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# Effect of Using Scientific Stations Strategy in Developing Deductive Thinking of Intermediate School Students in General Sciences

*Abstract*

*The study aimed to know the effect of using the Scientific stations strategy in developing Deductive thinking of intermediate school students in the science subject. To achieve the aim of the research, the researcher used experimental design with two equal groups, the research sample consisted of (65) intermediate-grade students in Al Nidhal school for boys represented by (30) students of the experimental group and (35) students for the control group, the researcher equivalence of the two research groups with a set of variables including (Intelligence, parents 'educational level, previous achievement, age calculated by months and pre-test for Deductive thinking), to verify the research aim the researcher put the two hypotheses as following :*

*1- There is no statistical significant difference at the level of significance (0.05) between the scores mean of the members of the experimental group and the members of the control group in the post test of Deductive thinking.*

*2- There is no statistical significant difference at the level of significance (0.05) between the mean difference between the (pre and post) tests of both experimental and control groups in the Deductive thinking test.*

*To verify the research hypotheses, the researcher prepared a test for Deductive thinking consisting of (20) items the researcher applied the test of Deductive thinking, collected the data, and tabulated it in tables for statistical processing and the results indicated:*

*1- There is a statistical significant difference between the scores mean of students in both groups in the Deductive thinking test and in favor of the experimental group.*

*2- There is a statistical significant difference between the mean difference between the two tests (pre - post) and in favor of the experimental group.*

*Keywords:* General Sciences, Scientific Stations, Deductive Thinking.

## Introduction

### *First: The Problem of the Research*

The process of teaching science is no longer just a transfer of scientific knowledge to the student, preserving and retrieving it only, but it is a process concerned with revitalizing the student's previous knowledge and building knowledge, understanding, acquisition and retention in order to build and integrate his scientific personality in various aspects (mentally, sentimental and skillful) (Zaitoon, 2007, 20).

The science teacher must use a variety of teaching methods and methods as the nature of science education differs from other subjects, as

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it is highly dependent on the student's involvement in various scientific activities and the practice of a set of basic and integrated science processes such as observation, classification, conclusion, forecast and interpretation, and it is the responsibility of the teacher to consider individual differences. Among students and the development of their mental abilities in thinking and highlighting the content of the scientific subject in a smooth, interesting and effective method to stimulate their thinking and motivation and link the theoretical and scientific sides of the scientific subject. (Ambosaidi and Al Balushi, 2009, p. 77).

The researcher sees through her review of previous studies and literature in the field of science education that there are things that the science teacher must use for various and modern teaching methods and methods, including:

1- (Science is a matter and a method): It is not sufficient for the student to learn and memorize concepts and information, but rather to learn and understand the scientific processes through which he obtains those concepts.

2- Science is a subject of an experimental nature so the teacher must choose from the teaching methods that are in line with the nature of the subject of science and link the theoretical side to the practical side

3- The nature of the concepts of science, some of which are abstract, imperceptible concepts, which makes them difficult, unpleasant and rigid subject. The science teacher must strive to change that view through diversity in teaching methods.

From this standpoint, the researcher chose the Scientific stations strategy, as it is considered one of the interesting strategies in teaching science because it gives an atmosphere of fun, change and movement, energizes students and their thinking, and links the theoretical side to the practical side.

The research problem can be formulated as follows:

The effect of using the Scientific stations strategy in developing Deductive thinking of intermediate school students in general science subject.

### *Second: Importance of the Research*

The current era is characterized by an acceleration in various fields, especially in the technical and industrial fields, and since the teaching of science is a reflection of the contemporary industrial revolution, the methods of teaching science have accelerated and diversified in a manner commensurate with their nature and character, and the specialists in the field of education have emphasized the importance of moving away from indoctrination of science and presenting it in a renewed manner It is varied, interesting, and not to be used as a single method of teaching (Al-Muhaisen, 2007, p. 159).

The diversity of methods of teaching science and methods is of great importance, due to the nature of the subject matter of science and the nature of the aim s to be achieved in the teaching process (Umbo Saeedi and Al Balushi, 2009, p. 12).

Upon Al-Hamdani (2013), the necessity of training teachers on modern teaching methods and methods and conveying to them what the world has achieved in the field of education and its importance in building modern Iraqi society and overcoming problems that prevent the teacher from using modern methods of teaching in the different scientific situation that requires followers The teacher has more than one method and method in one lesson (Al-Hamdani, 2013, p. 7).

The diversity in the teaching methods and strategies that the teacher uses with his students where the student is the main axis of the learning process and has the largest role in the educational situation that would break the boring routine in the eyes of many students if compared to the traditional method of teaching (Dams, 2009, p. 16).

Of the modern teaching strategies is the strategy of scientific stations designed by Denise J-Jones, which is considered one of the fun ways to teach theoretical and practical lessons as well and gives the class an atmosphere of fun, change, movement and increasing their motivation by dividing the class into groups that each group To walk around each scientific station and interact with it so that the experiences vary in it from reading, exploring, experimenting, and listening (Ambosaidi and Al-Balushi, 2009, p. 283).

