

The Effectiveness of using the Treagust's Model in Mathematics Achievement And Pivotal Thinking Skills At The Second Intermediate Grade Female Students

**Prof. Dr. Abbas Naji Abd Al Ameer,
Noor Alhayat Hasan**

Ministry of Higher Education and Scientific Research, Mustansiriyah University, College of Basic Education
Masters / Methods of teaching mathematics

ABSTRACT

There is no statistically significant difference at the level of significance (0.05) between the average scores of the experimental group students who will study mathematics according to the Treagust model and the average scores of the control group who will study the same subject according to the usual method of the pivotal thinking test.

The research community that represents intermediate and secondary schools for girls was identified within the General Directorate for Education of Al-Rusafa First. The research sample was chosen from (64) female students of the second intermediate grade in Al-Asma'i Intermediate School for Girls intentionally, and the sample was divided into two groups, an experimental group and a control group. The experimental group included (33) A student studied according to the Treagust model, and the control group included (31) students who studied according to the regular method.

Equivalence was made between the two research groups in some variables (previous achievement, parents 'academic achievement, previous information, intelligence, and axial thinking), and two tests were built:

The pivotal thinking test: it consists of (24) paragraphs of the objective type in its final form.

The experiment was applied in the first semester of the academic year (2020-2021) at the rate of (6) lessons per group per week. The researcher studied the two research groups on her own after formulating behavioral goals for the three semesters and for the six levels of Bloom's cognitive field. The number reached (106) goals. (20) Teaching plan for each group that included research topics.

Appropriate statistical analyzes were carried out for the test results, as the Keoder-Richardson equation (K-R20) was used to calculate the coefficient of the stability of the axial thinking test, the coefficients of difficulty and discrimination, the effectiveness of alternatives, the Pearson correlation coefficient and the t-test for two independent eyes, and the results indicated the superiority of the experimental group over the control group students. In the axial thinking test.

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Introduction

Both (Al-Mashhadani and Al-Kubaisi, 2016) indicated a decrease in the level of the learners' thinking about mathematics because of its curricula and methods of teaching it, including those related to the teacher and the learner, and they indicated that many studies indicate that there is a clear weakness among middle school students in mathematics, and perhaps the most important reasons are methods Teaching used in the subject of mathematics that does not arouse the enthusiasm of students, but on the contrary, provokes monotony and boredom, and thus does not enable them to deal well with numbers and

operations on them.(Al-Mashhadani & Al-Kubaisi, 2016: 66)

First: the research problem

The research problem is summarized in the answer to the following question:

What is the effectiveness of using the Treagust model in the pivotal thinking skills of the second year intermediate students in mathematics?

Second: The importance of research

The "Treagust" model is a model related to the lives of students. Many of them use similes in estimating certain phenomena, and mathematics is full of that, so it is very important for a mathematics teacher to invest this phenomenon

and try to employ it in the classroom (Embu Saidi and Al Balushi, 2009: 567)

The Treagust model of teaching with similes emerged from the constructivism perspective in learning, which dictates the necessity of linking the information acquired by the students with the information they have.

(Olive, 2000: 329)

Third: The objective of the research

The following research aims to know:

The effectiveness of using the Treagust model in the pivotal thinking skills of second-grade intermediate students in mathematics.

Fourth: the two research hypotheses

To achieve the goal of the research, the following null hypothesis was put:

There is no statistically significant difference at the level of significance (0.05) between the average scores of the students of the experimental group who will study mathematics according to the Treagust model and the average scores of the control group who will study the same subject according to the usual method of the axial thinking test.

Fifth: Research limits

1- Female students of the second intermediate grade in governmental intermediate schools affiliated to the General Directorate of Education in Baghdad Governorate / Rusafa 1 for the academic year (2020-2021).

2- The first semester of the academic year (2020-2021).

3- The Three Chapters of the Course Mathematics Book (Relative Numbers, Real Numbers, and Boundaries), authored by Abdul Hadi, Ahmad Mawloud and others (2017): Mathematics for the second intermediate level, 1st Edition, General Directorate of Curricula, Ministry of Education, Republic of Iraq, Baghdad

4 - Pivotal thinking skills: (focus, information gathering, remembering, organizing, analysis, generation, integration, evaluation).

Sixth: Defining terms

The Treagust Model:

1- (Ambu Saidi and Al-Balooshi, 2009): "A teaching model based on similes according

to three stages (focus, action, and meditation) and is called (FAR)". (Ambu Saeedi & Al Balushi, 2009: 569)

2- It is an instructional model in which female students of the second intermediate grade (the research sample) are taught through three steps (focus, action, and meditation) as it is based on identifying and identifying similarities between concepts.

central thinking:

1- (Marzano, 1988): The group of mental processes called intelligence processes that process content are found in eight basic skills, including sub-processes of twenty-one skills. (Al-Rimawi and Nouvel, 2008: 33)

2- It is the ability to use the eight major mental operations and (21 sub-skills) in the post-axial thinking test of the objective type for the second intermediate grade students prepared for research purposes.

