

How to Cite:

Al-Rikaby, R. B. K., & Al-Husseinawy, M. I. A. (2022). The effect of my sequential information strategy on developing lateral thinking for second-grade intermediate students in science subject. *International Journal of Health Sciences*, 6(S4), 9137–9150.
<https://doi.org/10.53730/ijhs.v6nS4.11923>

The effect of my sequential information strategy on developing lateral thinking for second-grade intermediate students in science subject

Prof. Dr. Raid B. Kh. Al-Rikaby

University of Sumer, College of Basic Education
Corresponding author email: r.baish@uos.edu.iqr

Murtadha I. A. Al-Husseinawy

University of Sumer, College of Basic Education
Email: murtadha.ibrahim@uos.edu.iq

Abstract--The current research aims to identify the effect of my sequential information strategy developing lateral thinking for second-grade intermediate students in science subject, The researchers deliberately chose Al-Shumukh Intermediate School for Boys affiliated to the Directorate of Education of Dhi Qar / Al-Rifai District Education Department, and by random selection method, Division (B) was chosen to represent the experimental group that will study science according to my sequential information strategy, while Division (A) represented the control group that will study the subject Science the usual way. The researchers determined the subject materials that will be taught during the experiment period in the second semester, which is the first and second units of the Science Book / Part Two, 4th Edition, for the year (2021 AD) for the second intermediate grade , the researcher formulated the behavioral objectives of the topics that the students will study, and they were (132) behavioral objectives. The number of students in the control group is (36) students , Parity was conducted between the two groups in the following variables (chronological age calculated in months, intelligence, previous information test, lateral thinking skills test). The researchers adopted the lateral thinking skills test, which consisted of (31) items, and its apparent validity, stability, difficulty level, and strength of discrimination were confirmed. The application of the experiment took a period of (9) weeks. The researchers applied the research tool to the two research groups after the end of the experiment at the same time. The researchers used the Statistical Package for the Social Sciences (SPSS) program to analyze the data

statistically, and one of the results that was reached is the superiority of the experimental group students who studied science with my sequential information strategy over the control group students who studied science in the usual way. In light of the findings of this research, the researchers recommend a set of recommendations, including introducing teachers to lateral thinking skills so that they can train their students about it by preparing a guide for the teacher dealing with how to develop lateral thinking skills in the field of teaching and to ensure that they are practiced in front of students, and this has a positive impact on developing their way of thinking, and the need to include in the curricula of teaching methods in colleges of education and colleges of basic education of modern strategies in teaching, including the sequential information strategy.

Keywords---my sequential information strategy, lateral thinking, students.

Introduction

The research problem

The educational process has been greatly affected in recent years by the Corona pandemic, and its impact has been reflected on all areas of life in general, and in education in particular. These effects caused a low level of students' understanding in most subjects, especially in science, which required those responsible for the educational process to work on finding possible ways to raise the efficiency of teaching and learning and improve students' performance (Al-Anbaki, 2014: 71). Because the world today is witnessing a tremendous scientific revolution that requires reconsideration to keep pace with it, the prevailing educational systems are still most of them unable to keep pace with the huge and great scientific development, and there is a weakness in the usual methods and teaching methods used to develop these skills and scientific expertise among students and their inability to acquire them scientific concepts and the development of their ways of thinking (Al-Tamimi, 2012: 2). The reality of the current educational institutions, especially middle schools, do not meet the ambition, but are below the level of ambition on the part of paying attention to students' thinking in all academic subjects in general and science in particular.

Also, the educational system still uses traditional methods in teaching different subjects at various stages. These methods are characterized by neglecting the role of students, relying only on the teacher, low students' retention of information, low level of thinking, lack of attention, focus on memorization only, lack of interest in their lateral thinking, and their inability to develop their lateral thinking by using knowledge to solve problems by distinguishing between the important and the most important. Since traditional teaching methods do not encourage the learner to think and research, the researchers decided to review many results of studies that confirmed the existence of a weakness in the students' level of thinking in science, which was confirmed by the study (Hamada, 2020).

