THE EFFECTIVENESS OF THE PROBLEM TREE STRATEGY IN THE COGNITIVE MOTIVATION AMONG FIFTH GRADE FEMALE STUDENTS IN SCIENCE

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Abstract: *The research aims to identify the effectiveness of the problem tree strategy among fifth grade female students in science and their cognitive motivation. The researcher adopted the experimental approach with an experimental design for two equal groups. The science subject will be studied according to the problem tree strategy, and section (B) to represent the control group that will study the same subject in the usual manner. The total number of students in the two groups has reached (68) students; (33) students in the experimental group, and (35) students in the control group. It was statistically rewarded between the members of the two groups in the following variables: (the chronological age of the students of the two research groups calculated in months, the educational attainment of the parents, the test of previous information in the subject of science, the grades of the previous year (2021-2022) in the subject of science, the Raven intelligence test, and the cognitive motivation scale) And the researcher identified the study material with the topics from the science book for the fifth grade of primary school, then the researcher formulated behavioral goals, as they numbered (200) behavioral goals. Validity, discriminatory power, and stability were verified; Its alpha-Cronbach stability was verified with a value of (0.92); The researcher used the appropriate statistical methods to extract the data, and the results showed that the students of the experimental group outperformed the students of the control group in the measure of cognitive motivation.*

Keywords: *Problem tree strategy, cognitive motivation, fifth grade, science subject*

Chapter One

First: The Problem of the Research

Science as a subject has its own composition that sets it apart from other subjects, and teaching methods in general and methods of teaching science in particular are currently experiencing a global renaissance that accompanies and keeps pace with the development that is taking place in science itself. and the essence of this privacy is reflected in the ways in which the material is taught, the method and method of teaching followed by the teacher is what leads to understanding science and consolidating it in the minds of learners and that any defect in the method of teaching science leads to poor understanding and poor motivation of learners towards Learning .

Through the researcher's experience in teaching as a science teacher in primary schools for more than (13) years, as well as the continuous discussion of her colleagues in her field of specialization, she noticed the low level of cognitive motivation of the fifth primary students and the weakness of their cognitive motivation towards science.

The researcher discovered that the issue is deeply embedded through the aforementioned, and after receiving formal approval from the University of Diyala/College of Basic Education, and according to the Department of Planning and Statistics under the book facilitating the task, the researcher prepared an open exploratory questionnaire directed to a sample of science teachers for the fifth grade of primary school, which numbered (20) teachers who have experience of not less than (5) years, where they were randomly selected, and the questionnaire included four questions:

1. 100% use the usual method of teaching science.
2. 90% have no previous knowledge of the problem tree strategy.

3. The percentage (90%) confirmed the weakness of the cognitive motivation of students towards science.

In an effort by the researcher to overcome this problem, and keep pace with modern trends in science teaching, her attempt came to know the effectiveness of the problem tree strategy and to know its effectiveness on the cognitive motivation, perhaps it may contribute to raising the cognitive motivation of fifth grade students towards science. Therefore, the research problem focused on answering the following question:

"What is the effectiveness of the problem tree strategy among fifth grade students in science and their cognitive motivation?"

Second: The Importance of the Research

Public education is in charge of shaping students' experiences, improving them, honing their talents, increasing their motivation, igniting their energy, and enlarging their perspectives., as it aims to prepare learners in comprehensive, integrated and parallel numbers in all spiritual, mental, physical and social aspects so that one side does not overwhelm the other, and so that they are useful people in their society (Saleh, 2016: 4).

Since the primary objective of scientific education is to develop a learner's personality in a way that is balanced and integrated across all of its various facets, the school curriculum is the main tool to achieve this by helping learners to achieve the educational goals to be achieved, and to rise to the end of their abilities and preparations and to the level of their expectations, taking into account Consider the individual differences between them. (Saada and Abdullah, 2018: 40).

The curriculum in its modern and comprehensive concept represents all the educational experiences that the school prepares for its learners inside and outside in order to help them grow comprehensively in all respects, and that the modern curriculum is not limited to the information and knowledge that teachers transmit through the textbook to their learners, but it includes skills, teaching methods, values, trends and activities practiced by learners, where the role of the teacher is a facilitator, guide and provider of information, and the learner becomes the focus of the educational process. (Jaber et al., 2009: 37)

The primary stage is one of the most crucial phases since it serves as the foundation for the succeeding stages; the more robust the foundation, the more resilient the educational system will be in the face of contemporary demands., so it is necessary to pay attention to that stage, by making learners know a lot about their daily lives, and what is happening in their environment, and working to develop their tendencies and motivations towards knowledge, experience and discovery, as it makes learners able to practice mental processes that will strengthen their learning, and thus prepare enlightened generations capable of adapting to Developments in science in every age. (Al-Azzawi, 2003: 4)

In order to keep pace with developments in our time, the teaching of science worldwide has witnessed a radical development, and this development derived its origins from the nature of science itself, and therefore science has received great attention in terms of the development of its goals, curricula, and teaching methods, as the goal of teaching it has become the consolidation of scientific knowledge in the interpretation of natural phenomena, and the use of the scientific method to become part of the learner's daily behavior. (Sheikho, 2019: 17). This trend has been clearly confirmed by the holding of numerous conferences and seminars, including:

- The specialized seminar organized by the House of Wisdom in Baghdad (November, 2009), which stressed the need to form committees from the Ministries of Education and Higher Education specialized in curricula and teaching methods to organize the knowledge content and modern methods and methods that call for making the learner the focus of the educational process, and the use of methods that suit the ages of learners for all stages (House of Wisdom, 2009: 3).
- The eleventh scientific conference held in Baghdad (2005), which stressed the need to develop curricula and use modern strategies in teaching to keep pace with the rapid scientific development in the learning and teaching process. (Al-Mustansiriya University, 2005: 11).