Deductive thinking has toke great attention from researchers and scholars, as there are many natural phenomena that cannot be discovered with the observational process, and here scientists resort to the inference process through the link between previous knowledge and current knowledge based on observation to reach hidden features and appropriate interpretations of the results of observation and see (Al-Khawaldah, 2016) This interest is due to several levels, including on the personal level, where Deductive thinking helps a person make future decisions and make assumptions about personal matters based on facts and information related to them in an attempt to predict the results of his taking certain decisions. Mufti (1974) believes that Deductive thinking provides

The time and effort to obtain solutions to problems is based on identifying and categorizing facts, drawing conclusions from results, making hypotheses related to the problem, and analyzing observations.

Likewise, at the educational level, researchers agree that success in academic or literary subjects depends on the Deductive ability of students to a large extent. Kelley conducted a study in which he found that the correlation between Deductive thinking and the educational level of students was (0.87), and the Lawons study found that the correlation between the two variables reached (0.76), which indicates a positive relationship between deductive and the educational level.

As for the social level, Deductive thinking helps students to think deeply about the social problems that society is going through in order to identify the causes of these problems, analyze them, coincide with their events, separate the cause and effect, and thus predict future events and diagnose and understand the problem posed accurately, which guarantees the individual access to a successful deductive of such These issues (Khawaldeh, 2016, p. 262)

Hence, the importance of the research can be determined by the following points:

1- This study came in response to recent trends that emphasize the importance of using modern teaching strategies and methods in teaching science.

2- The subject of science is of an experimental nature, which makes it imperative for the teacher to choose the teaching methods that link the theoretical and practical side, and therefore the strategy of scientific stations works to achieve this aim.

3- The subject of the scientific stations strategy and its impact on Deductive thinking for research and experimentation in the subject of science for the intermediate stage, subject to the researcher's knowledge.

4- Providing those interested in the intermediate stage with a test of Deductive thinking to apply it to students to reveal their educational levels.

5- This research corresponds to its independent and dependent variables with the directions of the Ministry of Education in using modern teaching methods that motivate the student to think and explore the information himself.

6- It also highlights the importance of this strategy in creating a healthy study environment characterized by enjoyment, interaction and cooperation of students, thus increasing their motivation to learn, and this is considered one of the important aims to be achieved in the classroom.

### *Third: Aims of the Research*

The study aimed to determine the effect of using the Scientific stations strategy in developing Deductive thinking of intermediate school students in the general science subject.

### *Fourth: Limitation of the Research*

1- The research sample is limited to two groups out of a total of 6 classes in (Al Nidhal intermediate school for boys), one is an experimental group and the other is a control group.

2- The application of the research is limited to the first unit (first semester: properties of matter and the second semester: atoms, elements and compounds) and the third semester of the second unit (arrangement of elements and their classes). The course is determined for the first intermediate class students.

3- The first semester of the academic year (2019-2020).

4- The measurement of Deductive testing is limited to three skills: inductive, deductive, and reasoning.

### *Fifth: Hypotheses of the Research*

1- There is no statistical significant difference at the level of significance (0.05) between the scores mean of the members of the experimental group (who studied by strategy of the scientific stations, and the members of control group (who studied by usual method) in the post test of deductive thinking test.

2- There is no statistical significant difference at the level of significance (0.05) between the mean difference between the two (pre and post) tests for both experimental and control groups in the Deductive thinking test.

### *Sixth: Definition of the Terms*

#### *Scientific Stations Strategy*

It was defined by:

1- Jones (2007): As a teaching method that consists of a series of stations in which a small group of students moves in succession, which allows them to use specific educational methods and provides an opportunity for each student in the group to perform all educational activities and activities by rotating to different stations P16), 2007, jones).

2- Ambo Saidi Al Balushi (2009): As a set of educational tables inside the classroom. Each table is considered an educational station in which the scientific material is presented in which the scientific material is presented in the

form of various activities. Students alternately wander around these stations and gain information and knowledge themselves under the supervision of the teacher and depend This method of teaching both theoretical and practical lessons (Umm Saidi Al-Balushi, 2009, p. 283).

Procedural definition: An educational strategy based on a set of various scientific activities set by the science teacher in which intermediate-class students learn (the experimental group) during their movement between the stations sequentially and by five stations (exploratory, imaginary, reading, audio, yes and no) under the supervision of the subject teacher with the aim of improving Student's scientific level, motivation, and deductive thinking.

### *Deductive Thinking: It was Defined by*

1- Jarwan (2002): As thinking skill that plays the role of facilitator of the information-processing process, which is interpretation, analysis, synthesis, or evaluation, or its practice. Inference consists of three sub-skills: inductive deductive, reasoning, and causal deductive that shows the relationship between cause and effect. (Wali et al. 2015, p. 219)

2- Khawaldeh (2016): As A logical mental process that includes a set of sub-skills that appear in every cognitive mental activity that includes extrapolating the general rule from the parts and deducing the parts from colleges where the individual walks from facts and issues known to Muslim information to validity to know the mentally unknown. (Khawaldeh, 2016, p. 261).

Procedural definition: It is one of the patterns of thinking that requires the student to recall previous information and experiences in order to access new, more in-depth information, whether summoning the information from public to private (deduction). Or from private to public (extrapolation). Or the conclusion of the result of the body of certain facts (conclusion) and is measured by the degree of the degree obtained by the student (1.0). In the Deductive thinking test prepared by the researcher.