Based on the foregoing, the researchers identified the research problem through the following question:

- What is the effect of my sequential information strategy on developing lateral thinking for second-grade students in the intermediate school in science?

The importance of research

The sequential information strategy is one of the strategies of the constructivist theory and it is one of the strategies for improving memory. Linking and organizing information in memory helps to remember it faster, and this strategy is based on presenting sequential information to the student and it is linked in a logical sequence (Zayer et al., 2015: 217). The researchers adopted a sequential information strategy to teach science that may address the problems that cause students to decline lateral thinking, so the current research is an experimental attempt to find out the impact of this.

The importance of developing lateral thinking in science come up from the development of the student's ability to reach conclusions on their own, as well as the graph of schematics and the graphic representation of drawings, as well as the presentation of different and proposed points of view from students and the opportunity to discuss them among themselves, direct and indirect questions to students to generate non-traditional and non-existent new ideas , and organizing their learning experiences to reach the largest possible number of correct solutions and alternatives that are important to be known and introduced to the world. (Hamada, 2011: 13)

Based on the foregoing, the importance of the research appears in the following:

1. One of the modern strategies that the researchers used is the (My Sequential Information) strategy, and this study is the first of its kind in science in Iraq, according to the researchers' knowledge.
2. The importance of lateral thinking in helping students to make correct decisions in their lives and reach useful creative results.

Research Objective

The current research aims to identify (the effect of my sequential information strategy on developing lateral thinking among second-grade students in science subject).

Research hypothesis

In light of the study, the researchers formulated the following null hypothesis: There are no statistically significant differences at the level (0.05) between the average scores of the experimental group students who will study using the sequential information strategy and the average scores of the control group students who will study using the usual method in the lateral thinking test.

Limitations of Research

The search is limited to the following limits:-

1. The human limit: students of the second intermediate grade / in Al-Shumukh intermediate school for boys / affiliated to the Department of Education of Al-Rifai District / General Directorate of Education in Dhi Qar Governorate.
2. Spatial limit: Al-Shumoukh Intermediate School for Boys / affiliated to the Al-Rifai District Education Department / General Directorate of Education in Dhi Qar Governorate.
3. Temporal limit: the second semester of the academic year 2021-2022 AD.
4. Cognitive limit: four semesters in two units of the science book for the second intermediate grade, namely: (the first unit, movement and force), (and the second unit, force and energy) with two chapters for each study unit.

Defining Terminology

Effect

(Al-Hashimi, 2019) defined the effect as: "Achievement in a series of educational tests in general education, and it is widely used to describe achievements in methodological topics." (Al-Hashemi, 2019: 128)

Procedural definition: The researchers define the effect as

The change that occurs to the students of the second intermediate grade (the experimental group) in the subject of science by reaching the results they aspire to after teaching them with the sequential information strategy and knowing its impact on their lateral thinking according to the tool prepared by the researchers for this purpose.

The Strategy

(Hamaden, and Obaidat, 2012) defined it as: "The set of steps and procedures that the teacher and students take within the class to implement the educational situation." (Hamaden, and slaves, 2012: 212)

Proception: The researchers define the strategy as

A set of steps and serial procedures followed by researchers inside the classroom, in order to achieve predetermined goals and make the learning process easier for middle school students in order to develop their side thinking in science subject.

My Sequential Information

(Al-Rikabi, 2018) defined it as: "a set of structured, organized steps that depend on information systems in a sequential manner and link them together based on logic that the researcher uses with the students of the experimental group by

adopting five steps (presentation, summarization, explanation, application, and evaluation).” (Al-Rikabi, 2018: 20)

Procedural definition: The two researchers define my sequential information strategy as

It is a set of logically sequential steps that depend mainly on the previously stored information for the second intermediate grade student and link it to the new information. It included five steps (presentation, summarization, explanation, application, and evaluation) that the second intermediate grade students in the (experimental group) will learn in the science subject, to know its impact on developing their lateral thinking according to the tool prepared by the researchers.