- The fifteenth annual scientific conference held at Al-Mustansiriya University / College of Basic Education / 2013), which aimed to motivate the researcher to search for the best teaching methods and advanced educational programs. (Al-Mustansiriya University, 2013: b).

Therefore, we need a new education that throws the human being to the level of civilization in the twenty-first century, which enables the learner to interact positively, and we also need educational programs that activate and develop the values of dedication to work and the capabilities of creativity and innovation (Al- hout, 2008: 15).

Therefore, modern teaching strategies and methods must be applied in providing knowledge to learners to keep pace with the developments that occur in this era and face various life problems (Saadeh, 2018: 37), so there is a need to adopt strategies more related to the learner's life, interests and abilities to reduce the gap between what learners get within the classroom walls and the experiences gained from their surrounding environment, as the learner today needs strategies that enable him to transfer scientific information, experiences and skills beyond the boundaries of the classroom and the school environment (Al-Kaabi, 2018: 19), as well as that it has great importance in translating the content of the educational material into the concepts and skills that the school aspires to achieve, and determining the type of learning and the degree of ease and difficulty in which it takes place, and has a clear impact on the attitudes of learners towards the subject and towards their teachers, so teaching strategies have become part of the school curriculum and not just an activity that takes place next to it. (Masoudi and Sanabel, 2018: 34)

One of the modern strategies in teaching is the strategy of the problem tree that the researcher will employ in this study, as it is a new dimension in taking notes, summarizing and reviewing, and depends on all mental skills, pictorial skills of memory, words, numbers, lists, logic, analysis, colors, imaginations, dimensions and total drawings. (Al-Ruwaithi, 2009: 65).

The problem tree strategy is more than just identifying the root causes of the problem, but it provides a visual imagination of the purposes and causes of the problems because it works to represent or draw the educational material in a way that facilitates the identification of the parts of the material and the stages of its learning, and creates a visual vision that the learner can understand (Awad, 2010: 24), and works to identify the problems related to the topic using the method of collecting ideas, identifying the main problems, identifying the causes and effects resulting from them, and reformulating all negative situations positively depending on what he planned beforehand, emphasizing the clarity of the idea, and paraphrasing if there are logical relationships between cause and effect. (Hamid, 2010: 8). Its importance also stems from the fact that it overlaps between one goal and another, due to the close interdependence of all components of the lesson material, which led to a better focus on the material and a distinct scientific application. (Khalil, 2013: 47)

In light of previous ideas and proposals, the researcher believes that it is necessary to try modern strategies, including the problem tree strategy, perhaps it may contribute to raising the level of cognitive motivation, which is one of the important educational goals in the learner's life, which the educational system works to improve for learners, as it is the criterion for the learner's progress in his studies and his transition from one stage to another, and its importance does not stop to this extent only, but the learner uses what he has learned and absorbed of information and experiences in facing challenges and problems in life Daily. (Zamili, 2018: 16).

The cognitive motivation is distinguished from the rest of the motives in its focus on mental effectiveness, the learner's vitality and activity, and his intervention in organizing experiences in order to introduce and integrate him into his cognitive structure in order to achieve cognitive balance. (Said, 2008: 13).

The cognitive motivation is also of great importance from the educational point of view of learners as one of the educational goals itself, and that stimulating the cognitive motivation of learners makes them enjoy the learning process and makes them do their duties on time and ask their teachers and contribute to the classroom discussion and may ask for other work and all that because they work, and that such learning is useful to them in their future lives. (Adas, 1998:333).

In light of the above, the researcher summarizes the importance of the research as follows:

1. It is the first research, according to the researcher's knowledge at the local level, which dealt with the strategy of the problem tree as a new and unusual strategy in teaching science to fifth grade students and its effectiveness in cognitive motivation.

2. Providing science teachers with new strategies and methods that can be employed in teaching science to try to understand the improvement of students' achievement and raise their cognitive motivation.

3. Providing the library and those interested in the educational field with research information on this strategy in teaching science.

Third: Research Objective: The current research aims to identify the effectiveness of the problem tree strategy in the cognitive motivation of the fifth-grade primary students in science.

Fourth: Research hypothesis

1. There is no statistically significant difference at the level of (0.05) between the average scores of the experimental group students who will study according to the problem tree strategy and the average scores of the control group students who will study according to the usual method in the cognitive motivation scale.

Fifth: limitations of the Research: The current research was limited to:

1. Spatial limits: Primary schools (for girls) of the Directorate of General Education in Babylon Governorate / Kothi District.

2. Time limits: First semester of the academic year (2022/2023).

3. Human limits: fifth grade students.

4. Knowledge limits: the first three units of the science book for the fifth grade of primary school, 4th Edition (2019), Ministry of Education, Republic of Iraq.

Sixth: Definition of key Terms

The problem tree strategy was (Zend, 2004) as: " Preparing shapes in the form of a tree that shows the problems to be solved or inquired about and allows the student the opportunity to analyze and identify problems to present, diagnose and find solutions to them" (Zend, 2004: 198).

The researcher defines it procedurally: as a strategy taught by the students of the experimental group of research and depends on the employment of the problem tree scheme where the roots (means, causes, stem (goal or problem) and branches (results and effects).

Cognitive Motivation was defined by: (Abu Hatab and Sadiq, 2013) as: "The desire to know, understand, master information, formulate problems and solve them. (Abu Hatab and Sadiq, 2013: 456).

The researcher defined it procedurally as: the learner's continuous desire to search for knowledge, understanding, curiosity and asking questions, which is done by answering the paragraphs of the cognitive motivation scale prepared by the researcher.