## Theoretical Framework

### *First: The Strategy of Scientific Stations*

Denise Jones is the designer of the strategy of scientific stations in cooperation with his colleague Sarah Harashe, where the overcrowding of the class with students and the scarcity of resources and learning resources motivated the design of this strategy in the year 2007 AD, as it is considered a relatively modern teaching strategy that represents one of the forms of diversity and excellence of methods And methods of teaching, and even different educational activities, in which the form of separation from the traditional form turns into some tables around which groups of students float around according to a specific system, and each of them is considered an educational station equipped with tools, educational materials and worksheets to practice an educational task as a kind of different and varied educational activities (Jones, 2007).

(Rogayan, 2019) believes that the learning station allows the student to use learning materials in order to increase their motivation to participate actively in the learning process and thus increase their confidence in themselves in facing any challenges in the future, which is beneficial to society and the country as it is a method that focuses on student learning and the teacher in which it works As a facilitator and facilitator of concepts and educational position. (Rogayan, 2019, 643).

### *Types of Scientific Stations*

Exploratory station: This station is concerned with laboratory activities, which require conducting a specific experiment that does not take long to implement, such as adding a substance to another material and monitoring the resulting reaction, or throwing a cube of wood in a laboratory with water included to calculate the volume of the cube, or throwing a glass ball into a tube It has an oil and measuring the time it takes to reach the bottom to compare the viscosity of the oil with the viscosity of water or glycerin, for example, or to connect a simple circuit, or test a solution with sunflower paper to identify acids, alkalis and salts, and then answer a number of accompanying questions

2- Reading station: In this station, a reading scientific article is placed as an article from a newspaper, or from the Internet, or from a scientific bulletin or a scientific publication, or an article from an encyclopedia or book, and students read the material in the station related to the subject of the lesson, with the aim of forming Qualitative learners can rely on themselves to obtain information, have the ability to extract knowledge from its original sources, and have independence skills in education without the need for an intermediary such as teacher or textbook, which increases their motivation to learn, and then answer a number of accompanying questions.

3- Visual Station: These stations are characterized by the presence of a number of pictures or drawings, which students browse and answer questions related to, and the source of the images may be a scientific encyclopedia, a

ready poster, or illustrated scientific stories, to help students bring scientific concepts and experiences to their minds.

4- Audio / visual station: In this station, a recording or video device can be set up to watch an educational movie related to the subject of the lesson, as the students listen or watch the presented scientific material, and they answer the accompanying questions in the worksheets, and the teacher can design the scientific material with the help of some students. (Umbo Saeedi and Al Balushi, 2009, p. 286).

5- Electronic station: In this station, a computer is placed and the students watch a presentation, P.P., or educational films related to the subject of the lesson, or they search the Internet, then answer the questions accompanying this scientific subject.

6- Advisory station: This station is intended for experts, so the teacher stands behind this station, or brings a visitor as an expert engineer or doctor who has a relationship related to the subject of the lesson, and when students arrive at this station they can ask any questions they propose and related to the subject of the lesson, in the form of a discussion, then it is possible to discuss Expand their awareness of the various aspects of the subject matter, which they could not understand.

7- The Wax Museum station: In this station, the teacher asks one of the students, whether inside or outside the classroom, to rehearse a scientific figure, such as a scholar, and he wears the clothes of the era in which the world lives if he is from Arab and Muslim scholars, and it is better for him to have samples of his books in front of him, Or the devices that he invented, or pictures that tell the most important achievements of this world and speaks of a scientific article related to the subject of the lesson itself, such as during the course of my procedure of chemical reaction, I noticed the occurrence of furan or otherwise.

8- The station (yes) and (no): This station is considered one of the interesting and thought-provoking stations for the students in a very noticeable way, where the teacher in this station conducts a specific experiment and to obtain an explanation of the results of this experiment, the group that reaches this station begins with formulating questions that are Answer them with (yes or no).

It is noted here that the time allocated to each station depends on the time of the session, so if the teacher chooses six stations in the session whose time is (45) forty-five minutes, he can allocate (5-10) minutes for each station, while if the teacher chooses three or four stations he can increase the time For each station, it is possible to increase or decrease the time of the stations as the teacher deems appropriate for the activities mentioned in the lesson and the nature of the students themselves and their level of study (Zaki, 2013, p. 18).

The current research attempts to use four or five scientific stations, which are (exploratory station, mock station, reading station, electronic station, blessing and no station) as they are appropriate for intermediate-grade students, the time allocated to the lesson, the nature of the subject and the study of its impact on Deductive thinking.

### *Advantages of Using the Scientific Stations Strategy*

Aslan and Al-Naqah mention a number of advantages for employing the strategy of scientific stations in the classroom, and what is mentioned are the following:

1- Take advantage of all available resources such as: books, computers, laboratory equipment, teaching aids, tools, chemical and laboratory materials...etc.

2- It contributes to the diversity of practical and theoretical experiences that students acquire by conducting experiments on their own, and they gain direct sensory experiences that are among the best types of experiences that elementary school students can obtain at different stations.

3-Students pass through sensory experiences and discover information with inquiry that makes teaching and learning a lasting impact.

4- The pleasure that the learner feels with scientific stations develops positive trends towards science and science.

5- Students work in cooperative groups that develop many social skills, such as cooperation, participation of others, acceptance of opinion, other opinion, etc. (Aslan and Naqa, p. 17).

