of flipped learning can be recognized as below:

1. Recorded lectures can be less engaging than live lectures.

2. Compliance with watching videos is difficult to monitor.

3. Technical problems may interfere with learning (Roehling, 2018).

4. Increased workload is one challenge, as students surprised by the amount of preparation that needs to be done before class; therefore a gradual implementation of the system should be taken into consideration

5. Teachers will also realize the flipped classroom requires a lot of preparation, creating pre-class materials and redesigning the face to face learning environment (Mehring and Leis, 2018; Al-Sherman, 2015).

6. Lack of availability of necessary electronic devices to prepare the contents in more than one way.

7. Lack of teachers' sufficient technology experiences in how to use tools for preparing digital contents.

8. Fear of some people from the disadvantage of using digital devices by the students (Al-ugaili, 2019).

The researcher tries to solve the obstacles during the implementation of the flipped learning as following: regarding point one the researcher has not just depended on the recorded lectures, but also she was present and ready in the classroom when students discuss the subject. According to obstacle number two, the researcher has prepared a (WSQ) paper in which students filled it by answering the questions which were written on the paper, then they bought back them to school in

the next lecture. Concerning the questions, which students couldn't get their answers immediately while they were viewing (vodcast), the researcher solved this problem by asking students to write down their questions in (WSQ) paper in order to answer them. Regarding the technical problems in point number four the researcher did not face any technical problems during the whole semester, this is due to the high quality of the recorded lectures, it is worth mentioning that the recorded lectures have not just depended or limited to the content of science subject, but also covered extra information like, photos and videos which are related to the topics of the lectures. Moreover the researcher has treated with workload carefully, at first she gave the students little homework to be familiar with, and then she increased the homework gradually. Regarding obstacles number seven, the researcher has devoted enough time to prepare a good video recording, the time allotted was not less than one hour for each lecture to present enough information to the learners. Furthermore, lack of electronic devices was not formed as problem or an obstacle for the researcher, because the researcher has made sure that all the students of experimental group have electronic devices in their home and use them daily.

It is worth noting that lack of experiences in using technology was not regarded as an obstacle for the researcher herself, because she has a good background of using technological devices and programs, as result the researcher did not face any obstacles deemed as a negative point during delivering the lectures, clarifying the level of the cultural awareness and the educational attainment of the students' parents, in spite of the students' passion to employ technology.

### 2.2.8 Teacher's Role in Flipped Learning Strategy

The teacher has many roles to play when applying the flipped learning strategy:

1. Moving lecture online and homework into the classroom.
2. Teacher's role from lecture content. Creator/curator and from expert to coach.
3. The purpose of content from central importance to a support function.
4. Designing and creating educational videos.
5. Transforming teacher's role from focusing on teaching content to teaching content, skill and patterns of thinking (Al-Sherman, 2015).

Teacher's adopting flipped teaching style does not mean that the teacher will abandon his role, in other words, means that he is doing more in the traditional teaching style, but it means that besides adapting the flipped teaching style, the teacher will go on in his following-up to his students in terms of, returning students' test paper quickly, correcting their assignments, correcting and scoring quizzes, giving feedback, and assessing the performance of each student.

### 2.2.9 Student's Role in Flipped Learning Strategy

Students play main roles in the strategy of the flipped learning as follows:

1. Students watch the educational video which is prepared by the teacher in pre-class (at home through computer, phone or tablets) (Strayer, 2007).
2. Taking notes and writing questions by students through watching video, because whenever they want the students can pause the video and take notes or make it fast forward and rewind of explanation of the topic to be able to understand the ambiguous elements (Hockstader, 2013).
3. Students come to class with the fundamental understanding of the key points and concepts related to the subject, with taking into consideration the time given in the starting of the lesson to answer students' question about the topic, and discussing them by doing arguments. After that the teacher has prepared the specific activity that associated to that day lecture which is in the form laboratory experiment, survey search mission, applies

activity regarding solving problems related to the lesson, or even formative testing, with possibility of having more than one activity or mission in one lesson (Bergman and Sams, 2012)

4. Students find answers to their own questions rather than expecting answers from you (teacher).
5. Students role from responsive learner to responsible learner (Green et al, 2017).
6. Students' focus on active learning inside the classroom.
7. Self-depending in learning by the students.
8. Student becomes the center of leaning during the lesson (Al-Sherman, 2015).

### 2.3 Reflective Thinking

Reflective thinking obsessed attention of many philosophies and psychological scientists as (Dewy), (Benet) and others, but this attention disappeared in psychological research during the flourishing of behaviorism, it remained the same until the early of eighties (1980s) of the past century. Afterward, (Schon) returned the attention of reflective thinking when he mentioned the importance of reflective thinking in educational process. Then, the attention increased by many of those who believe of the importance of analytical thinking and critical thinking to use reflective term in their research, especially what is related to classroom learning (Al Zoubi, 2015).

Reflective thinking is considered one of the necessary requirements in improving the educational process, whereas reflective thinking enhances and develops the skills of critical thinking of learners through practicing educational activities, hence it is necessary to combine reflective thinking skills with critical thinking in the classroom.

The importance of reflective thinking seems to be encouraging learners to gain deeper understanding of subject contents, and convert their negative experiences which connect with their feelings and motives to positive experiences.

On the other hand Kish & Sheehan (1997) pointed out that enhancing learners' reflective thinking by their teachers leads into positive educational outcomes, in fact, it is manifested in decreasing guiding toward impulsive behavioral, in addition to the promoting of the association between different viewpoints and promote of self-contentment which develops their problems solving skills, moreover it helps them to analyze the ideas, situations, issues in careful and closer look acts a significant role in evaluating the results of students (Abdulqadir, 2017).

#### 2.3.1 Stages of Reflective Thinking

Several views have existed in determining stages of reflective thinking, while practicing the process of thinking. There are distinctive levels of preparation and mental rehabilitation which can be taken from the famous steps that of (John Dewey) s about reflective thinking process. The stages of reflective thinking are classified as (Hulfish and Smith, 1961):

1. Having of situation and admitting to the problem.
2. Clarifying the problem by recognizing the reasons of happening.
3. Testing and editing the composition of hypothesis.
4. Depending on the hypothesis that is enhanced more than others (Hulfish and Smith, 1961).

While Schon (1983) divides the stages of reflective thinking into three stages:

1. **Reflection before action:** it starts by planning and putting complete imagination on the action and planning for prospective argents.
2. **Reflection in action:** it is a formative meditation which means thinking continuously about what the individual is doing and amending ones practices one-to-one if any.
3. **Reflection on action:** It requires understanding the problem of situation, reformulating it, testing the proposed solutions, and presenting the results with the intent of



generating new meanings for the student's work to facilitate his learning.

As Lee (2005) pointed out three stages of flipped learning: first stage: lack of reflective, second stage is usual practice and the last one is thinking about practicing.

Regarding the arising of reflective thinking according to (Dewy), it is connected with the rigidity of situations which are faced by the student that requires from him/her a systematic mental question and work on survey research to face it, which leads to the pleasure of thought and theoretical manipulation (Al-Sa'ydeh, 2016).

Obid and Afanna (2003) show many stages of reflective thinking as:

1. Awareness of problem.
2. Understanding the problem.
3. Proposed solutions, data classification and exploring the relations.
4. Findings of proposed solutions- accept or refuse solutions.
5. Testing solutions practically- accept or refuse findings (Obid and Afanna, 2003).