Chapter Two
Theoretical Background and Previous Studies

Good and original scientific research is a basic platform through what it represents of an addition that contributes to bridging a certain gap in previous studies or addressing some of its weaknesses in a professional scientific treatment, so this chapter included two main sections, namely theoretical background and previous studies, and we will detail the statement in it as follows:

The First Axis: Theoretical Background:

Active Learning

Active learning focuses on learning processes more than on learning outcomes, and this type of learning does not eliminate the role of the teacher, although the learner is the focus of the educational process and this role is achieved only in the presence of a teacher who guides, facilitates and facilitates the educational process. (Bishop&Denely, 1997: 48). Sharon & Martha pointed out in (Abu Al-Hajj, 2016) that it is the process of dynamic inclusion of the learner in his educational attitude and requires him to move, perform, effectiveness and participate under the supervision of the teacher. (Abul Hajj, 2016: 8). Kariman (2012) explained that active learning is a joint cooperative learning in which all learners participate in assignments, classroom activities,

analysis of scientific material and positive listening, as all of these are done in the presence of the teacher managing the educational process, which pushes them to achieve the educational goals they seek. (Creman, 2012: 35)

Problem Tree Strategy

A problem tree is a specific perception or title in the middle of the page (to help focus and remember) and then organize it in an organized way, using keywords, and images instead of writing down what we want to remember in the usual sentence. (Al-Ruwaithi, 2009: 65)

The idea of the problem tree strategy is based on enabling learners to have the skills of analytical accuracy of one problem, and to distinguish between two important aspects: (the causes of the problem, and the results of the problem), and that the goal of this strategy is to help learners acquire the skills of analytical accuracy of the problems that the learner is exposed to in his lesson, and that the time of implementation of the strategy has some freedom as it can be used as a prelude at the beginning of the lesson or as an activity during or at the end of it (Al-Shuwaili et al., 2016: 55)

Steps of the Problem Tree Strategy

1. The teacher draws for the learners the strategy and the steps for its implementation as follows:
2. After the teacher explains to the learners the lesson that relates to the problem or a specific issue, he distributes to them the activity sheet that includes the strategy, and the learners write the problem, then the causes of the problem and finally its results.
3. After completing the implementation of the strategy learners, the teacher discusses the learners in the causes and consequences of the problem. (Ambo Saidi and Huda, 2016: 52)

We have shown from the above that the problem tree represents a graphic technique to represent ideas and notes, and depends on the use of symbols and colors and expresses one central concept, word or idea and has branches like a tree of related ideas and can be used in the field of different life centers, and in improving their learning and thinking in the clearest way and with the best human performance, where branches, images and colors are used to express the idea and are used as a method of using memory and depend on visual memory in an illustration in the form of A tree that is easy to review with easy rules and instructions and it shows ideas clearly.

Steps of drawing the Problem Tree Strategy: The steps to draw the problem tree strategy are as follows:

1. Start from the middle and write the main idea with the use of a shape or image that expresses the main idea and the central image helps to focus.
2. The use of colors during drawing, because colors work to draw attention and excitement, and they also give strength to the problem tree.
3. Use branches as much as possible, with a lot of explanation of a topic in one branch and linking the branches in the central form, and connecting the branches of the third and fourth levels to the first and second levels.
4. The connection between the branches takes the form of curves because limiting themselves to straight lines bores the mind, while curved and interconnected branches, such as tree branches, are more noticeable.
5. Using one keyword indicates the idea in each line, because the single keyword gives the problem tree more flexibility, strength, and each single word is similar to arithmetic multiplications, resulting in a set of mental connections and different relationships, and is able to generate ideas, with the possibility of adding notes on any branch with no more than one or two sentences.
6. Use as expressive as possible to describe sub-ideas, and if the topic is saturated or large, it is preferable to distribute it among more than one problem tree (Polltt, 2003: 5).

Fourth: Motivation

The subject of motivation is one of the most important and most significant topics of psychology, whether at the theoretical or applied level, so psychological problems cannot be solved without paying attention to the motives of the organism, which plays the main role in determining its behavior quantitatively and qualitatively (Ghobari, 2008: 273).

Motivation is also a forum of interest for workers in the educational process, including learners, teachers, counselors, managers and everyone who has a relationship or connection with the educational process, as motivation has received very great attention by those interested in the field of psychology in general and psychology motives in particular, where motivation is usually seen as the engines behind the behavior of the organism alike, there is a reason or several reasons behind each behavior and these reasons are related to the internal state of the organism when it occurs Behavior on the one hand and stimuli of the external environment on the other. (Abu Jado, 2014: 291); Cognitive motivation is defined as an internal state that moves the learner's thoughts, knowledge, cognitive structures, consciousness and attention and insists on him to continue performing to reach a state of cognitive balance (Qatami and Qatami, 2000: 216)

The cognitive motivation of the concepts that have been crystallized in the theory of growth and cognitive development of the Swiss scientist Jean Piaget and called cognitive motivation Piaget cognitive balance as it assumes that the goal of cognitive growth of the learner is to reach the state of cognitive balance and this balance is achieved as indicated (Al-Qatami, et al., 2010) as follows:

1. Passing from a state of knowledge that is predominantly representative to reach a state of cognitive adaptation.
2. Reaching a state of self-organization appropriate to the experiences and preparations of the learner.
3. Access to knowledge and get rid of the state of disorder resulting from the inappropriateness of learning to the state of cognitive development that the learner is going through.
4. Get rid of the cognitive distortion state.
5. Comprehension and understanding that rids the learner of the state of imbalance.
6. Access to cognitive closure status.
7. Solving a difficult problem that the learner feels requires absent cognitive energy in which he challenges himself to reach the solution (equilibrium state).
8. Challenge opportunities represent opportunities to develop experiences that the learner interacts with to achieve the concept of experience and mental control. (Al-Qatami, et al., 2010: 298)

The concept of cognitive motivation, like other psychological concepts, such as perception, remembering and learning, is a hypothetical formation that is inferred in the behavior of the organism (Ghobari et al., 2008: 15). The cognitive motivation is the first engine and the first guide to understanding and knowledge, and it directs the learner to receive stimuli and pay attention to them and then code, save and organize this has led researchers to make cognitive motivation one of the manifestations of the operation of information and processing (Nashawati, 2003: 112)

Second Axes: Previous Studies

After reviewing the previous studies and literature, the researcher did not find any Arab or local study that dealt with the problem tree strategy as an independent variable in science, only one foreign study will be mentioned later, and also the researcher will address previous studies of the dependent variable (cognitive motivation) and they have been arranged in chronological order.