### *Methods of Applying the Scientific Stations Strategy*

Ambo Saidi and Al-Balushi (2009) explained the methods of applying the strategy of scientific stations as follows:-

1- Moving to all stations: It depends when the stations need a short time, in which the teacher determines the number of stations and divides the students of the class into groups equal to the number of stations, each group includes (4-6) students and after (7-10) minutes have passed the teacher announces the end of time, asking the groups to move to the stations to his right or left according to the law set by the teacher at the beginning of the session, after

completing the visit to all stations, the groups return to their places, then the teacher begins discussing the worksheet and discussing the results of the groups in each station, then the teacher closes the activity.

2- Roaming on half of the stations: It depends when the activities need more than 10 minutes time, so resorting to shortening the stations to half the number, and instead of passing on (4) stations, for example, traffic is carried out on only two stations, and here (4) stations are designed every two They are similar and it takes about 15 minutes for each station to stay.

3- Partial learning: It is adopted when the time is shortened, and in it the members of one group are distributed among the different stations, as each member of the group visits only one station, then they meet after the end of the specified time, and each student gives what he has done and witnessed in the station he visited, Thus, they exchange experiences (Umbo Saidi and Al-Balushi, 292, 2009).

The researcher will choose the first method (roaming on all stations) for the following reasons:-

1- It suits the nature of the research in terms of the number of groups in the classroom and the type of stations that were designed.

2- Because the entire group passes through each station, which provides an opportunity for each student to gain scientific knowledge on his own, which may help to raise the level of educational achievement for them.

Upon Al-Bawi and Al-Shammari (2012), the researcher sets the following steps to implement the strategy of scientific stations in the classroom:

1- The teacher presents an introduction to the lesson and what groups are required to do when roaming on the scientific stations.

2- Cooperative learning groups are formed, preferably heterogeneous, and prepared among (4-6) students.

3- The teacher places worksheets on each station with the answer sheet in the place designated for them.

4- The teacher announces the start of implementing the worksheets of the stations, and the time is calculated, provided that the stay in each station does not exceed more than (7) minutes.

5- The teacher announces the end of his stay in the station and asks the groups to move to the next station according to the direction of the clock movement.

6- The groups return to their places after completing the roaming on all stations and starting to discuss what each group has reached, and this is done under the supervision of the teacher

7- The teacher received the answer sheets from the groups and audits and returns them to them in the next lesson (Al-Bawi and Al-Shammari, 2012, p. 4)

**The aims of the Scientific stations strategy:** The aims of the Scientific stations strategy are:

1- Overcoming the problem of the lack of tools: When tools and materials are limited, the strategy of scientific stations is useful in overcoming this problem, then the materials for each experiment are placed on a separate table and the learners in their groups group after another visit this station and conduct the experiment, and this does not need to provide materials And tools by the number of groups.

2- Overcoming the negative of practical presentations. In the method of practical presentations, the teacher usually performs the experiment in front of the whole class, and the role of learners is watching, following, and waiting to obtain the result. As for the strategy of scientific stations, each group conducts the experiment on its own and interacts with the materials and tools directly, thereby They are trained in a greater number of science operations, especially the experimentation process that they conduct themselves.

3- Bringing fun, change and movement in the classroom.

4- The diversity of practical and theoretical experiences, in which scientific stations are designed so that the experiences in them vary between reading, exploring, experimenting and listening (Al-Anbaki, 2014, p. 87).

***Intellectual Trends of the Scientific Stations Strategy***

1- Constructive direction: The constructive direction emphasizes that students are the focus of the learning process and they must search for information themselves and teachers should help them clarify their ideas and inquiries and provide scientific positions that excite and challenge their thinking and help them find many interpretations of different phenomena and this is what Piaget emphasized on the educational process In teaching science, the sensory activity is taken into account before the linguistic activity during the process of researching and exploring information, and investing laboratories and educational methods in the learning process.

2- Exploratory direction: Al-Kubaisi (2008) asserts that learning by exploration helps students discover their ideas and find solutions to scientific problems themselves, which creates

a feeling of satisfaction and increases their motivation towards learning and discover new ideas.

Mustafa (2011) believes that students in the process of discovery should make a real effort in acquiring information and not be given ready-to-learn experiences based on their mental processes such as observation, interpretation, deductive, and experimentation.

3- Investigative direction: Al-Haila (2001) mentioned that Bruner saw that the survey is one of the best methods to effect the process of learning and teaching, as it is based on understanding and understanding, as it is considered one of the most influential teaching methods in developing thinking and science processes among students (Al-Bawi and Al-Shammari, 2020, p. 35).

Upon the researcher view, the scientific stations of all kinds make the student a focus of the learning process and focuses on his performance more than focusing on the teacher's performance and frees the student from their negative role through experimentation and self-reliance in discovering the information as the student gains a sense of confidence through his investigation of the information which stimulates his internal reinforcement.

### *Second Deductive Thinking*

Psychologists, logic, and philosophy scientists gave a great deal of attention a long time ago when man used deductive thinking to make sure the truth of the new knowledge by measuring it on another previous knowledge assuming the validity of the previous knowledge and finding the relationship between them and the new knowledge.