The treagust model

It is a model developed by the Australian scientist (Treagust, 1993), which relies on similes and defines them as "the process of identifying and identifying similarities between concepts."

Where he distinguishes between two types of concepts, the first is known to students and is called (the analogy) and the second is unknown, which is the scientific concept to be clarified and is called (the analogy), and the analogy with it is familiar to the student so that he can comprehend the simile process, and that both the analogy and the analogous have common characteristics between them. And, at the same time, non-shared qualities.

(Ambu Saeedi and Al Balushi, 2011: 566) David (Treagust, 1993), an Australian scientific education scientist, suggested three steps during the teaching process with this model, and these steps are called (F.A.R) abbreviated as shown in The following table

Teaching steps using the treagust model

Step	Illustration
First: Focus includes 1. The concept 2. Students 3. Simile	Is it difficult, just, or unfamiliar? What information do students know about the concept? What is the thing that students know and is similar in some of its characteristics to the concept you are studying?
Second: The verb includes 1- similar 2- The different	What are the similarities between a scientific concept and something similar to it and write it on the board? What are the differences between a scientific concept and something similar to it and write it on the board?
Third: Meditation and it includes 1- Outputs 2- Improvement	Is the analogy clear, useful, and does not lead to ambiguity and distraction? Emphasizing the above and giving various examples of the concept.

(Ambu Saeedi & Al Balushi, 2009: 569)

Pivotal thinking skills: Eight major skills were selected that consisted of (21) sub-skills, as follows

First: The skill of concentration Included The skill of defining problems ,The skill of setting goals .

Second: the skill of gathering information Included Observation skill ,The skill of formulating questions .

Third: the skills of remembering Included Coding skill , Summoning skill .

Fourth: Organizing skill Included Comparative skill , Classification skill , Arranging skill , Acting skill .

Fifth: the skill of analysis Included Determine the features and components , Identifying patterns and relationships , Identify the main ideas , Identify errors.

Sixth: the skill of generation Included Inference , Prediction , Expansion .

Seventh: integration skills Included Summarizing , Reconstruction .

Eighth: the evaluation skill Included Standards building skill , Verification skill

previous studies

After reviewing some studies related to research variables to benefit from them such as objectives, size and type of sample, type of design and others, they included the following:

Studies dealing with the Travest model

1. (Al-Qatrawi, 2010): The effect of adopting the similes strategy on developing science processes and reflective thinking skills in science among eighth grade students.
2. (Al-Wakeel, 2011): The effect of the TRANSIT model on science and mental skills achievement for fifth-grade students.
3. (Ibrahim, 2014): To know the effect of the TRAGEST model on the acquisition of geographical concepts among second-grade intermediate students.

Studies dealing with pivotal thinking

1. (Al-Tawa'ia, 2012): The effect of blended learning on the development of core thinking skills and achievement among students of the basic stage in science.
2. (Al-Mousawi, 2012): The effect of the two strategies of the Learning Dimensions Model in

the attainment of chemistry, cognitive preference, and the development of pivotal thinking skills.

3. (Al-Issawi, 2015): The effect of teaching with pivotal thinking skills and rational investigation on biology achievement and positive thinking among third-grade intermediate students.

Research Methodology

The researcher followed the quasi-experimental method of research to achieve the goal of her research, as it is considered one of the most accurate and efficient research methodologies and one of the closest research to

solve theoretical or applied scientific problems, which allows the researcher to reach more accurate conclusions. (Melhem, 2009: 288)

Experimental design

The real experimental design is one of the most controlled experimental designs, and it is the standard against which educational research designs are compared and is strong in terms of internal validity, and it is used when individuals in the experimental and control group are randomly assigned.

(Creswell, 2012: 309)

Experimental design

the group	Parity	Indepe ndent variabl e	Dependent variable	Measurig the dependent variable
Experimental	1-Intelligence 2- Previous 3-Collection 4-Test	Model Treagust	Pivotal thinking	The axial thinking test
Control	Previous Information	The usual way		

research community

The research community consisted of female students of the second intermediate grade in the Baghdad Education Directorate / Rusafa 1, morning studies for the academic year 2020-2021, and in schools (intermediate, secondary) for government girls.

The research sample

The researcher intentionally chose (Al-Asma'i Intermediate School for Girls) affiliated to the Baghdad Education Directorate / Rusafa Al-Oula.