First: Previous Studies that Dealt with the Problem Tree Strategy:

Table (1): Previous studies dealing with the problem tree strategy

Researcher Name and Year of Study	Place of study	Objective of the study	Grade	Sample size and sex	Subject matter	research tool	Statistical means	Key findings
Ausbel& Youssef, 1975)(	America	Know the impact of Proble	Elementary School	160 college students	Science	Immediate and deferred (retention) test	Single variance analysis, Schiff test,	The superiority of the experimental group

		m Tree Strategy in Learning and Retention in Science					Pearson correlation coefficient, and T-test for two unequal independent samples	over the control group

Second: Previous studies that dealt with cognitive motivation:

Table (2): Previous studies on cognitive motivation

Researcher Name and Year of Study	Place of study	Research goal	Grade	Sample size and sex	Subject matter	Research tool	Statistical means	Key findings
The Fatlawi 2018)	Iraq	Knowing the effectiveness of teaching based on the theory of self-organized learning in the achievement of second-grade intermediate students in chemistry and their cognitive motivation	Middle School	60 Students	Chemistry	Achievement test and cognitive motivation scale	Coefficient of difficulty, Pearson correlation Cronbach's alpha equation, effect size equation	experimental group students outperformed the control group students

Chapter Three
Research Methodology and Procedures

This chapter includes research procedures in terms of selecting the experimental design, determining the research community, selecting the research sample and its equivalence in a number of variables, preparing its tools and preparing its requirements, then applying the experiment and selecting the appropriate statistical means as follows:

First: Research Methodology

The experimental method has been adopted as it is the most appropriate approach to the current research procedures and verification of its objectives, as he confirms (Wolflock, 2015) that the experimental method is one of the most accurate research methods that can affect the causal

relationship between the independent variable and the dependent variable in the experiment, instead of shortening the description of what exists, the researcher enters the variables and observes the results, and this is done through his study of the opposite situations that were set, except for the variable that the researcher is interested in studying (Woolfolk, 2015: 87)

Second: Experimental Design

The current research includes one independent variable, which is the strategy (problem tree) and a dependent variable (cognitive motivation) The researcher chose the experimental design with partial control, which consists of two groups (experimental group and control group) with a post-test to measure cognitive motivation, it is suitable for the current research procedures and verification of the research goals and the validity of the null hypothesis.

group	parity	Independent variable	Dependent variable	Test Tool
Experimental	Chronological age in months Previous information IQ test Ravn Previous Collection	Problem Tree Strategy Normal method	Cognitive motivation	Cognitive Motivation Scale
control				

Scheme (1): Experimental design adopted in the research

Third: The Research Community and its Sample

A. Research Community: The current research community includes all fifth-grade primary school students in (7) primary schools for girls, as school data was obtained from the planning and statistics department under the task facilitation book as shown in Table (3):

Table 3: Primary schools for girls belonging to the research community

no	School Name	Number of students	Number of sections
1	Al Tatweer School for Girls	77	2
2	Al Rayhana School for Girls	80	2
3	Al Razi School for Girls	96	2
4	Rafah School for Girls	123	3
5	Al Noha School for Girls	130	3
6	Ariha School for Girls	125	3
	Total	785	

B. Research sample: The researcher deliberately selected Al-Tatweer Primary School for Girls as a sample for the current research for the following reasons:

1. The researcher is a teacher, and the school administration expresses its cooperation with the researcher to apply the experiment.
2. In addition to the presence of two sections for the fifth grade of primary school and simple random draw, section (A) was selected as an experimental group and section (B) as a control group by (35) students for the experimental group and (38) students for the control group.
3. Most of the students are from one geographical area, as they form a homogeneous environment socially and culturally, which facilitates the researcher procedures for parity between the students of the two research groups.

Table (4): Preparation of students of the research sample before and after the exclusion process

group	section	Number of pupils before exclusion	Number of excluded schoolgirls	Number of pupils after exclusion
Experimental	A	38	5	33
control	B	39	4	35
Total		77	9	68

Fourth: Equivalence of the Two Research Groups

The researcher conducted equivalence for the two research groups in some variables that are believed to affect the results of the experiment, and the researcher obtained the information from the school card and through the students themselves and these variables were parity between the two research groups and table (5) shows the parity between them:

Table (5): Equivalence of the two research groups

Variable	group	no	Arithmetic mean	Standard deviation	contrast	Degree of freedom	T- value		Significance level
							calculated	tabular	
Chronological age	Experimental	33	124.848	5.449	29.691	66	1.094	2,000	Non-significant
	Control	35	126.400	6.193	38.353				
Previous information	Experimental	33	14.030	3.703	13.712	66	0.831	2‹000	Non-significant
	Control	35	14.714	3.073	9.443				
Previous Collection	Experimental	33	9.181	1.236	1.527	66	1.174	2‹000	Non-significant
	Control	35	8.771	1.610	2.592				
IQ test	Experimental	33	17.878	5.424	29.419	66	0.992	2‹000	Non-significant
	Control	35	16.485	6.108	37.307				

Fifth: The Control of extraneous variables

There are many variables that experimental research is exposed to that affect the internal and external integrity of the experimental design and for the purpose of reducing the error in the results resulting from the presence of these variables, they must be controlled and fixed, bast the variable to be measured, namely: (classes, duration of the experiment, subject matter, confidentiality of the experiment, subject teacher, school building (place of experiment),

conditions of the experiment and associated accidents, experimental extinction, processes related to maturity, measurement tools).