### 2.3.2 Reflective Thinking Levels

Reflective thinking is considered one of the mental activities that are performed by individuals and it is obvious from the levels that are classified by reflection which individuals can practice. Researchers' classification varied according to the procedures or the purpose behind using this type of thinking, as Al-Harithy (2011) demonstrated that this type of thinking can be classified into three levels as:

1. First level: Everyday reflection fleeting: Daily or random reflective which happens most of the time and in its own range, but not usually when the individual is alone, however this form of thinking is not deeper than thinking or remembering about things with single person or more. It can have a part role within lots of several thinking levels that reach the practice of thinking.
2. Second level: Deliberate reflection committed: It includes careful and deliberate meditation which involves reviewing and developing person to individual practicing by number of individual or collaborative studied methods. So the reflection in this level is about procedure and perhaps contributes or not directly in develops practicing.
3. Third level: Deliberative and systematic reflection-programmatic: This is happened an established and deliberated reviewing and through programmatic development. Reflection occurs through the process of work. In addition about the process of work, usually it takes form of projects as it requires long period of time and accurate planning, in fact often it requires funding to support these needs.

Nevertheless each level has been asserted by value, and each level that has been chosen by a person to work through, it is determined by the related goal (Al-Harithy, 2011).

### 2.3.3 Reflective Thinking Skills

Reflective thinking involves five basic skills as follows:

1. Visual vision: is the ability to present aspects of the problem and identifies its components. This can be done through the nature of the problem or giving drawing or shape showing its component in which the available relations can be discovered visually.
2. Paralogisms revealing: it is attended to identify gaps of the problems, and this can be done through determining inappropriate relationships, illogical, or identifying some of wrong steps in the implementation of the educational mission.
3. Conclusions: it is the ability to reach particular logical relationships through understanding to the content of the problem and reaching the proper outcomes and this is through checking everything presenting from the similarities found in educational situation.

4. Provide convincing explanation: it is the ability to make sense of the linked relationships or the findings logically, and it might be this sense depends on the previous information or nature of problem and its characteristic.

5. Proposed solutions: it is the ability of preparing logical steps to solve the problem at hand; so these steps will be based on expected intellectual perceptions to the problem presented (Al-Shahri, 2017).

The researchers agree with the previous skill definitions, for the clarity of their expressions and to the sufficient explanation which is intended concern those skills, in which reflective thinking skills will be measured through students' answers on reflective thinking scale which is prepared for the purpose of measuring.

## SECOND: PREVIOUS RELATED STUDIES:

### 2.4 Overview

In this part of the study the researchers refers to the previous related studies to research variables which are Flipped learning Strategy and reflective thinking, and it is important to mention these studies are experimental related to the research variables:

### 2.5 Previous Studies related to Flipped Learning Strategy:

#### 2.5.1 Feledichuk and Wong (2014)

This study was done in Canada (Alberta), which aimed to compare two undergraduate economics classes taught by the same instructor. One class used a traditional method which contained (73) students, while the other utilized a flipped classroom strategy on (27) students. In the flipped classrooms students watched video lectures outside class time and worked on application activities within inside the class. Assessments included two mind- terms and a final exam. The results showed an overall increase of 11.43% in the final grade of the flipped class in comparison to the non-flipped classroom. International students showed an increase of 13.23% and Canadian students 10.85% in the flipped class environment in comparison to their corresponding group in the non-flipped class (Feledichuk and Wong, 2014).

#### 2.5.2 Qeshta, (2016)

This study was done in Palestine (Gaza), which aimed at explaining the impact of employing the flipped learning on developing the Science concepts and Reflective Thinking skills of the tenth grade female students in the Biology course. The study sample consisted of (80) female students in the tenth grade at Amina Bint Wahb secondary girls' school in the scholastic year 2015/2016. They were divided into two groups after being randomly selected: a control group consisted of (42) students and an experimental group consisted of (38) students. After applying the study tools on the sample of the study and making the necessary statistical analyses, the results showed that there were statistically significant differences at the significance level (0.05) between the mean scores of the control group and the experimental group in the science concepts' test in favor of the experimental group. The results also showed that there were statistically significant differences at the significance level (0.05) between the mean scores of the control group and the experimental group in the reflective thinking test in favor of the experimental group (Qeshta, 2016).

#### 2.5.3 Othman, (2016)

This study was done in Jordan (AlYarmouk), which aimed at explaining the effect of employing the flipped learning strategy on the achievement of seventh grade students in science and their attitudes towards science. The researcher applied a Quasi Experimental approach, and the sample of study consisted of (56) students selected randomly from students of 7<sup>th</sup> basic class in two different school, one of them experimental group were taught according to flipped learning strategy, and the second control group were taught according to the traditional method.

After applying the study tools on the sample of the study and making the necessary statistical analyses, the results showed that there were no statistically significant differences at the significance level (0.05) between the mean scores of the experimental group and the control group in the academic achievement test, the study also showed that the attitudes of students towards science were positive (Othman, 2016).

#### **2.5.4 Camiling (2017)**

This study was done in Philippines (Quezon), the study investigated the effect of flipped classroom strategy on the basic science process skills, an experimental design was used, and the sample of study consisted of (24) students as the participants were divided into two groups: experimental and control. The experimental group was asked to watch at home researcher-made videos that teach the basic science process skills. In class, these participants deepened understanding of the skills through varied activities. The control group was taught using the traditional method operationalized as 5E Inquiry-Based Model. Both pre- and post-tests were administered to check the relative test scores. It was concluded that there was a statistically significant difference at (0.05), with a large effect size between the two variables (Camiling, 2017).

#### **2.5.5 Elian and Hamaidi (2018)**

This study was done in Jordan (Amman), which aimed at investigating the effect of flipped classroom strategy on the academic achievement in the subject of science among fourth grade students in Jordan. The study population consisted of all fourth grade students in the Directorate of Private Education in Amman area, during the second semester of the academic year (2015-2016). The study sample consisted of (44) male and female students who were chosen purposely from the study population. The study sample was distributed into two groups: the experimental group that consisted of (22) students who have studied according to flipped classroom strategy, and the control group that consisted of (22) students, who have studied in the ordinary method. The results of the study showed that there were statistically significant differences in the Means on the educational achievement test attributed to the teaching strategy, in favor of the members of the experimental group, and they also showed that there were no statistically significant differences in the Means on the academic achievement test attributed to gender. (Elian and Hamaidi, 2018).

## **2.6 Previous Studies related to Reflective Thinking:**

#### **2.6.1 El-Qatrawi (2010)**

This study was done in Palestine (Gaza), which aimed to investigate the effect of using "Analogical Strategy" in developing science process and reflective thinking skills. The study sample selected as purpose method. Each classroom contained (32) students, and the other group was the experimental control group and contained (32) students. The researcher designed the study instrument, namely the analysis instrument of the unit "telescope and cell unit" in the eighth grade science book to identify science processes and limited reflective thinking skills in this study as defining operationally, classifying and predicting. The second instrument comprised a 30-item test of science processes to measure the science processes under study. Also, the researcher used the 30-item test of reflective thinking skills. The results showed that there were significant statistical differences at the level (0.01) between the mean of the experimental group and the control group on science processes test due to using the analogical strategy as a method of teaching. There were significant statistical differences at the level (0.01) between the mean of the experimental group and the control group on reflective thinking test due to using the analogical strategy as a method of teaching (El-Qatrawi, 2010).

#### **2.6.2 Abadlh. (2013)**

This study was done in Palestine (Gaza), which aimed to investigate the effect of utilizing six out thinking Hats on teaching science on the achievement level and reflective thinking Skills of tenth grade students in Khan Younis Governorate. The study sample consisted of (80) students; they were selected randomly from Aylabun High School for Girls. The study was in the second quarter of the academic year (2012-2013). The most important results that resulted from the study, showed statistical significant differences between the students' grades average of the experimental and control group of students in the Academic achievement test, and reflective thinking test for the favour of the experimental group (Abadlh, 2013).