Deductive thinking is one of the most important types of thinking to study scientific subjects, especially science, because it helps the student to come up with a structure of science from facts, concepts, generalizations, laws and theories. It is also an important mental process that helps address and understand problems facing the individual in different educational and life situations, which makes him considered one of the aim s Major for Science Education (Salman, 2012, p. 26)

Deductive is a mental intellectual skill that acts as a facilitator to implement or process information-processing processes that include interpretation, analysis, synthesis, and evaluation. Wes. Deductive includes sub-skills: inductive, deductive, and causal (deductive) deductive that clarifies the relationship between cause and effect, and Deductive thinking is one of the requirements of the scientific method in solving problems when the individual faces a scientific problem and a question that needs an answer and does not find in his previous experience what

The first problem, the mental activity will increase, trying to find a solution to the problem by imposing assumptions, collecting information and finding new relationships from the experiences stored in his mind. (Wali et al., 2015, p. 22)

**Theories and the concept of deductive:** It appears from the theories that dealt with the concept of deductive that they are going in two directions, one of them,

1 - The first direction, called operating theories of intelligence: deals with the concept of deductive in general without emphasizing its characteristics and how it grows, and without indicating the factors affecting it, and from the owners of this trend.

Spearman who considers intelligence to be synonymous with deductive, where intelligence is defined as an awareness of the relationships and attachments that are based in essence on deductive, as some of his research has shown that the most saturated tests in the general factor is the deductive test.

Thurston said that the inductive ability and deductive ability of the eight primary mental abilities.

As for Burt, when categorizing the hierarchical model of intelligence, he referred to inference with its inductive and deductive types within the level of relationships that represented one of the four levels of cognitive mental formation.

While Gulford put inferred processes from the dimensions of thinking, which are the factor of knowing the relationships between symbols and the factor of knowledge of symbolic systems and in two other dimensions of productive thinking as well, they are the factor of the convergent production of relations between symbols, and the factor of convergent production of symbolic systems (Mohammed and Obaid, 2017, p. 455).

3- As for the second direction theories, they are called theories of cognitive development, the most famous of which was the Piaget theory and cognitive development, which dealt with thinking and deductive in some detail and clarity, especially among children and adolescents.

Which Piaget is a pioneer in the study of cognitive development and the definition of its stages and analysis of Deductive processes.

Among children and their acquisition of concepts, so his theory has become one of the most cognitive theories of growth.

Common in the fields of psychology and one of the most influencing the mental cognitive curve as well as it.

Attention and deductive in children and adolescents gave great attention to it, as it is considered the first theory that interested in studying Deductive thinking (Wali and others, 2015, p. 25).

### *Deductive Thinking Skills*

The researchers agree that deductive skills consist of induction, which is (the transition from particles or special cases to the general rule) and deduction is (the transition from the general rule to particles and special cases) and this is agreed upon by philosophers and logic scientists as well, and when we look at psychological studies we will see that the ability Deductive thinking has emerged in Thurston Ami's research (1941-1938) through two main components, deduction and induction, yet doubts remain about the number of skills of subordinate deductive skills (Al-Otaibi, 2001, p. 11).

Some also believe that Deductive thinking depends on Heuristic abbreviated Deductive methods such as representation, availability, anchoring, modification and its function is to select information related to the task or problem from a large group of information, but it is less accurate and subject to different forms of errors and self-biases, and then analyze this information that It was received from these methods in order to generate new conclusions, Scriven (1976) indicates that Deductive depends on the basis of presenting a new element that is different from the issues from which Deductive begins i.e. in deductive we link two ideas that were not apparent between them. Correlation before, and so the conclusion enters every new element, in which the individual issues a new, unspecified judgment or new result from the information (introductions) that he already has (Khawalidah, 2016, p. 263)

It can be summarized above that when relying on the skills of deduction and extrapolation only in Deductive thinking, we will find we have general facts and rules that are not connected, and therefore deductive is not productive, but if these general rules are linked by creating relationships between them and trying to infer other relationships then This will lead to results that were previously hidden, and the deductive will then be productive.

Thus it can be said that the skills of Deductive thinking are: induction, deduction, and deduction We can briefly offer to define each of these skills:

#### *1- Inductive*

It is the mental activity in which the student moves from part to whole or from examples to the general rule and from sub-ideas to overall ideas.

#### *2- Deductive*

It is the mental activity that is based on the logical deductive process that aims to reach new knowledge and to conclusions based on the assumptions or introductions available to the student (Attia, 2015, p. 130).

#### *3- Conclusion*

It is the individual's ability to find relationships between the information available to the student in order to reach a specific result through deep and objective thinking. The sub-skills included in the conclusion are (predicting results, extracting new information from observations, linking cause and effect and interpreting results) (Abu Al-Hajj, 2016, p. 27).

### *The Importance of Deductive Thinking*

1- Inference is a tool for the impact of science: when the student uses scientific thinking, he switches between induction and deduction. Inductive deductive helps to form hypotheses and deductive reveals the results that result in order to exclude hypotheses that do not agree with the facts and then re-induction again to verify the remaining assumptions while inference The deductive contributes to linking the information reached by inductive deductive and deductive, so the student was able to draw new results based on the data observed from both.

2- Deductive increases student achievement: Deductive increases student achievement and ability to understand, comprehend and apply and provides it with an organized way of learning to benefit from what you learn when it is needed (Salman, 2012, p. 25).

3- Deductive thinking helps in predicting, anticipating and making decisions, but it includes a set of basic cognitive processes in developing logical relationships (Ashkar, 2011, p. 71).

4- It helps the learner to think deeply about the topics presented and increases the positive and effective learner towards the learning process (Al-Kubaisi, 2007, p. 182).

