

The Impact of the Schemes of Knowledge Discrepancy in Geography Education and the Development of Metacognitive Skills among Fifth Grade Literary Students

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This research aims to identify the impact of the schemes of knowledge discrepancy in the collection of geography and the development of metacognitive skills among fifth grade literary students. The research uses two groups that will study the same material in the usual way: Division A comprises the control group, a randomly selected young female Khadija sample and Division B the experimental group; both were studied according to the schemes of knowledge conflict. The research sample involved 60 students, 30 students in Division B, 30 in Division B representing the six directorates of Baghdadi education. To measure the achievement of students of the two research groups, the researcher prepared a test consisting of 40 paragraphs that test multiple and metric skills beyond knowledge. The research conducted the appropriate T-test statistical methods to determine correlation coefficients. Statistical analysis found that the experimental students showed superiority over the control group students in achievement and metacognition skills.

Key words: *Knowledge schemes, Metacognitive constructivism, Achievement, Geography*

Introduction

Educational institutions currently face problems in the context of low education outputs in general and geography education in particular. The problem facing school education in general regards the aspect of teaching and its methodology which has moved away from the needs of learners. A general perception is that teacher practice has become dry and dull without taking

into account the environment of learners and their needs and thinking, as well as lack of attention to their perceptions and the range of mental abilities and the diversity of available teaching methods, strategies and models required to address each class or level appropriately. In terms of student academic achievement, the most serious reasons that lead to low academic achievement are for example, weakness in the content of the subject, the educational activities involved or methods of evaluation as well as the lack of use of various teaching aids that keep pace with trends. Modern education philosophy emphasizes the need to introduce material in a way that enables teachers to engage student senses by placing them in educational situations that heighten those senses and develop the ability to observe and experiment to reach conclusions. Research (Moussawi, 2011; Jassim, 2016) identifies the need for 21st Century learners to understand the relationships between things and apply them in new educational situations in the field of demographics.

Therefore, it has become necessary to include the skills of metacognition in curricula because of their important role in the development of processes of understanding, reading, attention, remembering, social knowledge and multiple types of self-control and self-learning and the ability to plan, control and evaluate; and this is confirmed by a number of research results. Al-Gharawi's (2010) research corroborates other studies that have focused on the skills of metacognition and facilitation of learning and understanding for the learner. The importance of these research findings is reflected in the following summary:

- 1 - Overcome the shortcomings in traditional teaching methods and keep pace with modern educational trends to overcome the difficulties of teaching geography, and the development of skills beyond knowledge.
- 2 - Use the constructivist theory in education.
- 3 - Maximise results that can contribute to enrich educational institutions with educational and psychological realities that enhance the role of these institutions in the realization of intellectual and thoughtful students.
4. - Highlight the constructivist theory as one of the modern cognitive theories used in teaching geography.

Research Objectives: The current research aims to determine

- 1 - The impact of schemes of knowledge discrepancy in the achievement of female student fifth grade literary.
- 2 - The impact of schemes of knowledge discrepancy in the development of Maura skills and knowledge among students of the fifth grade literary.

Research hypotheses: To achieve the objectives of the research the following zero hypotheses were formulated:

- 1 - There is no statistically significant difference at the level (05/0) between the average scores of the experimental group students, who are studying geography subject knowledge schemes contradiction, and control group students who study the same material in the usual way as evidenced in the test achievement.
- 2 - There is no statistically significant difference at the level (05/0) between the average scores of experimental group students who are studying schemes of knowledge discrepancy, and control group students who study the same material in the usual way in the development of skills beyond knowledge.

Fifth grade sample: Research Limits: The current research is limited to:

- 1 - Fifth grade literary students in secondary and preparatory day schools - government study of the Directorates of Education Baghdad.
- 2 - The first semester of the academic year (2016 - 2017).
- 3 - Topics of the natural geography for fifth grade literary in Iraq.

Identification of terms: First: schemes of knowledge conflict: defined by:

Baz and Ali (2008): "An educational conceptual diagram developed by the teacher as an educational tool aimed at replacing the wrong scientific concepts with a specific subject in students and then presenting a contradictory concept and event in a practical and cooperative manner among students. Alternative and New Concepts "(Baz and Ali, 2008)

Procedural definition: schemes include the detection of misconceptions between the incompatible event and the presentation of the correct perception; and explanation and supporting sensory perceptions that cause student dissatisfaction with the information they have because it is contrary to the scientific material. This leads to problem solving to determine the solution and understand the reason for the difference and reach compatibility between new and previous information.

Metacognitive skills:

The conscious attempts of the individual to organize knowledge and self-organizing mechanisms, such as identification, planning, control, control, selection, and modification, used by the active individual in attempts to reach understanding (Alison, 1999).