#### **2.6.3 Murphy (2014)**

This study was done in the United States of America (New York). The aim of this study was to measure the effect of a reflective practice instructional method on students' critical and reflective thinking enrolled in core curriculum science classes; standardized high school curriculum classes that embody skills and knowledge considered essential and thus made mandatory for all students. A target sample of (200) participating students was originally sought from intact groups in grades 9 through 12. The study was quasi-experimental in nature, with a pretest/posttest comparison group design using intact classrooms of students. Administration of two instruments measuring the characteristics of dispositions associated with critical thinking and the level of reflective thinking were used. The findings suggest that students were engaged in reflective practice in science class would have significantly higher levels of reflection, as measured by the RTQ, than students who did not. In addition, students' levels of reflective thinking predicted their critical thinking dispositions of Mental Focus and Cognitive Integrity (Murphy, 2014).

#### **2.6.4 Alhadaybeh and Ambusaedy (2016)**

This study which was done in Sultanate of Oman, aimed to investigate the effect of using McCarthy Model in developing reflective thinking and science achievement among grade 6th female students. The sample of study consisted of (55) female students, who were selected from two schools in Dakhiliyah Governorate. The experimental group (31) was taught the science content by McCarthy Model and control group (24) was taught the by the conventional method of teaching. To achieve the study's aims, three research instruments were designed: a teacher guide based on McCarthy Model, a reflective thinking skills test and a science achievement test. The results revealed that there were statically significant differences at (0.05) between the means of the experimental group and the control group in the whole reflective thinking skills and in the whole science achievement test in favor of the experimental group (Alhadaybeh and Ambusaedy, 2016).

## **3. METHODOLOGY OF THE RESEARCH AND PROCEDURES**

### **3.1 Overview**

The researcher has followed a number of procedures required by the research in order to reach the goals and verify the hypothesis. The procedures consisted choice of experimental design, specifying the research population, sample selection and the equivalency of the two groups, preparation of research materials with its tools, and used the appropriate statistical methods to analyze the research data as follows:

### **3.2 Experimental Design**

Before starting any experimental study, an appropriate experimental design should be selected to check the validity of the results derived from the hypothesis. The choice of experimental design provides a great advantage to the research which guarantees the proper structure and the appropriate strategy that controls the researcher's investigation and reach

the results which can be depended on to answer the research questions (Van Daleen, 2007). Therefore, the researcher has adopted the experimental design of equivalent groups because it fits the current research and achieves its objectives. This design includes two equivalent groups in a number of variables (Cohen et al, 2007). The first

one is an experimental taught according to Flipped Learning, and the second one is the control taught according to the traditional method. It includes a pre-test and post-test of the Reflective Thinking and only the post-test for academic achievement, as shown in the figure (3.1):

Group	Pre-test	Independent variable	Dependent variable (Post-test)
Experimental	Reflective Thinking	Flipped Learning Strategy	Academic Achievement
Control		Traditional Method	Reflective Thinking

Figure 3.1 Shows the experimental design of the research

### 3.3 Identify the Research Population and Sample

#### 3.3.1 Research Population:

The research population is represented by all the eighth-grade students and their number is (548) female student in the basic schools of Soran district for the academic year (2019-2020), and their numbers are (7) basic schools for girls. <sup>1</sup>.

#### 3.3.2 Research Sample:

The researcher chose (Trooska girls basic school) purposely to apply the experimental research, because she is familiar with the school's management, as they expressed their willingness to cooperate with her and provide the necessary facilities to conduct the research experiment, in addition of that the school contained more than one class of the eighth grade basic and did not subject to the distribution of any condition, as well as the students of the school are close from social, economic and

cultural environment, which assists the researcher fix some variables between the two groups for the purpose of equivalency between them, bearing in mind that the researcher has a formal permission from the directorate of education of Soran.

The researchers visited the school and found that there were two classes of eighth basic grade, the teaching method was randomly distributed on classes. Then the sample was selected randomly from the classes and the choice was made on class (B), which became the experimental group consisted of (21) students, taught according to Flipped Learning Strategy, whereas class (A) became the control group contained (20) students studying by the Traditional Methods, hence the total number of the sample students became (41) as shown in table (3.1)

Table 3. 1 Shows the distribution of the individuals of the research sample in the two groups

Class	Group	Teaching Method	Number of students in each group
B	Experimental	Flipped Learning Strategy	21
A	Control	Traditional Methods	20
Total			41

### 3.4 Equivalent Procedure of the Two Research Groups

The researcher conducted the equivalency between the two research groups in a number of variables that affect the two dependent variables and consequently in the results of the research and its accuracy, the researcher relied on testing these variables on some previous studies and related literature, and these variables are:

#### 1. Chronological Age:

Chronological age means the age of the students calculated in months. The researcher obtained the data related to this variable from the school records of the students and the students themselves, then the chronological age of the students of the two groups of research calculated in months until 1/10/2019, and to verify the equivalence between the two groups of research. The researcher extracted the average life time of the experimental and control groups, the average age of students in the experimental group are (163) months, and controlled group students (165.1) months. In order to determine the indication of the difference between the two averages, the researcher used T-test for two independent samples, the calculated T- value (0.813) is less than schedule T-value (2.042) at the level of significance (0.05) and the degree of freedom (39), and this indicates that there is no statistical difference. Thus, the two groups are equal in the chronological age variable, as shown in table (3.2).

Table 3. 2 Shows the arithmetic mean, and standard deviation, the calculated and tabular value (T) for the two groups of research in the chronological age variable

Group	Number of students	Arithmetic mean	Standard deviation	T value		Significance at level (0.05)
				Calculated	Schedule	
Experimental	21	163	9.888	0.813	2.042	Not significant statistically
Control	20	165.1	6.348			

<sup>1</sup>The researcher obtained these data from the Statistics unit of the General Directorate for the Education of Soran district, by an official letter from faculty of education- soran university numbered (495) at (11/9./2019).

**2. Intelligence Degree:**

The researchers applied the IQ test that prepared by Ahmad Zaki saleh (1964), and Al-Qazzaz codified it for the Iraqi environment (Al-Qazzaz, 1989), which includes (60) illustrated items, and its degrees range from (zero-60). After collecting the answers of the students of the two research groups, the results showed that the IQ means of the students for the experimental group is (35.476), while control group is

(34.1). To find the difference between the two samples, the researcher used T-test for two independent samples; the difference that was found was not statistically significant, where calculated T value was (0.785), which is less than the schedule T- value (2.042) at the significance level (0.05) at degree of freedom (39). This means that the two groups are equal in IQ. As shown in table (3.3).

**Table 3.3 Showing the arithmetic mean, the standard deviation, and the calculated and schedule T- value for the two groups in the IQ test**

Group	Number of students	Arithmetic mean	Standard deviation	T value		Significance at level (0.05)
				Calculated	Schedule	
Experimental	21	35.476	5.794	0.785	2.042	Not significant statistically
Control	20	34.10	5.428			

**3. Prior Knowledge of the Experimental Subject:**

For the purpose of equivalency between the two research groups in the previous knowledge test for the subject material of the experiment, the researcher prepared an achievement test which was a multiple-choice test that included (20) items. To ensure the integrity of the test before its application, it was presented to a group of specialists in science and teaching methods. After applying the test the arithmetic mean was

calculated for each group using T-test to compare between the two research groups. It was found out that there were no statistically significant differences and the calculated T value reached (1.157) which is less than table value (2.042) at the significance level (0.05), at degree of freedom (39). This means that the two groups are equal in the previous knowledge of the subject material to the experiment as shown in table (3.4).