The researcher adds that Deductive thinking is important in solving the life problems faced by the individual, dealing with them, analyzing them, identifying their dimensions and causes, making decisions on his own, and predicting what will happen in the future.

**Related Studies**

***First: Studies on the Strategy of Scientific Stations***

**1-** Study of Dawood (2016): "The effect of the science stations strategy on achievement and habits of mind among the fourth scientific students in biology."

This study was conducted in Iraq aimed at identifying the effect of the scientific stations strategy on achievement and habits of mind among the fourth scientific students. The researcher chose the experimental design with two equal groups. The research sample consisted of (42) students from the fourth grade scientific students and distributed equally to two groups, one of which was an experimental study, according to Scientific and other stations are controlled according to the usual method. The researcher rewarded between the two research groups in a set of variables, including (age of months in months, previous information, intelligence, cultural level of parents, test of pre mind habits) The achievement test was built while the researcher adopted a measure of mind habits scale (Al-Saffar, 2008) as research tools applied after verifying their validity and reliability. After conducting the statistical analysis, the researcher concluded that there are statistical significant differences for both tools for the benefit of the experimental group. The researcher recommended relying on the results of his experiment on the importance of using scientific stations in teaching biology.

**2- Study of Al-Farkahi & Al-Abaji (2019):** "The effect of the science stations strategy in modifying the misconception of scientific concepts among middle school students in the middle of science."

This study was conducted in Iraq aimed at identifying the effect of the scientific stations strategy in modifying the misunderstanding of scientific concepts among the first intermediate grade students. The researcher used experimental design with two equal groups. The research sample consisted of (54) students from the first intermediate grade students distributed equally to the two research groups. By 27 students for the experimental group and 27 students for the control group, the researcher rewarded the two groups in several variables (the academic achievement of the science course for the first course, the general average, the chronological age in months and the academic achievement of the parents) With the wrong understanding you need to diagnose and make the appropriate adjustment for it by relying on modern strategies and methods in treating it. The researcher recommended the necessity of using scientific stations in teaching science and their importance in modifying the wrong understanding of scientific concepts.

***Second: Studies Dealing with Inferential Thinking***

**1- Al-Tamimi Study (2008):** The effect of using two therapeutic methods as part of the strategy to master learning on achievement and the development of inferential thinking among students of the Institute for the preparation of female students.

This study aimed to know "the effect of using two therapeutic methods within the framework of the mastery of learning strategy, which is: cooperative learning and written feedback on achievement and the development of inferential thinking among students of the third stage \ Institute for the preparation of teachers in Dujail \ Salah al-Din Governorate, a budget in the usual way of teaching"

The researcher chose the experimental design with pre- and post-testing for three groups (two experimental groups and a control group). The research sample consisted of (60) students from the third stage students distributed on three study classes by two experimental groups and a control group, and the three groups were rewarded in a set of variables (time, age and age Mental and previous achievement in mathematics) A achievement test consisting of (32) items of a multiple choice type was built for the purpose of measuring inferential thinking The researcher adopted a test ready for inferential reasoning consisting of (30) items applied to research groups before and after conducting the statistical analysis the results indicated superiority The two experimental groups on the control group in the achievement test and the development of inferential thinking.

**2- Study of Afaneh (2016):** The effect of the learning strategy centered on the problem in developing science processes and inferential thinking skills in chemistry among ninth grade students in Zarqa.

The study aimed to identify the impact of the learning strategy centered on the problem in the development of science processes and reasoning thinking skills in chemistry for students of the ninth grade, and to achieve the research goal the researcher used the experimental approach for two independent samples, the research eye consisted of (88) students distributed equally to two groups an experimental group And a control group, the researcher developed the science operations test for Cronin and Baidla and prepared a test to measure inferential thinking skills. The results showed that there was a statistical significant difference at the level of significance (= 0.05 = α) in developing

science operations and inferential thinking skills and for the benefit of students of the experimental group who studied the learning strategy centered around the problem.

### *Indications and Indications for Related Studies*

**1- Research Aim:**

Previous studies varied in terms of the goal, the studies of the first axis aimed to know the impact of the strategy of scientific stations in various variables such as achievement, retention and habits of the mind as in the study of David (2016) and scientific concepts as in the study of Al-Farkahi (2019). As for the second axis studies, I aimed at studying the strategies Varied and its effect on inferential thinking, as in the study of Al-Tamimi (2008) and Afaneh study (2016). The aim of the current research is to know the effect of scientific stations strategy on inferential thinking.

**2- The research sample**: The research sample for the previous studies varied in terms of number, gender, and educational stage. As for the current research, it was represented by the average first class students (65) students.