Sixth: Research Supplies

A. Determining the scientific material: Before starting the experiment, the researcher determined the scientific material that will be taught to the students of the two research groups during the experiment during the first semester, which included three units, the first of the science book to be taught, the fourth edition of 2019 AD for the fifth grade of primary school, and table (6) shows the distribution of the scientific material to the chapters of the units.

Table (6): Distribution of scientific material on the chapters of the units to be taught from the science book

Unit	Chapter	subjects
First: classification and diversity	First: flowering and non-flowering plants	Lesson One/Flowering Plants
		Lesson Two/ Non-Flowering Plants
Second: The human body and its health	Second: vertebrate and invertebrate animals	Lesson One/ Intervertebral Animals
		Lesson Two / Invertebrate Animals
Third: Material	Third: circulatory system and breathing apparatus	The first lesson / circulatory system and its health
		Lesson Two/Breathing System and its Health
	Fourth: the digestive and respiratory system	Lesson One / Digestive System and its Health
		Lesson Two/The Urinary System and its Health
	Fifth: Elements	Lesson One / Elements and their Types
		Lesson Two/Common Elements and their Characteristics

B. Formulation of behavioral goals: Each desired educational product is developed in the form of specific, clear and short-term phrases, and can be observed on what the learner's performance shows after passing through the educational experience called (behavioral purpose), as it uses clear words with clear meanings that are not subject to implicit interpretation, they are words that can be measured directly and directly momentary, so behavioral purposes were formulated according to Bloom's classification This is because of the prevalence of its use and the reason for this is that it is impossible to write good questions without knowing its educational objectives, i.e. the questions are placed to see the extent of what has been achieved from the purposes, so the researcher formulated behavioral purposes depending on the content of science for the fifth grade of primary school, which was included in the experiment and amounted to (200) behavioral purposes, which were distributed in three levels within the cognitive classification of Bloom for the field, namely (remember, understand, apply), and these purposes were presented to a group of arbitrators and specialists in the field of teaching methods Science, educational psychology, measurement and evaluation have all been considered valid behavioral purposes.

C. Preparation of teaching plan: The researcher prepared (48) teaching plan for the students of the two research groups (experimental and control) by (24) plan for (experimental group) according to the strategy of the problem tree and (24) plan for (control group) according to the usual method, and models of teaching plans for the experimental and control groups were presented to a group of testers and specialists in science teaching methods, in light of their observations and good opinions, the necessary adjustments were made to the plans.

Seventh: Research Tool

The research requires the preparation of a tool to measure the dependent variable represented by (cognitive motivation), through which we learn about the extent to which the goal and hypothesis

of the research have been achieved, and the researcher has prepared a test to measure cognitive motivation, and the following is an explanation of the procedures carried out by the researcher:

Cognitive Motivation Scale

One of the requirements of the current research is to build a scale used to measure cognitive motivation among fifth grade primary students, so the researcher built a cognitive motivation scale.

1. Determining the goal of the scale: The scale aims to measure the cognitive motivation of fifth grade students in order to identify their motivation towards science.

2. Determining the areas of the cognitive motivation scale and the number of its paragraphs: After reviewing previous studies and literature (Chalabi study, 2016), (Al-Sharifi, 2017), and (Al-Fatlawi, 2018), the researcher formulated the paragraphs of the scale in its initial form within three areas, including: (the first area: the pursuit of knowledge and the desire to read, the second field: curiosity, and the third field: information processing).

Each area included a number of paragraphs that represent aspects of cognitive motivation, where the number of paragraphs for each area (7 paragraphs) and thus the total number of paragraphs of the scale (21 paragraphs) The researcher was keen that these paragraphs be appropriate to the nature of the sample and to ensure the accuracy of the selection of these areas and the formulation of paragraphs, the researcher presented them to a group of experts in educational and psychological sciences (21) In light of the opinions of experts, and their observations, the areas have received the approval of all experts, as the researcher adopted The percentage of agreement (85%) of experts or more is a criterion for the validity of the field to measure what was set for it, Some paragraphs have been reformulated to become clear and understandable, and in front of each paragraph the researcher developed three alternatives to answer: (a lot), (sometimes), (rarely), and the researcher was keen that these paragraphs are appropriate to the nature of the sample, and to ensure the accuracy of the selection of these areas and the formulation of their paragraphs, the researcher presented them to a group of arbitrators in educational and psychological sciences, measurement and evaluation, the adult(21) All paragraphs have obtained high agreement rates, as the researcher relied on the percentage of agreement (85%) or more as a criterion for the validity of the paragraph that measures the field, taking all the amendments in the wording of some paragraphs to become clear and understandable, and Table (7) refers to the distribution of paragraphs of the cognitive motivation scale on its fields.

Table (7) Paragraphs of the cognitive motivation scale according to each of the fields

no	Domain	Number of paragraphs	paragraphs
1	The pursuit of knowledge and the desire to read	7	1-2-3-4-5-6-7
2	Curiosity and exploration	7	8-9-10-11-12-13-14
3	Information Processing	7	15-16-17-18-19-20-21

3. Instructions of the cognitive motivation scale: The instructions of the scale included the method of answering it, and how to urge students to answer accurately and quickly, and informing them of the answers lies in their use for scientific research purposes only.

4. Scale correction instructions: The researcher chose the Likert method of correcting the scale.

5. Face validity: It is one of the easiest types of honesty, as it requires the presentation of the scale in its initial form to a group of arbitrators and specialists related to the subject of the test, and therefore it is also called the honesty of experts or the sincerity of the arbitrators, and based on the agreement of the arbitrators can reach the sincerity of the scale, and in order for the research tool to be honest and measure the goal for which it was prepared, the researcher

presented the scale in its initial form to a group of arbitrators in the field of curricula and methods of teaching science and measurement, evaluation and psychology; In order to ensure the soundness of the drafting of the paragraphs, their comprehensiveness and clarity, the arbitrators expressed their observations on the paragraphs of the scale, and some of them suggested amending some of them, while the rest of the paragraphs won their agreement for their validity.