**Table 3.4 Show the arithmetic mean, the standard deviation, and the calculated and tabular value (T) for the two groups in Prior knowledge test**

Group	Number of students	Arithmetic mean	Standard deviation	T value		Significance at level (0.05)
				Calculated	Schedule	
Experimental	21	8.667	1.338	1.157	2.042	Not significant statistically
Control	20	8	2.221			

**4. Academic Achievement in Science subject of Seventh Basic Grade**

The researcher obtained the final grades of the students for each group of the general science lesson which they studied in the seventh grade for the academic year (2018-2019) from the record of the school grades. Then, the arithmetic mean was calculated for each group then T-test was utilized in order to

compare between the two research groups. The test showed that there were no statistically significant differences and the calculated T-value reached (0.416) which is less than the table value (2.042) at the level of significance (0.05), at degree of freedom (39). This means that the two groups are equal in the prior knowledge of the subject material to the experiment as shown in table (3.5).

**Table 3.5 Show the arithmetic mean, the standard deviation, and the calculated and schedule T- value for the grades of the two groups of research in science for the seventh grade**

Group	Number of students	Arithmetic mean	Standard deviation	T value		Significance at level (0.05)
				Calculated	Schedule	
Experimental	21	68.571	14.211	0.416	2.042	Not significant statistically
Control	20	66.80	13.067			

**5. The Overall Average Degree for Students of the two Research Groups for the Seventh Basic Grade:**

The researcher obtained the general average score of the students for the two groups in the seventh basic grade from the schools' records, and the mathematical average for the students of the experimental and control groups was measured, which reached (73.714) and (72.25) respectively. To know the significance of the difference between the two averages, T-test

was used for comparison between the two research groups. It was found that there were no statistically significant differences, and the calculated T-value is (0.496) which is less than the table value (2.042) at the level of significance (0.05) and the degree of freedom (39). Therefore, the groups are equal in the previous knowledge of the subject material to the experiment, as shown in table (3.6).

**Table 3.6 Shows the calculated mean, standard deviation, calculated and tabulated T-value for two research groups in the overall rate**

Group	Number of students	Arithmetic mean	Standard deviation	T value		Significance at level (0.05)
				Calculated	Schedule	
Experimental	21	73.714	8.207	0.496	2.042	Not significant statistically
Control	20	72.25	10.503			

**6. Educational Level of Parents:**

The researchers earned the information on the educational level of the students’ parents of the two research groups from the school ID cards and from the students themselves in order to verify the information obtained. After collecting data on the parents’ education level, the levels were as follows:

**A. For Fathers:**

The researchers conducted statistical analyses by applying Chi square ( $\chi^2$ ) on the data of the academic achievement for the students’ fathers of the two research groups. The results showed that the calculated value of the chi square has reached (0.20) which is less than its table value (3.841) at the level of significance (0.05) and a degree of freedom (1). Therefore, the two groups are equivalent in the educational level of fathers, as shown in table (3.7).

**Table 3.7 Shows the educational level of the fathers of the students of the two research groups and the calculated and tabular value of the chi square**

Group	Number of students	Fathers academic achievement level							$\chi^2$ value		Significance at level (0.05)
		Illiterate	2 Reading & writing	primary	secondary	High school	Institute	College and higher	Calculated	Schedule	
Experimental	21	4	4	11	1	1			0.20	3.841	Not significant statistically
Control	20	5	4	7	4						

**B. For Mothers:**

The researcher conducted the statistical analyses by applying Chi square on the data of the educational level for the students’ mothers of the two research groups. The results showed that the calculated value of the Chi square reached (0.033) which is less

than its table value (3.841) at the level of significance (0.05) and degree of freedom (1). Therefore, the two groups are equivalent in the educational level of mothers, as shown in Table (3.8).

**Table 3.8 Shows the educational level of the mothers of the students of the two research groups and the calculated and tabular value of the chi square**

Group	Number of students	Fathers academic achievement level							$\chi^2$ value		Significance at level (0.05))
		Illiterate	3 Reading & writing	primary	secondary	High school	Institute	College and higher	Calculated	Schedule	
Experimental	21	12	12	5	4				0,033	3,841	Not significant statistically
Control	20	12	4	2	1	1					

**7. Reflective Thinking Scale:**

The researcher applied reflective thinking scale which was prepared for this purpose. On the students of the experimental

and control groups, the average degree was (100.048), (101.7) respectively. In order to know the significance of the difference between the two averages, the researcher applied T-test for two

<sup>2</sup> For fathers, cell was integrated (Illiterate & Reading, writing), and :( Primary, Secondary, High school).

<sup>3</sup> For mothers, cell was integrated (Illiterate & Reading, writing), and :( Primary, Secondary, High school).

independent samples; the calculated T value was (0.452) which is less than the table value (2.042) at the significance level (0.05) and the degree of freedom (39). This indicates that there

is no statistically significant difference therefore; the two groups are equivalent in this variable, as shown in table (3.9).

**Table 3.9 Shows the calculated mean, standard deviation, calculated and schedule T-value for two research groups on the Reflective Thinking Scale**

Group	Number of students	Arithmetic mean	Standard deviation	T value		Significance at level (0.05)
				Calculated	Schedule	
Experimental	21	100.048	12.053	0.452	2.042	Not significant statistically
Control	20	101.7	11.333			

### 3.6 Research Tools

To achieve the goal of the research, it is required to have preparation of two tools: which are; Academic Achievement Test and Reflective Thinking Scale.

#### 3.6.1 Academic Achievement Test

One of the requirements of the current research is the preparation of a test in order to measure the academic achievement of the eighth-grade students in the experimental and control groups.

##### A. Test Items:

The researcher has formulated the test items of the multiple-choice type, because it is comprehensive in content and it is objective in terms of assessing the degree (Al-Smadi and Al-Daraabi, 2004). Therefore, the researchers prepared an initial formula of the test, which includes (30) items of the multiple-choice type, and each item has four alternative answers, with instructions explained to the students on how to answer the test.

##### B. Validity of the Test:

Validity means the experiment should measure what is supposed to be measure and attains what is prepared to be achieved (Lamprianou and Athanasou, 2009: 19). To ensure that the test measures what was prepared to be measured, the researcher used the apparent honesty, which is achieved by the judgment of specialists on the degree of test measurement for the measured feature (Allam, 2006).

Accordingly, the test was presented to a number of experts and specialists in the field of measurement and evaluation, teaching methods, science, supervisors and teachers of science subject in the basic stage. In order to determine their opinions on the validity of formulating items, logic of the alternatives, their attractiveness and any other notes that think it will improve the quality of the test. Their suggestions and opinions have been taken to reword some of the items, as well as some alternative items. The researcher has considered the item valid if it has an approval ratio (80%) or more, as a result the (30) test items are all valid for the purposes of measuring academic achievement in the science subject for eighth grade students.

##### C. Statistical Analysis of the Test Items:

In order to know the difficulty level of the test items, its distinctive strength, the clarity of the test, its instructions and the time taken, the researcher applied the test on a survey sample randomly chosen from the (Hawnaz basic school), their students reached (34). After adjusting the answers, the grades have been arranged in descending order and divided into two halves, the upper half (17) answers, and the lower half (17) answers. Through the analysis processes, the following were found:

##### 1. Clarity of the items and the time taken to answer:

After applying the test, it became clear to the researcher that the test items and instructions for answering them were clear and understandable to the students, and that the time taken

in answering is between (20- 40) minutes, and with an average of (20) minutes, which is an appropriate time and acceptable for this age level and for this stage of study.