3-Research tools: Previous studies used various tools according to the research goal between tests for academic achievement and retention and scientific concepts, and a measure of habits of reason and inferential thinking. As for the current research tools, a test of inferential thinking was prepared to measure three skills (induction, deduction and conclusion)

**4 - Statistical means:** Statistical methods varied in previous studies according to the purpose and purpose of each study. F-test and Pearson correlation coefficient and accompanying variance analysis (CANOVA) were used as in Afaneh study (2016), and the use of monovalent contrast test (ANOVA) and t-test For two independent samples and two interlinked samples, as in the Al-Tamimi study (2008), most studies agreed in using statistical methods for the discrimination and difficulty equations and the KR-20 equation) to calculate the coefficients of difficulty, discrimination and reliability by Cronbach's alpha equation. Thjs study agree with those studies in using Difficulty and Equation of Richardson Cuder -Research (20)

## Methodology and Procedures

### *First: Experimental Design*

The researcher chose the experimental design with two groups equivalent to its reliability with the conditions of the experiment. An experimental group is studying according to the strategy of the scientific stations and the control group, which is studied according to the usual method as shown in Figure No. 1.

| Group | Pre-test | Independent variable | Post-test |
|---|---|---|---|
| Experimental | Deductive Thinking | ⟶ Scientific stations | ⟶ Deductive Thinking |
| Control | Deductive Thinking | ⟶ Usual method | ⟶ Deductive thinking |

**Figure 1**

**Second: The research community and its sample**: The researcher chose intentionally for the boys intentionally from among the schools affiliated to the General Directorate of Education of Nineveh to apply the experiment for the academic year (2019-2020), because there are 6 classes from the first intermediate class students, which makes it easier for the researcher to choose the research sample randomly

The number of students in the three classes (A - B - C - D - E - F) was a student. Two classes were randomly chosen to represent the A class of the experimental group and the E class of the controlling group, so that the two classes were separated from each other. Economically, and for the school administration to show its cooperation with the researcher, the number of the sample population was 65 students, 30 students for the experimental group and 35 students for the control.

**Third: The equivalence of the two groups**: although the two research groups are from one school. It is a somewhat close social environment and similar ages, but the equivalence between the two research groups a number of variables that may affect the results of the research, including the degree of science of the sixth grade of primary education, the age of time calculated by months, the degree of intelligence, the parents 'achievement and the pre-test for Deductive and table (1) explains this:

**Table 1.**
*Shows the equivalence of the two groups in a set of variables*

| Variable | Group | N | Mean | Std. Deviation | t.test value | t.test tabled | Std. Deviation |
|---|---|---|---|---|---|---|---|
| Age by month | Experimental | 30 | 149.1000 | 10.09045 | 1.565 | 1.99 ) 0.0 (5 (63) | Equivalent |
| | Control | 35 | 153.5714 | 12.55174 | | | |
| Intelligence | Experimental | 30 | 40.2000 | 3.65211 | 0,364 | | Equivalent |
| | Control | 35 | 39.7714 | 5.49377 | | | |
| Past achievement | Experimental | 30 | 66.9667 | 15.27333 | 0.536 | | Equivalent |
| | Control | 35 | 65.0571 | 13.45350 | | | |
| Pre-test | Experimental | 30 | 8.7000 | 4.17835 | 0.253 | | Equivalent |
| | Control | 35 | 8.4571 | 3.56736 | | | |
| Variable | Group | Up to Primary | Secondary | Diploma, Bachelor and up | Chi Square Value | Chi Square tabled | Significance |
| Father academic level | Experimental | 6 | 13 | 11 | 0.550 | ,995 ,05) 2)(0 ( | Equivalent |
| | Control | 7 | 18 | 10 | | | |
| Mother academic level | Experimental | 13 | 9 | 8 | 1.447 | ,995 ,05) 2)(0 ( | Equivalent |
| | Control | 14 | 15 | 6 | | | |

***Fourth: The Research Tool***

**Deductive thinking test**: The researcher prepared a test for Deductive thinking for intermediate school students after reviewing the set of literature and studies that dealt with Deductive thinking, including the study of Salman (2012) and Afaneh study (2016) and Hassan study (2013) The researcher also reviewed the science book for the first intermediate grade and the science book For the second intermediate grade, a group of facts and concepts from which the student had previously learned to formulate the test items was drawn soundly, where the test consisted of (20) items consisting of three classes of inductive, deductive, and reasoning.

**Preparing study plans**: The study plans were prepared based on the content of the educational material and the behavioral aims included in the curriculum. A sample of these plans was presented to a committee of experts, Table No. (1) to show its validity and reliability. It was approved after taking into consideration their agreed observations and opinions.

**The Validity of the test:** Items of Deductive thinking test were presented to a committee of experts and arbitrators in the field of educational and psychological sciences. Table No. 3 to express their views on the validity of the test and the extent of its reliability of the level of intermediate school students. Based on their observations, some of the items were reformulated to be prepared as The final consists of (20) items, and it is corrected by giving a score (zero or one) for each of the test items.

**Table 2.**
*Shows the names of experts and arbitrators in the field of psychological and educational sciences*

| | |
|---|---|
| Prof. Dr. Fadhil Khalil Ibrahim | College of Basic Education \ University of Mosul |
| Assist. prof.. Bushra Khamis Mohammed | College of Basic Education \ University of Mosul |
| Assist. Prof. Dr.Fathi Taha Mashaal | College of Basic Education \ University of Mosul |
| Assist. prof. Zena Taha Hassoun | College of Basic Education \ University of Mosul |
| Assist. Prof. Khawla Ahmed Mohamed Saeed | College of Basic Education \ University of Mosul |
| Assist. Prof. Ghusun Khalid Sharif | College of Basic Education \ University of Mosul |
| Assist. Prof. Dr.Mahmoud Abdel Salam | College of Education for Humanities \ University of Mosul |
| Assist. Prof. Wasef Mahdi Younes | College of Basic Education \ University of Mosul |
| Assist. Prof. Dr.Amal Fattah Zidan | College of Education for Humanities \ University of Mosul |

**Exploratory sample:** The test was applied to an exploratory sample from the first intermediate class students consisting of (20) students in the (intermediate) for girls for the purpose of calculating the time taken from answering the test and the accuracy of the test instructions and its reliability for the research sample. Before the researcher, the difficulty of the items ranged between (0.25-0.70). As for the distinction of the items, it ranged between (0.20 - 0.60). No item was deleted from the test items because they are within the range of acceptance of the items in terms of the difficulty and discrimination of the item.