Lateral thinking

It was defined by (Al-Samarrai and Faida, 2018) as: “The thinking by which one looks at the problem from different angles instead of adhering to a direct line to proceed in the research, so this thinking tends to encompass various other opinions, but rather departs from what is familiar in thinking.” (Al-Samarrai, The Benefit, 2018: 205)

Procedural definition: The researchers define lateral thinking as

A mental attitude and a planned process during which students of the second intermediate grade use their broad imagination to find new unusual ways or ideas or proposed solutions to the problems they face in science, and it is measured by the degree they will obtain in the test prepared by the researchers.

Theoretical framework and previous studies

**The first axis: the theoretical framework
First, the constructivist theory**

The emergence of the constructivist theory: The initial beginnings of the constructivist theory go back to the thinker Socrates, who saw the need to help the learner build his own meaning of knowledge, followed by Kant, who developed this idea, and at the beginning of the twentieth century, John Dewey suggested that the educational process must start from instantaneous knowledge. For the learner, taking into account the previous knowledge and interests of the learner, there are two forms of constructivism, the cognitive constructivism of Piaget and the social constructivism of Vygotsky, where Piaget sees that the acquisition of knowledge is based on an active process that includes the modification of cognitive structures through processes he called assimilation, alignment and organization, while Vygotsky sees that the acquisition of knowledge is achieved through social interaction between the teacher and students and between the students themselves (DeAngele, Tuchman, and Clark, 2009).

Second: My sequential information strategy

It is a type of structural theory strategies and models, as well as strategies for remembering information and improving memory. Undoubtedly, the sequence in linking and arranging information in an orderly manner helps to make it easier and faster to remember. My sequential information strategy is based on providing sequential information to the student and organizing it in a sequential manner, making sure that this information is linked in a logical.

Steps to My Information Sequential Strategy

There are several steps to my Sequential Information Strategy:

1. The teacher provides a simplified introduction to the information to be learned in this lesson, taking into account that the information is interesting to the student about the formation of an illustrated story or a group of colored images that lead to the information to be learned.
2. The teacher asks his students to summarize what they understood from the introduction in their own way and orally.
3. The teacher explains the logical sequence of the presented information, which helps them to keep it in their memory.
4. Students apply what they have learned in a scientific manner to the learned topics.
5. The teacher presents oral assessment questions, through which he can judge the extent to which the students have mastered what they have learned (Zayer, et al., 2015: 171).

Third: Lateral thinking

Lateral thinking is one of the distinct mental skills in thinking, according to which new and unexpected results or solutions can be reached to the problems facing humans. It is a skill because it can be acquired through training and practice. Lateral thinking relies on overcoming the traditional way of thinking and looking at the phenomenon in question from a new angle; It is often a close and direct angle; It is so close and direct that the individual with a traditional view of thinking does not look at it. (Al Kubaisi, 2013: 13).

The second axis / previous studies

First: Studies that dealt with my sequential information strategy

The two researchers found only one study (to their knowledge), which is the study of (Al-Rikabi: 2018).

Table (1) The study that dealt with my sequential information strategy

No.	The name of the researcher and year and graduation	The experiment's place	Purpose of the study	Educational level	Sample size and gender	Subject	research tool	Statistical methods	The most important results
1	Al-Rikabi, 2018	Iraq	Recognize the impact of my sequential information strategy on Expressive performance of fifth grade students	Primary stage	53 peoples	Sciences	The researcher used a tool to measure the expressive performance level of the students of the two research groups. A final exam which is a topic chosen at random	T-test for two independent samples, chi-square and Pearson correlation coefficient	The researcher concluded that the students of the experimental group outperformed the students of the control group in expressive performance