##### 2. Difficulty and ease coefficient of items:

Difficulty coefficient means the ratio of the number of female students who gave correct answer for each individual item or can solve a specific problem (Al-Zayoud et al, 2005). Accordingly to this basis, the difficulty coefficient for each of the test items was found using the formula for the difficulty of the items (Odeh, 2002). The researcher calculated the difficulty level was each of the test items and found that it was ranged between (0.41 – 0.71) at average of (0.55) for all items. Since the best degree of difficulty for the item that was accepted by the scientists of measurement is to be between (0.20 – 0.80), with an average of (0.50) for all of the items (Samara et al, 2000). Therefore, the test items that were prepared by the researcher considered good and their coefficient of difficulty was appropriate.

##### 3. Discriminatory Strength:

Discriminatory strength of items means the extent of its ability to discriminate between students of higher and lower levels according to the attribute which the test measures (Stanly and Kenneth, 1970). After they measured the discriminatory strength of the test items, the researcher found that it ranged between (0.35- 0.65), and it was considered distinct, because the discriminatory strength of the test items was distinct if it reached (0.30) or more (Al-Nabhan, 2004).

##### Effectiveness of Wrong Alternatives:

In tests that contain multiple choice-questions, it is necessary to examine the students' answers to each alternative item. To ensure the wrong alternative was attractive and valid, negative values had to be obtained for the wrong alternatives, Al-Zobaie, Bakr and Al-Kanani (1981). Odeh (2002) asserts that wrong alternative is effective when the number of individuals is attracted to the wrong alternative from the upper group is less than the number of individuals chooses the wrong alternative from the lower group with no less than (0.05). After using the formula for the effectiveness of the wrong alternative (Odeh, 2002), it was found that the coefficients of efficiency of all wrong alternatives were negative, thus, all wrong alternatives were considered effective.

##### 4. Reliability of the Test:

The test is reliable if it gives almost the same results, if it is reapplied twice differently on the same individuals and under almost the same conditions (Linn and Gronlund, 2000).

In order to measure the reliability of the test, the researchers applied the test on a sample of students who were selected from Hawnaz girls basic school, reached (34) students.

The researchers extracted the consistency of the test equation depending on the equation of (Kodur-Richardson-20-KR) (Al-Kubaisi, 2007), which was used to calculate the internal consistency coefficient of the test and was applicable in cases where the student's response was estimated as (0-1), (Allam,

2006). After dealing with the reported answers (Item Analysis Sample) that were (34) answers it indicated that the stability factor had reached (0.85) which was a good Coefficient of constancy (Anastasi and Urbina, 1997).

After these procedures have been done, the test has taken final expression and it was ready for application.

### 3.6.2 Reflective Thinking Scale

Since one of the aims of the current research is to identify the impact of the use of Flipped Learning Strategy on the development of Reflective Thinking, the researcher prepared a scale for reflective thinking, the number of its items reached (35) items and each paragraph has four alternatives to answer with instructions that explain how to answer.

#### 1. Validity of the Scale;

Validity or trueness is one of the most important characteristics of tests and educational psychological scales as it indicates the extent to which the scale performs the purpose that it must achieve, or the extent to which it performs the function that is supposed to be performed when it is applied to a class that has been set (Anastasi and Urbian, 1997).

To verify the accuracy of the scale, it was presented to a number of experts and specialists in educational and psychological sciences measurement and evaluation. In order to take into consideration their opinions and observations on the items of the scale in terms of suitability to measure what is supposed to be measured, and add items which they see are suitable. For the safety formulation and its suitability to the level of the sample, the researcher has taken a unanimously rate (80%) or more of the opinions as a criterion for acceptance the items or not, and according to their opinions, the researcher made the suggested amendments in drafting some items. Thus, the scale validity was achieved.

#### 2. Exploratory Test:

To ensure the clarity of the scale items and the instructions for answering its items, and to know the time taken to answer, the researchers applied the scale on (34) students who were randomly selected from (Soran Female Basic School). The researchers applied the scale exclusively on basic eighth grade, so it became clear that the items and instructions for answering were quite clear for female students. The time was taken to answer the test items ranged between (25-40) minutes and average (15) minutes, which was considered a suitable and acceptable time for this age level and for this stage of study.

#### 3. Discriminatory Strength of Items:

Discriminatory Strength of Items means "the ability of the item to discriminate between female students who have more knowledge and female students who have less knowledge in a specific area of knowledge" (Melhem, 2002). In order to find the discriminatory strength of the items, the researchers applied the test on the same above-mentioned exploratory sample, which reached (34) students who were chosen randomly from the (Soran Female Basic School). After correcting the answers, they were arranged in descending order, divided into two halves, the upper half (17) answers, and the lowest half (17) answers. The distinction coefficients were measured using T-test between the two groups, and by comparing the calculated (T) values for each of the scale items with the table (T) value at the level of significance (0.05) and degree of freedom (32), it was found that the calculated (T) values were greater than the schedule (T) value (2,038), this means that these items discriminate between members of the upper and lower groups.

#### 4. Reliability of the Scale:

To verify the stability of the scale, the researchers relied on the Cronbach-Alpha equation which is preferred to use when the answer to the items of the scale was graded, i.e. not dual (Al-Nour, 2007). After conducting the treatment of the answers of (34) students (the exploratory sample of the scale), it was found that the stability coefficient reached (0.88), which was considered a good stability factor (Allam, 2006; Al-Nabhan, 2004).

Thus, the scale took the final form and became ready to apply on the (35) items.

### 3.7 Preparing teaching plans

Planning is defined as a process that relies on a set of curriculums procedures that are selected, arranged, constructed and organized according to the elements of the lesson and its components in the view of the results and goals being expected (Abu Dayyeh, 2011).

In the view of the content of the educational subject to be taught during the first semester, and taking into consideration the duration of the experiment (48), the teaching plan was prepared in the view of specific behavioral goals and the educational material for the two experimental groups according to the Flipped Learning Strategy, while the control group has been prepared according to the traditional method. A copy of all the plans was presented to a group of arbitrators with expertise in the field of teaching methods, educational and psychological sciences, history, material supervisors and teachers, to have their opinions about the plans and the extent which the content of the plans matches the steps of each of the two methods, and their suitability to behavioral purposes. Arbitrators' notes and observations were taken into consideration in order to obtain the final form.

### 3.8 Procedures for applying the experiment

After completing the requirements to conduct the experiment, the researcher started the following procedures:

1. Starting commencement was made in (Trooska Basic School of Girls) on 21/9/2019 until 3/10/2019, where this period was assigned to parity procedures between students of the two research groups, also to conduct a pre-application for the test of contemplative thinking and arranging the schedule study for the researcher with the school administration.
2. Actual teaching of the two research groups started on the day of Saturday corresponding to 5/10/2019, and up to the day of Thursday corresponding to 19/12/2019, with a full semester of the academic year (2019-2020) and the application persisted for a period of (11) weeks.

### 3.9 Applying the research tools

After completing the application of the experiment, the researchers started applying the research's two tools on the students of the two groups and the researcher supervised them herself with assistance of the teacher of the subject in the school according to the below application processes:

#### 1. Academic Achievement Test:

The researchers applied the academic achievement test to the students of the two groups depending on the correction key which was prepared for this purpose. Score (1) was assigned to each correct answer and (zero) for the wrong or left answer or those that contain more than one answer.

#### 2. Reflective Thinking Scale:

The reflective thinking test was applied to the students of the two groups in one day, on 22/12/2019, with prior notification.