Adjustment procedures

1- Intelligence:**The results of the T-test for the two groups of research in the variable intelligence**

Milestones Statistic the group	Division	The number of students	SMA	standard deviation	Degree of freedom	(T-test)		Statistica l significa nce at (0.05)
						Tabular	Calculated	
Experimental	A-B	33	21.36	4.40	62	1.999	1.520	Not a function
Control	C-D	31	19.55	5.14				

Previous achievement in mathematics**Results of the T-test for the two research groups for the variable previous mathematics achievement**

Milestones Statistic the group	Division	The number of students	SMA	standard deviation	Degree of freedom	(T-test)		Statistica l significa nce at (0.05)
						Tabular	Calculated	
Experimental	A-B	33	53.79	16.017	62	1.999	1.553	Not a function
Control	C-D	31	48.03	13.423				

2- Examining previous information in mathematics**Results of the T-test to find out the significance of the difference between the two research groups of the variable of previous knowledge**

Milestones Statistic the group	Division	The number of students	SMA	standard deviation	Degree of freedom	(T-test)		Statistica l significa nce at (0.05)
						Tabular	Calculated	
Experimental	A-B	33	11.30	2.158	62	1.999	1.174	Not a function
Control	C-D	31	10.71	1.865				

- **Scientific material:**

Subject classes taught in the experiment

the classroom	Scientific material
1	The Rational Numbers
2	The Real Numbers
3	Polynomials

- **Duration of the experiment:** The duration of the experiment was uniform and equal for the students of the experimental and control research groups, as it began on Monday 12/7/2020 and ended on Monday 20/1/2021.
- **Distribution of lessons:** The lessons were distributed equally, in agreement with the

school administration, between the experimental and control research groups.

- **Formulating behavioral goals:**

The behavioral goals of the three semesters are divided into levels (remembering, comprehension, application, analysis, structure, and evaluation)

the classroom	remembering	comprehension	application	analysis	structure	evaluation	Total
1	3	9	8				20
2	19	9	19	1		2	50
3	10	3	17	3	1	2	36
Total	32	21	44	4	1	4	106

- **The aim of the axial thinking test:** It aims to measure the axial thinking skills of the second-year intermediate students in mathematics.
- **Psychometric characteristics (truthfulness and constancy):**

A- **Apparent validity:** The post-axial thinking test was presented to a group of arbitrators to verify the apparent validity, and a percentage of agreement was obtained on most of the test items. Therefore, all 24 items of the objective type of multiple choice were retained.

B- **The stability of the test:** using the Keoder-Richardson equation K-R20) (The stability value of the pivotal thinking test that was applied to the second pilot sample that depends on applying the test once was calculated and it can be used to verify the homogeneity of all test items that measure one characteristic and indicate) Allam,

2000: 543) that the stability value if it reached (0.80) and above is a high value of stability, as the stability of the test reached (0.81). Thus, the stability value is high.

Application procedures:

A- **Procedures for applying the experiment:** The experiment started on Monday 7/12/2020 and ended on Wednesday 20/1/2021, as the experiment was applied by teaching the experimental group according to the Treagust model and the control group according to the usual method, and the experiment ended with the application of the research tool (the dimensional axial thinking test).

B- **Procedures for applying the test:** After completing the teaching of the scientific material prescribed to the students of the two groups of research, the date of

application of the test was decided. The students of the two research groups were notified a week before the date of the exam to prepare for it. The post-axial thinking test was applied for the purpose of measuring the dependent variable (pivotal thinking skills) on Tuesday the 26th. 1/1/2021, and the test did not affect his performance.

Statistical means

- 1- T-test for two independent samples
- 2- Chi square
- 3- Difficulty coefficient
- 4- Power factor of discrimination
- 5- The effectiveness of the wrong alternatives
- 6- BKiodor - Richarson KR – 20

Presentation and interpretation of results :

Statistical description of the experimental and control groups in the axial thinking variable

Milestones Statistic the group	Divisio n	The number of students	SMA	standard deviation	Degree of freedom	(T-test)		Statistical significanc e at (0.05)
						Tabular	Calculated	
Experimental	A-B	33	17.545	1.606	62	1.999	2.149	Statisticall y d
Control	C-D	31	16.772	1.230				

Interpretation of the results of pivotal thinking

- 1- Teaching according to the Treagust model helped students exchange previous sports information and new sports information by organizing a good classroom environment, which led to an increase in students' thinking ability.
- 2- Teaching thinking skills has a prominent effect on developing students' thinking and their interaction with each other and with the content of the subject.

- 3- Using the (Treagust) model in pivotal thinking is more effective than the usual method for second-grade intermediate students.

Recommendations

From the results of the research, the following was recommended:

- 1- Adopting the Treagust model in teaching mathematics because of its clear impact on raising the levels of female students.
- 2- Emphasizing the importance of thinking among students, especially pivotal thinking, as it has an impact on increasing their understanding.

The conclusions

Some points can be deduced from the results of the current research, including:

- 1- By comparing the simile with the analogue and linking it with the surrounding environment, the (Treagust) model led to the activation of the pivotal thinking skills of the students.
- 2- The Treagust model contributed in organizing the teaching process in an integrated and coherent manner for mathematics.

the proposals

To complete this research, the following studies were proposed:

- 1- A study similar to the current study for other academic stages.
- 2- Studies dealing with the effect of the (Treagust) model on other variables such

as trend, tendency, motivation and creative thinking.

- 3- Conducting comparative studies dealing with the preferences of using specific models and strategies with the Trajist model.

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