Second: Studies dealing with lateral thinking skills

Table (2) The study that dealt with lateral thinking

No.	The name of the researcher	The experiment's place	Purpose of the study	Educational level	Sample size and gender	Subject	research tool	Statistical level methods	The most important results
1	Hamada, 2020	Iraq	The effect of the priority pyramid strategy on achievement and lateral thinking skills among students of the second intermediate grade in science	Middle school	66 students	Sciences	Achievement test and lateral thinking skills test	The researcher used the t-test for two independent samples, the chi-square, the Pearson correlation coefficient, the equation of the difficulty coefficient, the paragraph discrimination power equation, the equation for the effectiveness of the wrong alternatives, and the Cohen square equation and the equation for the size of the effect	After analyzing the results, the researcher concluded that the experimental group outperformed the control group in Achievement test and lateral thinking skills test.

Research Methodology and Procedures

First / Research Methodology and Design

The experimental method has been relied upon to achieve the objectives of the research because it is very appropriate to verify its hypotheses, as well as the method that helps to reach a new truth, and through which it is able to overcome any problem. In this research, the researchers relied on the experimental design with partial control on two equal groups, an experimental group that will be studied according to the (My Sequential Information) strategy and a control group that will be taught according to the (ordinary method) with a pre and post test for the development of lateral thinking.

research tool	dependent variable	independent variable	group
Lateral thinking test	Lateral thinking)My sequential information strategy(The experimental
		the usual way	The control

Figure (1) Experimental Design

Secondly, the research community and its sample

1. Research community: Society means "individuals, things or elements that have one observable characteristics (Abu Allam, 2011: 160).
2. Research sample: The research sample means "a subset of the original community of the research, selected in an organized scientific way from all the elements of the community and in a certain percentage according to the nature of the research and the size of the original community. (Al-Jubouri and Al-Sultani, 2013: 126)

Schools sample

The researchers chose Al-Shumukh intermediate school for boys located in Al-Rifai District / The labor District intentionally for the purpose of applying their experience due to its proximity to the researcher's residence and the cooperation of the school administration with him.

Student sample

The researchers chose the research sample randomly from Al-Shumukh intermediate school for boys, the students of Division (B), which were 34 students, as the experimental group who will study according to (my sequential information strategy), and the students of Division (A) which 36 students, as the control group, that will study in the usual way.

Third / Equality of the two research groups

The researchers made the equivalence between the two groups with the following variables: (the chronological age of the students in months, Daniel's test of intelligence, the lateral thinking test), Table (3).

Table (3) Arithmetic mean, standard deviation, and the calculated and tabulated T-value of the variable (chronological age, intelligence test, lateral thinking skills test) for the two research groups

No.	Variable	group	Number	Arithmetic mean	standard deviation	variance	degree of freedom	T-value		Statistical significance at a level of (0,05)
								calculated	tabulated	
1	chronological age	experimental	34	164,29	6,39	40,80	68	0,421	2,03	Not statistically significant
		control	36	163,72	4,93	24,26				
2	Daniel's IQ Test	experimental	34	20,40	4,15	17,20		0,551		
		control	36	19,38	3,95	15,57				
3	Lateral thinking test	experimental	34	109,24	41,98	1762,02		0,772		
		control	36	117,07	46,32	2145,43				

It is clear from Table (3) that the calculated value for each of (chronological age, Daniel's test of intelligence, and lateral thinking test) amounted to (0.421, 0.551, 0.772), respectively, which is less than the tabular t-value (2.03), that is, it is not statistically significant at the level of (0,05) and a degree of freedom (68), so the above variables were equalized for the two research groups (control and experimental).