### 3.10 Correcting the Research Tools

After completing the application of the research tools, the researcher devoted her time to correct the answers of the students of the two groups as follows:

#### 1. Academic Achievement Test:

The researcher corrected the answers of the students of the two groups to depend on the correction key which was prepared for this purpose. Score (1) was assigned to each correct answer and (zero) for the wrong or left answer or those that contained more than one answer.

#### 2. Reflective Thinking Scale:

The researcher corrected the students answers on the scale, she gave the alternatives (Always, Often, Sometimes, Rarely),

weights (4, 3, 2, 1) respectively, and the students' score on the scale ranges between (35-140) degrees.

**4. DATA ANALYSIS AND DISCUSSION**

**4.1 Overview**

This chapter includes a comprehensive presentation of the results that the researcher come up with, according to the research's objectives and hypothesis, with giving scientific explanation and discussion for each of these findings:

**4.2 First hypothesis:**

The results of the first null hypothesis which states that **"There is no statistically significant difference in the significance level (0.05) between the average degrees of the students in the experimental group which they have been taught according to the Flipped Learning Strategy and the average degrees of the students of the control group which they were**

**taught according to the Traditional Method in the Academic Achievement"**.

To verify the validity of the hypotheses, the mean and the standard deviation of the students' scores of both experimental and control groups of the applied post- test of the Academic Achievement Test were calculated, and by using the t-test for two independent samples.

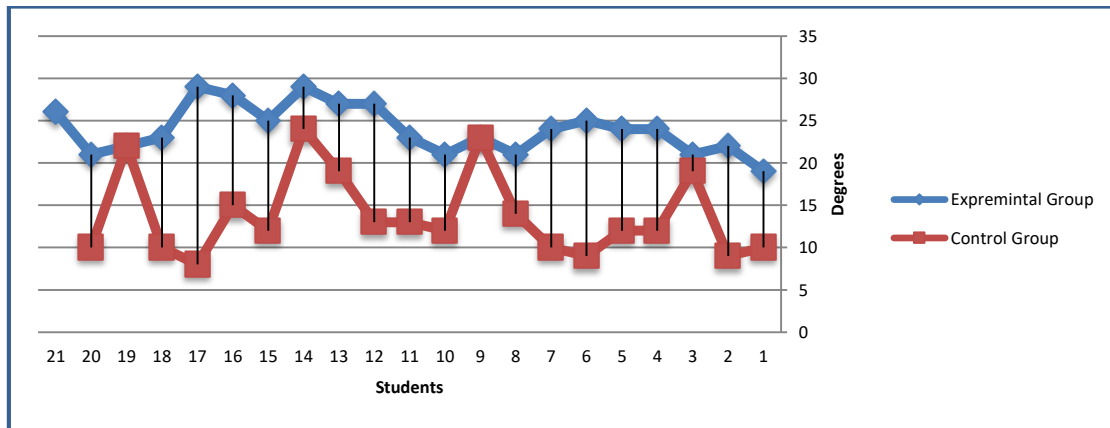
It is obvious that the calculated T- value reached namely (8.154) which is larger than the schedule T- value of (2.042) at the significant level of (0.05) and (39) degrees of freedom. This means that there is significant statistically difference between the average score of the experimental group students and the average score of the control group students, and for the benefit of the experimental group, as a result this rejects the first null hypothesis and accepts the alternative hypothesis, as shown in table (4.1).

**Table 4.1 Showing the arithmetic mean, the standard deviation, and the calculated and schedule T-value for the two research groups in the Academic Achievement posttest**

Group	Number of students	Arithmetic mean	Standard deviation	T value		Significance at level (0.05)
				Calculated	Schedule	
Experimental	21	24	2.846	8.154	2.042	Statistically significant
Control	20	13.8	4.938			

This indicates that the experimental group (which was taught according to the flipped learning strategy) had a greater effectiveness in the academic achievement in the science subject of eighth-grade students after the completion of the

experiment from the control group (which was taught according to the traditional method), as it is clear in the grades of students of the two groups as shown below in the chart (4.1).



**Chart 4.1 Students' degrees of experimental and control groups in the post-academic achievement test**

that enables learners to receive conceptual knowledge in educational methods and from different educational sources, such as repeating a video clip several times, or speeding up the section to skip parts they have experience with, and the ability of taking notes.

3. Watching educational videos at home through CDs has contributed to make the teacher focus more in the classroom on who needs much time to learn, and directing students towards improving their performance.

4. Flipped learning is characterized by its ability to change continuously to meet the needs of the students; also the learning via this method is mixed with fun and vitality with devoting of a little efforts and explanation by the researcher, and a lot of cooperative learning and discussions by students.

5. Flipped learning strategy provides one of the best investments for the lesson time. And through what this strategy does from inverting of the educational situation, in other words,

The researcher attributed the superiority of the students of the experimental group over the control group to the effectiveness of the independent variable represented by the flipped learning strategy that contributed of increasing academic achievement, because this strategy was characterized by many features that helped students to increase their academic achievement and they are:

1. The flipped learning strategy contributed greatly to the recognition of the educational content, and helped to create an enjoyable and effective educational atmosphere in continuous following-up and studying, also the effective communication between the students and the researcher as acted the role of school teacher through the interactive flipped learning environment. In addition to departing from the stereotyped and acquainted teaching methods of science subject.

2. Flipped learning is one of patterns in blended learning, in which the use of technology in learning is activated, in a way



of using the flipped learning strategy in teaching with the aim of increasing the academic achievement with other variables. On the other hand, the result of this study does not correspond with the findings of other studies as (Marlowe, 2012) and (Othman, 2016), whose studies show that there is no differences between the experimental group and the control group in the academic achievement test due to the method of teaching.

**4.3 Second hypothesis:**

The results of the second null hypothesis which states that **"There is no statistically significant difference at the significance level (0.05) between the average difference of the students' degrees of the experimental group which have been taught according to the Flipped Learning Strategy and the average difference of the students' degrees of the control group which have been taught according to the Traditional Method in developing Reflective Thinking"**.

To validate this hypothesis, the mean and the standard deviation of the scores of the two research groups in the pre and post-tests of the Reflective Thinking Scale were found, and the results revealed that there is difference between the average variations of growth in Reflective Thinking among the students of the two research groups. In order to test the significance of this difference, t-test was used for two independent samples, so the results were shown in table (4.2).

by giving theoretical content to students through the educational videos that they watch in advance. Accordingly, this allows the class time to be devoted for accomplishing educational tasks and classroom activities, which are carried out by groups through which students collaborate to do what is required from them. So, it lets increasing the interaction between students themselves gain information, and during the teacher's following-up to the students in completing their tasks and answering their inquiries, this increases the interaction between the teacher and his/her students, and also it assists the teacher to help the students with low achievement.

6. The variety of pre-classroom learning resources in flipped learning, especially, presentations and films, help in clarifying the concepts and ideas contained in the lessons, through sensory models of knowledge presented to the students in touchable or visual way, which has more than one sense involved including visual and auditory, consequently this will help to save the information of the lessons in their long-term memories and strength their competence which as a result it leads to increasing students achievement.

This result agreed with the results of the following studies: (Feledichuk and Wong, 2014), (Qeshta, 2016), (Al-Mashni, 2016), (Al-Jaser, 2017), (Bsharat, 2017), and (Butterick, 2017), (Camiling, 2017), and (Elian and Hamaidi, 2018).