It is the opinion of the researcher that the schemes of cognitive conflict include a set of procedures and sequential steps, proven in the cognitive conflict scheme, through which the teacher provides information to students in the form of opposition and, contradictory to the previous knowledge in their minds, which leads to an imbalance between this previous knowledge and new information provided to them. The students realize that the information in their cognitive structure is correct and that the perceptual information provided by the teacher is also true, but it is inconsistent with their experiences. That is, this conflict is a virtual inconsistency caused by the teacher intentionally in order to cause knowledge discrepancy that drives the student to learn. In this case the student uses the processes of representation and adaptation so they can get attain a state of balance and adaptation and subsequently learning occurs. This methodology is based on the theory of constructivism.

The steps of teaching according to the schemes of knowledge conflict:

A. Previous experience and tribal knowledge (alternative perception) is a true or false information set related to the subject under study and found in the cognitive structure of the student. The teacher makes a brief introduction to the concept to be taught in the form of questioning in order to show the previous experiences of the student and the extent of tribal knowledge associated with the subject under study, and then writes the perception of the most common error in the place allocated to the scheme.

B. Contradictory Perceptual (Contradictory) is a perceptual perception provided by the teacher to the student. During the teaching process, information that is inconsistent with previous experiences found in student cognitive structure are offered as a perceptual conflicting event with student previous experiences; and here begins the process of cognitive conflict. The difference between the previously internalised information and the perceptual conflict highlights the conflict between the student and the perception of error.

C. The new scientific concept: the experience, information or new concept that the teacher wants the student to acquire, associated with their previous experiences and concepts. The teacher presents the new scientific concept (to be learned), develops an appropriate definition for it and adds it to the schema.

D. Critical event or explanation: what the teacher is doing to explain and clarify the new concept, experience or information to be acquired for students to understand and describe their characteristics. During this, the teacher provides an explanation of the new scientific concept to be taught and explains its characteristics and the factors that depend on it and adds it to the chart.

E. Associated scientific concepts: a set of experiences, information and concepts associated with the new scientific concept that the student learns provided by the teacher until the education becomes meaningful. The teacher mentions some scientific concepts associated with the scientific concept to be learned and explains the extent of the relationship and link between them, giving students the opportunity to make other connections, then add it to the chart.

F. Supported perceptions: A set of events and activities provided by the teacher to the student after learning the new concept or experience that help students reference to similar events in order to help them understand and retain education longer. The teacher provides some of the perceptions that support the new scientific concept, which is characterized by the applied nature of the environment and the teacher requires students to mention other perceptions supporting the concept that they learned to be of an applied nature associated with the environment and add to the scheme. Planned (1).

Metacognition

Metacognition refers to the process of “knowledge about knowledge”. If human knowledge refers to available data and information as relayed to the individual, metacognition refers to internal knowledge and processes of information internally and further, metacognition refers to how an individual thinks and controls his or her processes. (Zachary, 2000) Metacognition is defined as an individual thinking about his or her own thinking and includes his or her own knowledge (2005: P 17 Fisher,).

* In this sense Afaneh & Khazindar, (2004) found that metacognition is divided into two main components: self-awareness of knowledge and self-organization of knowledge.

Metacognitive skills consist of:

Component 1: Self-awareness of knowledge. This component includes three main types of knowledge: Conceptual Knowledge; Procedural Knowledge and Contextual Knowledge (Afaneh and Khazindar, 2004)

Component 2: Self-organization of knowledge. This component includes three types of knowledge: knowledge management (Metacognition of Knowledge); evaluation of knowledge: (Knowledge Knowledge) and regulation of knowledge: (Regulation Knowledge). (Jarwan, 1999).

The researcher believes that the learner must be aware of thinking processes, especially those used by himself in learning, as well as this, the learner must have sufficient information on different learning strategies in order to choose the most appropriate for use in the educational situations they are experiencing.

Some researchers have classified metacognition into a taxonomy (Nolan, 2000).

Metacognitive skills: Many sources such as Jarwan, (1999), (Fowler, 2003) state that the skills of metacognition, are:

First - Planning (planning): meaning to develop plans and objectives and identify the main sources before learning and refer to deliberate activities that govern all learning processes including:

- 1- Define the goal or feeling of a problem and determine its nature.
- 2 - Choose a strategy to implement the solution.
3. -Arrange the sequence of implementation steps.
- 4 - Identify errors and enduring difficulties.
- 5 - Identify the methods to face these difficulties and mistakes.
- 6 - Determine the time required for learning.
7. Predict the desired or expected results.

Second - Monitoring and Controlling: the learner's awareness of the strategies he/she uses to learn or solve the problem and the ability to use alternative strategies to correct understanding and performance errors. The following questions are essential to learning activities. What do I do? What is the right course of learning? How should I do do? What information is important to complete the given tasks? Should I work in different directions? How should I adjust my speed?

Third – Evaluation: the ability to analyze performance and effective strategies following learning or problem solving. This refers to the assessment of the learner's learning processes and includes an assessment of their progress in learning activities and assessment skills that can help learners develop a set of necessary skills and strategies that assist in the learning process (Jarwan, 1999).