Fourth / adjusting non-experimental (exotic) variables

Although the researchers verified the equality of the two research groups in some variables believed to affect the course of the experiment, they tried to avoid the impact of some exotic variables on the course of the experiment. Here are some of these variables and how to control them: Accidents accompanying the experiment: The experiment in the research was not exposed to any emergency or accident that hinders its conduct. Experimental extinction: There was no interruption or transfer of any student from both groups (experimental and control) throughout the duration of the experiment. The two research groups were chosen randomly, and the equivalence of the two groups was ascertained. Maturity factor: due to the fact that the duration of the experiment is unified between the two research groups, as well as the convergence of the ages of the students in the two groups, so the growth that occurs will return to the members of the two groups at the same level, so this factor had no effect on the research. The effect of experimental procedures: the researchers worked to reduce the impact of experimental procedures that could affect the dependent variable during the course of the experiment.

Research Requirements

1. Determining the scientific subject: The researchers determined the scientific subject that will be taught to the students of the two research groups during the experiment. The scientific material included two units (the first - and the second) from the second part of the science book for the second intermediate class, i 4, for the year (2021 AD), authored by (Daoud et al., 2021).
2. Formulating behavioral goals: Defining educational goals allows for the possibility of controlling and evaluating the learner's work, providing him with indicators that guide him during the learning process and giving him opportunities to evaluate his performance. (Abd al-Amir and Rahim, 2015: 13)
3. Preparing teaching plans: Planning is a set of measures taken by the teacher to ensure the success of the educational process and the achievement of its objectives, and it includes (objectives, subject content, teaching methods, methods of measurement and evaluation). (Obeidat, and Abu Al-Sameed, 2007: 9)

The search tool

One of the requirements of the current research is to prepare a tool to measure the dependent variable (the lateral thinking test) in order to know the extent of the influence of the independent variable represented by (my sequential information strategy) on this variable, and the researchers adopted the lateral thinking test (Al Kubaisi, 2013).

Lateral thinking skills test: The lateral thinking skills test is a research tool, so the two researchers prepared a lateral thinking skills test for second-grade students according to the following steps:

1. Determining the objective of the test: The test aims to measure the lateral thinking skills of the students of the two research groups (experimental and control) for the second intermediate grade.
2. Drafting the test items: After reviewing the previous studies and literature, the researchers formulated the test items according to the lateral thinking skills. The number of test items in its initial form reached (31).
3. Set test answer instructions and the correction:
 - A. Answer instructions: The researchers developed instructions for answering the lateral thinking test, which require students to write the specified information (student name, class, class, school name), and answer all questions.
 - B. Correction form: The lateral thinking skills test was corrected after reviewing the literature related to lateral thinking and its given degree and consulting specialists in the field of science teaching methods, measurement and evaluation, and it was agreed to give each paragraph of the test consisting of (31) paragraphs an one (1) degree for the correct answer for each paragraph, and a score of (zero) for the wrong answer or the left item, and thus the degree of the answer from the test ranges between (zero -31) degrees.

4. Validity of the Lateral Thinking Skills Test:
Apparent honesty: The researchers presented the test in its initial form to a group of arbitrators and specialists in the field of methods of teaching science, measurement and evaluation, containing (31) paragraphs.
5. The exploratory application of the Lateral Thinking Test:
 - A. The first exploratory application of the Lateral Thinking Test: The researchers applied the test to an exploratory sample consisting of (30) students of the second intermediate grade in (Al Nawars Intermediate School for Boys), without the research sample on Thursday Dec. 23th, 2021 to ensure the clarity of the test instructions and the clarity of its paragraphs, as well as the time taken to answer the questions. the test.
 - B. The second reconnaissance application / statistical analysis :After ensuring the clarity of the wording of the paragraphs and the time taken to answer, the test was applied again on an exploratory sample of second-grade intermediate students from (Sheikh Abdul-Saheb Al-Hadi Intermediate School for Boys) without the research sample, consisting of (100) students. The test was applied on Wednesday, Dec. 28th 2021). The researchers corrected the answers of the students of the exploratory sample and arranged them in descending order from the highest score (31) to the lowest score of (5), in order to conduct the following statistical analyzes:
 - C. Difficulty coefficient of test items: The coefficient of difficulty of each item of the Lateral Thinking Skills test was found using the coefficient of difficulty equation. As it turns out that the difficulty coefficient ranges between (0.31 - 0.46) and thus all test items are considered acceptable with an acceptable difficulty coefficient, as the test items are good, as their difficulty coefficient ranged between (0.20- 0.80). (Al Kubaisi, 2007: 95).
 - D. The discriminatory power of the test items: The discriminatory power was calculated for each of the test items using the discriminatory power equation, as it became clear that the discriminatory power of the items ranges between (0.41 - 0.78), so all test items are acceptable, as the test items are good if the coefficient of discrimination is (0.20) or more (Al-Najjar, 2010: 210).
6. The stability of the lateral thinking test: To calculate the stability of the internal consistency of the test, the researchers used the Kewder-Richardson equation -20, and found that its stability coefficient is equal to (0.92), which is a good stability coefficient, if the value of the stability coefficient is from (0.67) and above it is good (Al-Nabhan, 2004: 240).
7. Lateral Thinking Test in its final form: The test in its final form has consisted of (31) paragraphs, ready to be applied to the research sample.