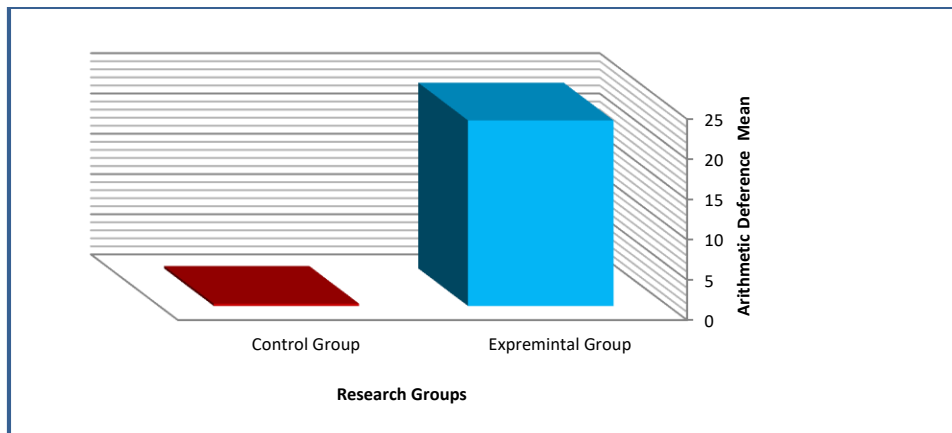
It is worth confirming the results of the above studies confirmed the superiority of the experimental group over the control group in the academic achievement test, as an outcome

**Table 4.2 T-test results to indicate the average variations between growth differences mean in Reflective Thinking Students for both groups**

Group	Number of students	Mean of differences	Standard deviation of differences	T value		Significance at level (0.05)
				Calculate d	Schedule	
Experimental	21	23.095	25.765	15.742	2.042	Statistically significant
Control	20	0.30	15.737			

control group for the benefit of the students of the experimental group, which in turn means that the Flipped Learning Strategy has more effectiveness in developing Reflective Thinking with a moral significance in comparison with the Traditional Method, and thus rejects the second null hypothesis and accepts the alternative hypothesis, as in chart (4.2) :

It is clear from Table (15) that the calculated T value reached namely (15.742) which is larger than the schedule T- value of (2.042) at the significant level of (0.05) and (39) degrees of freedom. and this means that there is a difference between the average degrees of development Reflective Thinking among female students of the experimental group and students of the



**Chart 4.2 A comparison between the average difference among the degrees of female students of the experimental group and control group in Reflective Thinking Scale**

The researcher attributed the experimental group students' mastery over the control group students to the influence of the independent variable which is used with the experimental group, which included many activities that in turn helped to

develop Reflective Thinking of the students of the experimental group, and these activities were among the requirements of the development of Reflective Thinking of the

students, and it was provided by the strategy which was used with the experimental group.

This result may be attributed to the fact that the Flipped Learning Strategy contributed easily to the development of students thinking, and their focusing on the thoughts and thinking, and also contributed significantly to the development of Reflective Thinking skills represented by the skills of (visual vision, paralogsims revealing, reach conclusions, provide convincing explanation, proposed solutions), This was through looking at the existed sources of information on the interactive environment of the reflected classroom, which was in turn helped more in developing students' cognitive awareness. In addition to the technological innovations used in the study, which was represented by making presentations in the form of an educational video on a CD, which was contributed to develop the visual vision of students through drawings, diagrams and illustrative pictures. Consequently this increased the students' motivation to deal with the material with forming a good knowledge and conceptual structure for themselves, that did not only contain what they understood and how they reached this understanding by giving convincing justifications about it, which led to increasing the level of their Reflective Thinking.

Moreover, the result may be attributed to the fact that students watching the new content in advance, raised many questions about the viewed content in their minds, which prompted them to record their notices and questions about what they observed, which in turn made them be active in their learning during the lesson in the next day. As a result, this made them be eager for getting the answers of their questions, which turned the students from passive recipients of information to positive and active recipients in their learning. It was worth mentioning due to the availability of educational content in their hands, which allowed them to re-watch the content more than once, this stimulated them with their thinking and reflective skills, and also enabled them to obtain feedback about the viewed content at any time they wanted.

Furthermore, it is attributed to claim that learning in the light of the Flipped Learning Strategy helped students to think and use their mind, so that they are no longer recipient students who have to receive the information as it is, memorizing and showing it, but they used their minds in all the information presented to them and linking it with their information, which contributed to the development of the experimental group's reflective thinking skills.

This result agreed with the results of the following studies: (Qeshta, 2016), (El-Qatrawi, 2010), (Al-Harithy, 2011), (El-Jadba, 2012), and (Abadlh, 2013), and (Abo-Awad and Ayash, 2013), (Murphy, 2014), (Al-zoubi, 2015), and (Alhadaybe and Ambusaedy, 2016). The results of these studies confirmed the mastery of the experimental group over the control group in the development of Reflective Thinking as a result of using various programs, strategies and teaching methods as an objective to develop reflective thinking.

## **5. CONCLUSIONS, RECOMMENDATIONS, AND SUGGESTIONS**

### **5.1 Overview**

This chapter contains the study's conclusions, the recommendations in accordance with the research results, and the suggestions for the future studies to complement the current study.

### **5.2 Conclusions:**

In the light of the results of the study, the study has come up with the following conclusions:

1. The Flipped Learning Strategy has demonstrated that it has a great effectiveness and a high impact of increasing the Academic Achievement and a key role in developing the Reflective Thinking of the experimental group students.

2. The students of the experimental group revealed their motivation and enthusiasm in following-up the implementing the steps and the procedures of the Flipped Learning Strategy as well as revitalizing the spirit of persistence and cooperation among them.

3. The new situation which is created by the Flipped Learning Strategy made the science lesson interesting and removed some misconceptions about the science subject as a difficult and boring subject in comparison to the rest of the subjects.

4. Using of Flipped Learning Strategy in science subject created a perceptible interest and a noticeable attention among the students.

### **5.3 Recommendations:**

On the base of the results, the study recommends the following:

1. Using Flipped Learning Strategy in teaching science subject in basic education stages.

2. Inserting the theoretical framework and applied procedures for the Flipped Learning Strategy within the topics of general teaching methods, and particularly in methods of teaching science in the colleges of basic education.

3. Conduct training courses and workshops for science teachers by the Ministry of Education's Directorate of Preparation and Training, on how Flipped Learning Strategy to be applied in science lessons at the preparatory stage.

4. Adopting new learning strategies and modern techniques in teaching to reduce the passivity of scientific concepts in general sciences in wide-ranging and life sciences in particular.

5. Encouraging science teachers to pay more attention to the developing of Reflective Thinking through teaching science, as it helps to develop the personality of the learner in its various aspects.

### **5.4 Suggestions:**

Complementing to the current research, the researcher recommends the following future studies:

1. A study on the effect of Flipped Learning Strategy on developing other dependent variables such as scientific thinking and attitudes towards science subject.

2. A comparative study between male and female students in the same independent variable and variables related to the current research.

3. A comparative study between Flipped Learning Strategy and metacognitive strategies and showing their effect on the variables covered by the current research.