6. Applying the cognitive motivation scale to the survey sample

A. The first exploratory sample: In order to ensure the clarity of the paragraphs and determine the time spent in answering all the paragraphs of the scale, the researcher applied the scale to an exploratory sample consisting of (30) students from (Jericho Primary School for Girls) of the General Directorate of Education in Babylon Governorate / Kotha District, on Sunday (16/10/2022AD)), and through the supervision of the researcher on the application, the researcher noted that the answer instructions and test paragraphs were clear through the lack of students' inquiries about how to answer.

B. The second exploratory sample (statistical analysis sample): The researcher applied the cognitive motivation scale to a sample of (100) students from (Al-Noha primary school for girls) of the general directorate of education in Babylon Governorate / Kotha A District on (Monday) (9/1/2023AD), and the researcher supervised the application of the scale in cooperation with the science teacher, and after the researcher corrected the students' answers, the grades were arranged in descending order, Thus, the highest score that can be obtained by one of the sample members on the scale is (61) degrees and the lowest score is (28) degrees, while the hypothetical average of the scale is (21) degrees, then the upper and lower extreme samples were chosen by (27%) as the best two groups to represent the whole sample.

7. Validity of the construction: The researcher extracted the sincerity of the construction of the cognitive motivation scale by calculating:

1. The relationship of the degree of the paragraph to the total degree of the scale: To find out the extent to which the degree of each paragraph is related with the total degree of the scale, the researcher subjected the degrees of the students of the second exploratory sample of (100) students to the analysis of paragraphs, and according to the correlation coefficient of the degree of each paragraph with the total degree of the scale using Pearson's correlation coefficient, and the correlation coefficients ranged between (0. 25 – 0.85) Thus, all paragraphs were statistically significant, and thus all paragraphs of the scale were retained amounting to (21) paragraphs and Table (8) shows that

Table (8) Correlation coefficients between the grade of the paragraph and the total score of the cognitive motivation scale

no	Correlation coefficient	no	Correlation coefficient	no	Correlation coefficient
1	0.48	8	0.44	15	0.27
2	0.51	9	0.66	16	0.32
3	0.63	10	0.55	17	0.56
4	0.54	11	0.38	18	0.46
5	0.25	12	0.45	19	0.39
6	0.54	13	0.71	20	0.38
7	0.43	14	0.85	21	0.6

B. The relationship of the degree of the paragraph to the total degree of the field: To find the sincerity of the internal consistency of the scale statistically, the Pearson correlation coefficient and the level of statistical significance were found between the degree of each paragraph and the degree of the field to which it belongs, as the correlation coefficients of the scale fields ranged as follows: the field of seeking knowledge and the desire to read (0.47 – 0.7), the field of curiosity and exploration (0.37 – 0.8), and the field of information processing (0.47 – 0.72)), which are good correlation coefficients, and thus the correlation coefficients are all between the paragraph and the degree of the field statistically significant, and this means that these areas actually measure or

express the cognitive motivation towards science, and thus distinguish the cognitive motivation scale towards science with structural honesty, and Table (9) explains that:

Table (9) Correlation coefficients between the degree of the paragraph and the degree of the field of the scale of cognitive motivation

The pursuit of knowledge		The pursuit of knowledge		Curiosity and exploration	
no	Correlation coefficient	no	Correlation coefficient	no	Correlation coefficient
1	0.57	8	0.6	15	0.47
2	0.59	9	0.37	16	0.68
3	0.7	10	0.67	17	0.6
4	0.61	11	0.65	18	0.72
5	0.47	12	0.74	19	0.66
6	0.55	13	0.8	20	0.58
7	0.55	14	0.46	21	0.51

C. The relationship of the degree of the field with the total degree of the scale: The degree of each field must be correlated with the total score of the scale, as the correlation coefficients between the degree of each field and the total score of the scale were calculated using Pearson's correlation coefficient and Table (10) shows that:

Table (10): Correlation coefficients between the domain score and the total score of the cognitive motivation scale

No	Domain	Correlation coefficient
1	The pursuit of knowledge	0،84
2	Curiosity and exploration	0،78
3	Information Processing	0،84

8. Paragraph discrimination power: The discrimination coefficient was calculated for each of the paragraphs of the scale and found that the T value ranged between (3.038 - 9.676).

9. Stability of the scale: There are several methods to calculate the stability of the scale as the researcher used to calculate the stability coefficient in the manner of Cronbach's alpha, and the coefficient of Cronbach's alpha was calculated to calculate the internal consistency of the scale from the degree of the second exploratory sample as it reached (0.92), which is a good stability coefficient.

Ninth: Statistical Means

The researcher used the statistical portfolio for social sciences (SPSS) version (26) to analyze the data.

Chapter Four
Presentation and Interpretation of Results

This chapter includes the presentation, analysis, discussion and interpretation of the results of the current research to find out (the effectiveness of the problem tree strategy in the achievement of fifth grade primary students in science and their cognitive motivation), and to verify the two research hypotheses and then indicate the conclusions, recommendations, and suggestions reached by the researcher as follows:

First: Presentation of Results:

The results will be presented in order of variables for this research and its null hypothesis:

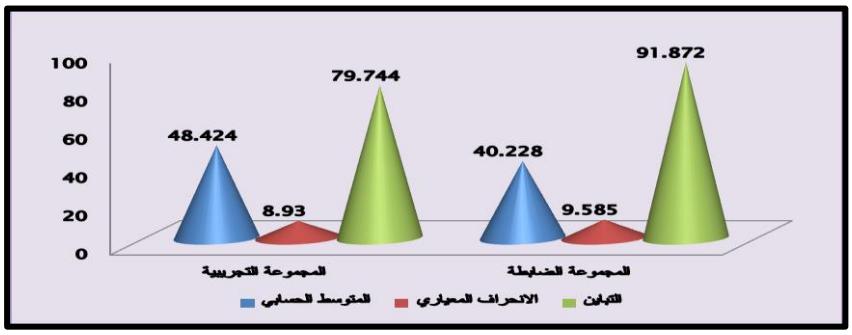
1. Results related to the second hypothesis:

For the purpose of verifying the validity of the second null hypothesis, which states that :(there is no statistically significant difference at the level of (0.05) between the average scores of the

experimental group students who studied science according to the problem tree strategy and the average scores of the control group students who studied science according to the usual method in the cognitive motivation scale in science), and after correcting the answer sheets of the students of the two research groups (experimental and control), The arithmetic mean of the scores of the two research groups (experimental and control) was calculated, so it appeared that the arithmetic average of the scores of the experimental group that was studied according to the problems strategy amounted to (48.424) and a standard deviation of (8.930) and a variance of (79.744), and it was found that the arithmetic average of the scores of the control group that was studied according to the usual method amounted to (40.228), with a standard deviation of (9.585) and variance (91.872), and using the test (t) for two independent samples, the T value was found as shown in table (11).

Table (11) The results of the T test for the students of the two research groups in the scores of the cognitive motivation scale

group	Number	Arithmetic mean	Standard deviation	Contrast	Degree of freedom	T value		Significance level 0,05
						Calculated	Tabular	
Experimental	33	48.424	8.930	79.744	66	3.642	2,000	Statistically significant
control	35	40.228	9.585	91.872				



Scheme (2): The results of the T-test for the students of the two research groups in the cognitive motivation scale

Table (11) and Chart(2) show that the calculated T value of (3.642) is greater than the tabular T value of (2.000) at the degree of freedom (66), i.e., there is a statistically significant difference between the mean differences and in favor of the experimental group in the cognitive motivation scale.

To show the size of the effect within the groups, table (12) shows the value of the effect size, which reflects the amount of the effect size of the two groups (experimental and control) in the cognitive motivation variable.

Table (12): The effect size of the independent variable in the cognitive motivation scale variable

Independent variable	Dependent variable	Square ŋ2	Impact size value	The magnitude of the effect size
Strategy of the Problem Tree	Cognitive motivation	0.14	0.953	big

It is clear from the above table that the value of the effect size is (0.953), which is an appropriate value to explain the effect size and a large amount for the problem tree strategy variable in the scale of the cognitive pain motivation and in favor of the experimental group.

Second: Interpretation of the results

1. Interpretation of the results related to the second null hypothesis

The results in Table (25) showed that there are statistically significant differences between the average scores of the experimental and control group in the cognitive motivation scale, and in favor of the experimental group, and this means the superiority of the experimental group students who studied science according to the problem tree strategy on the control group students who studied science according to the usual method in the cognitive motivation scale and the reason for this can be attributed to:

A. Presenting the lesson according to the problem tree strategy provides an interactive environment in which students are positive and effective in the educational situation, and this helps in raising the cognitive motivation of students towards science.

B. The role of the researcher within the strategy of the problem tree is based on encouraging students to raise special problems in the subject of the lesson and mention their causes, analysis and conclusion of symptoms or results and also motivate students to increase participation in the discussion and access to higher thinking solutions towards situations has contributed to increasing their cognitive motivation.

Third: Conclusion: In light of the results of the research, the following conclusions were reached:

1. The problem tree strategy has a role in making students the focus of the educational process through their active participation in the educational situation, which would increase their self-confidence and encourage them to persevere to raise their scientific level.

2. The problem tree strategy plays a role in the teacher's management of the class by involving the students, exchanging opinions between them, and overcoming the boredom and rigidity of the students compared to the usual way of boring in the classroom.

Fourth: Recommendations: In light of the findings of the current research, the researcher recommends the following:

1. Include curricula of teaching methods in the faculties of education and faculties of basic education in the departments of science for modern strategies in teaching, including the strategy of the problem tree.

2. The need to work on providing active learning requirements such as books, research, furniture, devices, teaching aids and laboratories for the success of the teaching process according to the problem tree strategy.

Fifth: Suggestions: Depending on what has passed, the researcher suggests the following:

1. Conducting a study to find out the effectiveness of the problem tree strategy in different subjects (chemistry, physics), and for higher academic stages (intermediate and preparatory).

2. Conducting a comparative study between the problem tree strategy and modern teaching methods emanating from active learning strategies to find out their impact on the cognitive motivation of fifth grade students .

References

[1] *Abbas, Muhammad Khalil, et al. (2009): Introduction to Research Methods in Education and Psychology, 2nd Edition, Dar Al-Masirah for Publishing and Distribution, Amman, Jordan.*

[2] *Abu Al-Hajj, Suha (2017): Active Learning Strategies between Theory and Practice, 1st Edition, Debono Center for Teaching Thinking, Amman, Jordan.*

[3] *Abu Hatab, Fouad and Sadiq Amal (2013): Educational Psychology, Anglo-Egyptian Library, Cairo, Egypt.*

[4] *Abu Jado, Saleh Mohammed (2014): Educational Psychology, 3rd Edition, Dar Al-Masirah for Publishing and Distribution, Amman, Jordan.*

[5] *Adas, Abdul Rahman (1998): Educational Psychology A Contemporary View, 1st Edition, Dar Al-Fikr for Publishing, Printing and Distribution, Amman, Jordan.*