Seventh: Procedures for applying the experiment:

- A. The experiment was implemented on Saturday 26th of Feb., 2022 and ended on Wednesday 27th of April , 2022)
- B. The researchers applied the Lateral Thinking Test on Thursday (28/4/2022).

Statistical means

The researchers used the Statistical Package for Social Sciences (SPSS) to extract the final results of the research.

Show the results

For the purpose of verifying the null hypothesis which states that (there are no statistically significant differences at the significance level (0.05), between the average scores of the experimental group students who studied science subject according to my serial information strategy and the average scores of the control group students who studied the same subject In the usual way in the Lateral Thinking Test.

Table (5) results of the t-test for two independent samples on the lateral thinking test for the two research groups

No.	Group	Student's number	arithmetic mean	standard deviation	variance	Degree of freedom	T-values		Statistical significance at the level 0.05
							calculated	tabular	
1	Experimental	34	19.91	4.40	19.36	68	3.464	2.03	Significance
2	Control	36	16.50	3.84	14.71				

It is evident from Table (5) that there are statistically significant differences between the mean scores of the students of the two research groups (experimental and control) in the lateral thinking test in favor of the experimental group. thus rejecting the null hypothesis and accepting the alternative hypothesis.

Interpretation of the results

The results related to the first hypothesis that showed the superiority of the experimental group students over the control group students in the lateral thinking test, the researchers attribute this result to several reasons, including:

- a. Teaching according to my sequential information strategy provides an opportunity for each student to put forward diverse and original ideas, which leads to an increase in their lateral thinking.
- b. Teaching according to my sequential information strategy allows students to search, investigate and conclude in search of information and increases the level of classroom interaction, and this develops them with more modern ideas.

Conclusions

In light of the research results, the researchers concluded: Teaching second-grade intermediate students according to my sequential information strategy had a positive impact in raising their lateral thinking skills.

Recommendations

In light of the findings of this research, the researchers recommend the following: Introducing teachers to lateral thinking skills and sequential information strategy, so that they can train their students on them by preparing a guide for the teacher, which deals with how to develop lateral thinking skills in the field of teaching, and to ensure that it is practiced in front of students, so it has a positive impact on developing their way of thinking.

Suggestions

To complement this research, the researchers suggest the following:

- Conducting a similar study using my sequential information strategy in other variables (gender, clever thinking, creative thinking, productive thinking, divergent thinking, social intelligence).