4. Adopting a similar study to biology subject at the preparatory stage.

5. Conducting a similar study in different environments and studying materials.

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کاریگری به کارهینانی ستراتيجیهی فیرونی هه لگه پراوه له دهست کهوتی خویندن له لایهین قوتابییانی پۆلی هه شته می بنه پرتی له بابتهی زانسته کان و گه شه پیدانی بیرکردنه وهی قول له لایهین هه وانه وه

پۆخته:

ئارمانجی تووژینه وه ناساندنی کاریگری به کارهینانی ستراتيجیهی فیرونی هه لگه پراوه له دهست کهوتی خویندن له لایهین قوتابییانی پۆلی هه شته می بنه پرتی له بابتهی زانسته کان و گه شه پیدانی بیرکردنه وهی قول له لایهین هه وانه وه، بۆ بهرجه سته کردنی ئەم ئامانجهش تووژهر دوو گریمانهی بۆش (سفر) ی داناهه. ههروهک تووژینه وه که کورت کراوه ته وه له سه ر کچه قوتابییانی پۆلی هه شته می بنه پرتی بۆ سالی خویندنی (2019-2020) ز له قوتابخانهی (تروسکهی بنه پرتی کچان) که به ریگای ویسته کی هه لبژێردراوه. ههروهها تووژهر پشته به ستووه به نه خشه سازی ئەزمونی خاوه ن کۆمه لهی ئەزمونی و کۆمه لهی ریکخهر (کۆتروول کەر) ههروهها به پتی ههردووک تاقی کردنه وهی پیش وهخته و پاش وهخته بۆ بگۆری بیرکردنه وهی (قول) له لایهک و تاقی کردنه وهی په هه ندیش به ته نها ده رباره ی بگۆری ده سته کهوتی خویندنی، چونکه کۆمه لهی ئەزمونی به پی ی ستراتيجیهی فیرونی هه لگه پراوه و کۆمه لهی ریکخه ریش به پی ی ریگای ئاسایی پروسه ی فیرونیان له ماوه ی دهست نیشانه کراو بۆ تووژینه وه که ئەنجامدا وه. نمونه ی تووژینه وه (41) قوتابی له خۆ گرتوه که دابهش بوون به سه ر (21) قوتابی له کۆمه لهی ئەزمونی و (20) قوتابی له کۆمه لهی کونترول کراو. و تووژهر هاوسه نگی له نێوان ههردوو گروپدا کرد له چه ند گروا دا. ههروهها بو ئەم مه به سته دوو ئارمانجی ئاماده کرد په که م: تاقیکردنه وه یه ک بۆ پێوانه کردنی ده سته کهوتی خویندنی به جوړیک که ژماره ی بره کهانی (30) بره که له جوړی هه لبژاردنه کان به چه شنیک که ده رخه ری فاکته ری قورسای و هیز ی جیاکاریه کان بوو بۆ بره که کان و کاریگری جیگره وه هه له کان. دووه م: پێوه بۆ پێوانه کردنی بیرکردنه وه ی امانی (قول) به جوړیک تیکرای بره کهانی ئەم ئارمانجی دووه مه شته گه یشته (35)، بره که، که ئەمه یشان دابهش بوو به سه ر پینچ ره هه نده کان (بینین، ئاشکرا کردنی هه له کان، گه یشتن به ده ر ئەنجامه کان، به خشی نی شیکردنه وه ی قایل کەر (باوه ر پی هینه ر)، دانانی چاره سه ر)، ههروهها تووژهر لی کۆلیته وه ی له باره ی راستی جیگر بوونی ههردوو ئارمانجه کان کردوه. له دوا ی کوتای هینان به ئەزمونی و جی به جیکردنی ههردوو ئارمانجه کان و ده رهینانی زانیاره کان هاوتا له گه ل کار رای ئاماری به به کارهینانی تاقیکردنه وه ی دوانه ی (test.t) ئەنجامه کان دیار کەر له راستیدا به کارهینانی ستراتيجیهی فیرونی هه لگه پراوه بۆ پیدئا گوته وه ی بابته ی زانسته کانی پۆلی (8) بنه پرتی کاریگری و شوین پی ی ئەرینی خۆی هه بووه له زیاد کردنی ده ست کهوتی خویندنی و له گه شه پیدانی بیرکردنه وه ی امانی. ههروهسا به کارهینانی ریگای ئاسایی به کارهاتوو له پیدئا گۆجی کچه قوتابییانی پۆلی (8) بنه پرتی کاریگری ئەوتوی شایه نی باسکردنی نه بووه له گه شه پیدانی بیرکردنه وه ی امانی. و له رژی سیه را ئەنجامه کان تووژهر پاسپاردی گزنگی به کارهینانی ستراتيجیهی فیرونی هه لگه پراوه له بهر ئەوه ی ستراتيجیهی تیکی نوئ یه. له گه ل پینشیا رکردنی ئەنجامدانی چه ندین تووژینه وه له پاشه روژدا.

په یقین سه ره کی: فیرونی هه لگه پراوه، ده ست کهوتی خویندن، بابته ی زانسته کان، قوناغی خویندنه وه ی بنه پرتی، بیرکردنه وه ی قول.

#### فاعلیه استخدام استراتيجیهی التعلم المقلوب في تحصيل طالبات الصف الثامن الأساسي

في مادة العلوم وتنمية التفكير التأملي لديهن

الملخص:

استهدف البحث التعرف على فاعلية استخدام استراتيجيه التعلم المقلوب في تحصيل طالبات الصف الثامن الأساسي في مادة العلوم وتنمية التفكير التأملي لديهن، ولتحقيق هذا الهدف وضعت الباحثة فرضيتين صفريتين. وقد اقتصر البحث على طالبات الصف الثامن الأساسي للعام الدراسي (2019 - 2020) في مدرسة (تروسكه الاساسية للبنات) التي اختيرت بطريقة قصدية. واعتمدت الباحثة التصميم التجريبي ذا المجموعة التجريبية و المجموعة الضابطة وبالاختبارين القبلي والبعدي لمتغير التفكير التأملي، والاختبارالبعدي فقط بالنسبة لمتغير التحصيل الدراسي، إذ درست المجموعة التجريبية على وفق استراتيجيه التعلم المقلوب، والمجموعة الضابطة على وفق الطريقة الاعتيادية. وبلغت عينة البحث (41) طالبة موزعين بواقع (21) طالبة في المجموعة التجريبية، و(20) طالبة في المجموعة الضابطة. وقد اجرت الباحثة التكاؤف بين طالبات المجموعتين في عدد من المتغيرات. واعدت الباحثة أداتين، الأول أختبار لقياس التحصيل الدراسي حيث بلغ عدد فقراته (30) فقرة من نوع الاختيار من متعدد مستخرجا معاملا الصعوبة والقوة التمييزية للفقرات وفعالية البدائل الخاطئة، والثاني مقياس لقياس التفكير التأملي حيث بلغ عدد فقراته (35) فقرة موزعة على ابعاده الخمس (الرؤية البصرية، الكشف عن المغالطات، الوصول إلى استنتاجات، إعطاء تفسيرات مقنعة، وضع حلول مقترحة). وقد تحققت الباحثة من صدق الأداتين وثباتهما. بعد الانتهاء من التجربة وتطبيق الأداتين واستخراج البيانات و اجراء التعامل الاحصائي معها باستخدام الاختبار التائي (t . Test). اظهرت النتائج ان استخدام استراتيجيه التعلم المقلوب في تدريس مادة العلوم لطالبات الصف الثامن الأساسي لها فاعليتها واثرا ايجابي في زيادة التحصيل الدراسي وتنمية التفكير التأملي لديهن. ولم يكن لاستخدام الطريقة الاعتيادية المتبعة في تدريس طالبات الصف الثامن الأساسي أثرا يذكر في تنمية التفكير التأملي لديهن. وفي ضوء نتائج البحث أوصت الباحثة بضرورة استخدام استراتيجيه التعلم المقلوب بوصفها استراتيجيه حديثة، فضلا عن إجراء المزيد من الدراسات المستقبلية.

الكلمات الدالة: التعلم المقلوب، التحصيل الدراسي، مادة العلوم، مرحلة التعليم الأساسي، التفكير التأملي.