[6] Al-Azzawi, Hani Kamal (2003): Teaching Competencies of Chemistry Teachers and their Relationship to the Orientation of Their Students towards the Subject, College of Education (Ibn Al-Haytham) for Pure Sciences / University of Baghdad. Unpublished Master's Thesis
[7] Al-Fatlawi, Muhammad Turki Najm Abboud, (2018): The effectiveness of teaching based on the theory of self-organized learning in the achievement of second intermediate grade students in chemistry and their cognitive motivation, College of Basic Education, University of Babylon. Unpublished Master's Thesis
[8] Al-Hout, Mohamed Sabry (2008): Reform of Learning between Reality and the Inside and the Pressures of the External, Anglo-Egyptian Library, Cairo, Egypt
[9] Al-Kaabi, Karrar Abdul Zahra (2018): Modern Strategies in Teaching and Learning, 1st Edition, Dar Safa for Publishing and Distribution, Amman, Jordan.
[10] Al-Masoudi, Muhammad Hamid Mahdi and Sanabel Thaban Salman Al-Hadawi (2018): Teaching Strategies in Constructivism, Knowledge and Metacognition, 1st Edition, Dar Al-Radwan for Publishing and Distribution, Amman, Jordan.
[11] Al-Mustansiriya University (2005): The Eleventh Scientific Conference on Education, Recommendations of the College of Basic Education, Baghdad, Iraq.
[12] Al-Qatami, Yousef Mahmoud and others (2010): Educational Psychology Theory and Practice, 1st Edition, Dar Wael for Publishing and Distribution, Amman, Jordan.
[13] Al-Qatami, Youssef Mahmoud (2000): Teaching Design, 1st Edition, Dar Al-Fikr for Printing, Publishing and Distribution, Amman, Jordan.
[14] Al-Ruwaithi, Iman Mohammed (2009): A New Vision in Education (Teaching from the Perspective of Metacognitive Thinking), Dar Al-Fikr, Amman, Jordan.
[15] Al-Sharifi, Ahmed Mohammed Amir Kazim (2017): The Effectiveness of Scientific Stations in the Achievement of Second Intermediate Grade Students in Physics and their Cognitive Motivation, College of Basic Education, University of Babylon, Iraq. Unpublished Master's Thesis
[16] Al-Shuwaili, Faisal et al. (2016): Creative Teaching Methods and Skills, 1st Edition, Dar Safa for Publishing and Distribution, Amman, Jordan.
[17] Al-Zamili, Karim Hussein Abd Mohammed (2018): The Effect of the Overlapping Wave Strategy on the Achievement of Second Grade Intermediate Students and the Development of Their Deductive Thinking Skills in Geography, University of Babylon, College of Basic Education, Babylon, Iraq. Unpublished Master's Thesis
[18] Ambusaidi, Abdullah bin Khamis and Huda bint Ali Al-Hosaniya (2016): Active Learning Strategies 180 Strategies with Applied Examples, 1st Edition, Dar Al-Masirah for Publishing and Distribution, Amman, Jordan.
[19] Attia, Mohsen Ali (2018): Active Learning: Modern Strategies and Methods in Teaching, 1st Edition, Dar Al-Shorouk for Publishing and Distribution, Amman, Jordan.
[20] Awad, Youssef Diab and Majdi Ali Zamil (2010): Active Learning Towards an Effective Educational Philosophy, Dar Al-Manhaj for Publishing and Distribution, Amman, Jordan.
[21] Bishop ، k. & Denley ، p. (1997) : effective. Learning in science. Stafford: Network Educational press Ltd.
[22] Chalabi, Muhammad Khalid Abdul Rahman (2016): The effectiveness of both the Fryer and Daniel models in acquiring scientific concepts and developing cognitive motivation among second grade intermediate students, Al-Ustada Magazine, Volume Two, Issue (219), College of Education for Pure Sciences Ibn Al-Haytham, University of Baghdad.
[23] Ghobari, Thaer Ahmed (2008): Motivation Theory and Practice, 1st Edition, Dar Al-Masirah for Publishing, Distribution and Printing, Amman, Jordan.
[24] Ghobari, Thaer et al. (2008): General Psychology, 1st Edition, Arab Society Library for Publishing and Distribution, Amman, Jordan.
[25] Hamid, Salma Mohammed (2010): The Effect of the Error Tree Model on Developing Historical Thinking Skills among Diyala University Students, Al-Fath Magazine, Diyala University, College of Education Al-Asma'i.
[26] House of Wisdom (2009): Recommendations and Proposals of the Specialized Symposium on the Reality of Education in Iraq, Baghdad, Iraq.
[27] Kariman, Muhammad Bdeir (2012): Active Learning, 2nd Edition, Dar Al-Masirah for Publishing and Distribution, Jordan.
[28] Khalil, Nawal Abdel Fattah (2013): The Effect of Using Thinking Maps on Developing Achievement, Deep Understanding and Achievement Motivation among Fifth Grade Primary Students in Science, Egyptian Society for Scientific Education, Volume XI, Issue IV.
[29] Nashawati, Abdul Majeed (2003): Educational Psychology, 4th Edition, Irbid, Jordan.

[30] Pollitt , A.L. , 2003 . Teaching for of and about Thinking. In A. costa (Ed), Developing minds: A resource book for teaching Thinking. Alexandria VA: Development.

[31] Saadeh, Jawdat Ahmed (2018): Contemporary Teaching Strategies, 1st Edition, Dar Al-Masirah for Publishing and Distribution, Amman, Jordan.

[32] Saeed, Suad Jabr (2008): Educational Psychology, 1st Edition, World of Modern Books, Amman.

[33] Saleh, Hussam Yousef (2016): Methods and Strategies of Science Teaching, 1st Edition, Central Press, Diyala University, Diyala, Iraq.

[34] Sheikho, Hashem Hassan Mistou (2019): Teaching Science Using Conceptual Circuit Maps (Theory and Practice), 1st Edition, Cordman Press, Duhok, Iraq.

[35] Wolfolk, Anita (2015): Educational Psychology, 2nd Edition, translated by Salah Al-Din Mahmoud Allam, Dar Al-Fikr, Amman

[36] *Zand, Abdullah, (2004): Methods of Teaching Social Subjects, 1st Edition, Al-Rasheed Library, Riyadh.*