**Reliability:** The stability of the vertebrae was extracted using Kurder - Richardson method

(20), and it reached (0.83), which is a good persistence factor. Thus, the test of Deductive thinking is ready and valid for application to the first grade students mean.

**Application Procedures:** The science teacher in the medium of AlNidhal intermediate school for boys started applying the experiment to the members of the two research groups, starting on Sunday, 10/13/2019, after he was provided with the necessary study plans and answered all questions about the mechanism of applying the academic plans at three classes per week and per week Second, the Deductive thinking and intelligence test was applied. Then the teacher taught the two groups, which lasted for 10 weeks until 18/12/2019. After completing the teaching of the first and second units of the course book, the post-test for Deductive thinking was applied on 12/22/2019.

**Checking and treating the data**

The researcher corrected the students' answers sheets for both groups of her research, as she gave one score for each correct answer and zero for the wrong answer. Thus, the test results and scheduling of scores were arranged in preparation for conducting statistical treatments.

**Statistical treatments**. The following statistical researcher used:

1. T-test for two independent samples, Kay square test, Discrimination equation, Difficulty equation, Kuder Richardson equation (20).

**View the Results**

To achieve the aim of the research in comparing the results of the effect of using the scientific stations strategy in Deductive thinking among the first intermediate students in the science and answer subject about the hypotheses included in the research, the results of the deductive test were analyzed between the two research groups and between the pre and post tests.

***1- The results of the first hypothesis, which states***

There was no statistical significant difference at the level of significance (0.05) between the scores mean of the experimental group students, which were studied according to the strategy of the educational stations and the scores mean of the students of the control group, which were studied in the usual method in the test of Deductive dimensional deductive. The T-test was used to identify the differences between the scores mean of students in both groups in the deductive test and table (2) shows the results of this hypothesis.

| Group | N | Mean | Std. Deviation | t.test | | Significance |
|---|---|---|---|---|---|---|
| | | | | value | Tabled | |
| Experimental | 30 | 13.3000 | 3.73382 | 4.407 | 1.999 0.05)(63)( | Significant in favor of experimental group |
| Control | 35 | 9.5143 | 3.19348 | | | |

t- value of the students 'scores in both groups in the dimensional Deductive thinking test.

It is clear from the above table that the calculated T value of (4.407) is greater than the tabular t value of (1.999) at the level of significance (0.05) and degree of freedom (63), and this indicates a statistical significant difference between the scores mean of students in the two groups in a test Deductive in favor of the empirical group thus rejects the null hypothesis and accepts the alternative hypothesis.

***Results for the second hypothesis, which states***

There is no statistical significant difference between the mean difference between the two tests (pre - post) and for both experimental and control groups in the test of Deductive thinking and the T-test was used for two independent samples (t-Test). To identify the mean difference between the pre and post tests and table (3) shows the results of these The hypothesis

| Group | N | Mean | Std. Deviation | t.test | | Significance |
|---|---|---|---|---|---|---|
| | | | | Value | tabled | |
| Experimental | 30 | 4.6000 | 2.69866 | 3.856 | 1.999 (63)(0.05) | Significant in favor of experimental group |
| Control | 35 | 1.0571 | 4.36526 | | | |

The t value of the students 'scores in both groups in the pre- and post-deductive deductive test

It is clear from the above table that the calculated t value of (3.856) is greater than the tabled t value of (1.999) at the level of significance (0.05) and degree of freedom (63), and this indicates that there is a statistical significant difference between the mean difference between the two tests (pre - Al-Baadi)

and in favor of the experimental group, and thus rejects the null hypothesis and accepts the alternative hypothesis.

**Discussion of the results**: After presenting the results shown in Tables (2) and (3) it was found that there were statistical significant differences between the two research groups (experimental and control) in the Deductive thinking test and in favor of the experimental group, as well as there are statistical significant differences between the two research groups in the science operations test between The pre and post tests are in favor of the experimental group and this indicates the effect of the strategy of educational stations compared to the usual method in developing Deductive thinking. The superiority of the experimental group over the control may be attributed to the following:

1- That the student interacts with the various educational stations that helped him discover the information himself, deal with it, and link it with his cognitive structure, which leads to the integration of knowledge in his mind and thus his induction of other new information.

2- The use of educational stations is based on teamwork, which creates a spirit of competition between students and interaction with each other, and this is what we lose in traditional teaching methods.

**Recommendations:** The researcher recommends the following:

1- Adopting scientific stations in teaching chemistry - physics - biology for the preparatory stage.

2- Training science teachers on applying the strategy of scientific stations in teaching through training courses.

### *Proposals*

1- Conducting studies using the Scientific stations strategy in other variables those mentioned in this study, such as creative thinking, multiple intelligences and motivation.

2- Conducting a comparative study between the Scientific stations strategy and other strategies in teaching science for various stages.

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