References

- Abdul Amir, Abbas Naji, and Rahim Younes Crowe (2015): Teaching Mathematics Concepts - Strategies - Applications, 1st Edition, Dar Al-Ayyam, Amman. (In Arabic)
- Abu Allam, Ragaa Mahmoud (2011): Research Methods in Psychological and Educational Sciences, 6th edition, University Publishing House, Cairo, Egypt. (In Arabic)
- Al-Anbaki, Ali Matani Ali (2014): Al-Wajeez in Teaching Science, Arab Society Library, Amman. (In Arabic)
- Al-Hashimi, Rafid (2019): The environment and its impact on the student's rights in academic achievement, 1st Edition, Dar Amjad for Publishing and Distribution, Amman, Jordan. (In Arabic)
- Al-Jubouri, Imran Jassem Muhammad, and Al-Sultani, Hamza Hashem (2013): Curricula and Methods of Teaching Arabic, 1st Edition, Dar Al-Radwan, Amman. (In Arabic)
- Al-Kubaisi, Abdul Wahed Hamid (2013): "Lateral thinking, exercises and practical applications", Amman, Debono Center for Teaching Thinking.
- Al-Kubaisi, Abdul-Wahhab (2007) Measurement and Evaluation, Updates and Discussions, Jarir House, Amman. (In Arabic)
- Al-Nabhan, Musa (2004): The basics of measurement in the behavioral sciences, 1st edition, Dar Al-Shorouk, Amman. (In Arabic)
- Al-Najjar, Nabil Jumaa Saleh (2010), Measurement and Evaluation: An Applied Perspective with the Applications of Spps Programming, 2nd Edition, Dar Hamed for Publishing and Distribution, Amman, Jordan. (In Arabic)
- Al-Rikabi, Jasib Saheb Yasir, (2018): The effect of my sequential information strategy on the expressive performance of fifth grade students, "Unpublished Master's Thesis", Iraq. (In Arabic)
- Al-Samarrai, Qusai Muhammad Latif, and Faida Yassin Taha Al-Badri (2018): Teaching Skills and Strategies, 1st Edition, Al-Sadiq Cultural Foundation, Babylon, Iraq. (In Arabic)
- Al-Tamimi, Wissam Najm Muhammad (2012): The effectiveness of the obstetric education model in acquiring and retaining historical concepts among first-

- grade intermediate students, “unpublished master’s thesis”, College of Education, University of Al-Qadisiyah. (In Arabic)
- De Angelo, C., Touchman, S., and Clark, D. (2009). Constructivism. Retrieved from <http://www.education.com/reference/article/Constructivism/> at 2 – 2 . 2012 .
- Hamada, Alaa Muhammad Toha (2020): The effect of the priority pyramid strategy on achievement and lateral thinking skills for second-grade students in the intermediate science subject, unpublished master’s thesis, University of Babylon, College of Basic Education, Iraq. (In Arabic)
- Hamada, Fayza Ahmed Mohamed (2011): The effectiveness of the strategy of “Wilson and Phillips” in teaching science to develop lateral thinking and metacognitive skills for female secondary school students, *Journal of Education Sciences*, Egyptian Association for Science Education, Volume (14) October 2011, part Second . (In Arabic)
- Hamadaneh, Muhammad Mahmoud and Obeidat, Khaled (2012): Teaching concepts in the modern era, methods, ways, strategies, the world of modern books, Jordan. (In Arabic)
- Mukhtar, A. U. S., Budu, B., Sanusi B, Y., Mappawere, N. A., & Azniah, A. (2022). The effect of reproductive health education with multimedia video learning on the improvement of fluor albus prevention behavior young woman pathologist. *International Journal of Health & Medical Sciences*, 5(1), 75-79. <https://doi.org/10.21744/ijhms.v5n1.1841>
- Obeidat, Thouqan, and Suhaila Abu Al-Sameed (2007): Teaching Strategies in the Twenty-first Century: A Teacher and Educational Supervisor’s Guide, Dar Al-Fikr, Amman. (In Arabic)
- Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). Get vaccinated when it is your turn and follow the local guidelines. *International Journal of Health Sciences*, 5(3), x-xv. <https://doi.org/10.53730/ijhs.v5n3.2938>
- Zayer, Saad Ali and others (2015): Suggested educational applications according to the dimensions of sustainable education, Al-Amir Library for Printing and Publishing. Baghdad . (In Arabic)