In addition to these skills (Lee and Baylor, 2006) adds a fourth skill: -

Fourth - Revising: These skills include modifying the pre-set work plan regarding the achievement of the goals, strategies and learning approaches used and include previous studies.

First: Studies dealing with schemes of knowledge conflict:

- 1- Knowledge of the effect of teaching with the help of cognitive discrepancy maps in the modification of alternative perceptions of first grade students and the concepts of chemical energy (Kandil, 2003).



Kandil's (2003) research sample was divided into two experimental and control groups totalling 140 students. The research tools used were the diagnostic test of alternative perceptions and the conceptual change test when modifying alternative perceptions of chemical energy concepts.

Madi's (2011) study investigated the impact of cognitive discrepancy schemes in the development of concepts and skills to solve the genetic problem among the tenth grade students in Palestine. The research sample was divided into two groups, the experimental and control group and comprised 95 students. The researcher utilized two research tool tests: one of them tested the problem solving skills of the genetics, and the other tested the concepts of genetics for genetic issues. (Past 2011)

The research sample consisted of 63 second grade students comprising an experimental group (32 students) and the control group (31 students), the research included an achievement test which consisted of 40 objective paragraphs and a systematic test which consisted of 24 data sets analyzed and processed statistically using T-test, Alpha-Cronbach equation and Pearson correlation laboratory.

The presence of statistically significant difference in favor of the experimental group in the achievement test and systemic test in chemistry was determined. (Amri, 2017)

Second: Studies related to the metacognitive skills variable:

1-Jassem, (2016): The study aimed to identify the effectiveness of an educational program according to the theory of information processing in the collection of geography and the development of metacognitive skills among students of fifth grade literary in the Faculty of Education. The research sample consisted of 60 students divided into two groups equally. The experimental group was taught using the information processing theory program, and the control group was run in the traditional way.

The research tools include a combination test of 49 items, 38 multiple choice items, 11 paragraphs articles, and a measure of metacognition skills (Schraw, Dennision (1994)). The T - test of two independent samples, found that the experimental group students outperformed the control group students in achievement and metacognition skills (Jassim, 2016).

2 - Abu Attia, (2006): The study investigated the impact of a proposed structural model for the development of supra-cognitive skills of ninth grade students in mathematics.

3- The study (Al Mazroua, 2005): This study investigated the effect of the circular house strategy on the development of supra-cognitive skills and academic achievement among

secondary school students. The research was conducted in Riyadh city. For the control group, the research tools consisted of a supra-cognitive skills scale consisting of (38) items distributed on the following dimensions: Reporting knowledge, procedural knowledge, conditional knowledge, planning, organization, evaluation, and achievement test, prepared by the researcher, as well as: the test of intersecting problems Translator (Jean Pascalion); and a Search the effectiveness of heart Ring House strategy in the form of skills development in context of the student cognitive and academic achievement results. The results also showed the absence of the impact of the interaction between the strategy and mental capacity used on any of the variables Altabaaan. (Cultivated 2005).

Research Methodology and Procedures

Research Methodology: The researcher followed the appropriate method for this research which is the experimental method. Experimental Design was implemented by the researcher to gather the necessary information and control the factors or variables that may have affected this information; then the appropriate analysis was conducted to answer the research questions within a comprehensive plan (Odeh, Malkawi, 1992).

The researcher adopted random group design for two groups: the experimental and the control group according to the scheme detailed in Table 1 below.

Table 1: Research group design

the tool	The dependent variable	Independent variable	Vol sample	set
1 - Achievement test 2 - Scale metacognition skills	1 - achievement	Cognitive conflict schemes	30	Experimenta l
	2 - skills beyond knowledge	Normal way	30	Control

Both the experimental group control groups are studying the contradictory schemes of geographic matter.

Research Society: The research community includes fifth grade female students in the schools of the six education directorates in Baghdad governorate (Karkh I, II, III, Rusafa I, II and III) for the academic year 2016-2017. The total number of female students is 2745 across 41 Secondary and preparatory schools.

Research sample: It is a requirement of experimental research that the experiment be conducted in a specific place or one school in order to facilitate the control of some extraneous variables and facilitate the task of the researcher to conduct the experiment and in particular, that the education system does not allow random selection of all members of the community and that the formation of the experimental group and the control group are subject to teaching. The variable will be boarded at a specific time of the school day. The researcher chose the random method to determine the sample of secondary school Khadija girls because it contains more than a division of the fifth grade literary. This facilitated the random research selection of classrooms, and then two divisions of the fifth grade literary with one experimental each Division A containing 30 students.

Equal research groups

1- For the test on previous geographical information, the researcher prepared a collection of 20 objective test items including 10 multiple choice items and 10 complementary paragraphs. The total score of the test is 20 degrees. A group of experts were engaged to ensure suitability for the purpose (Annex 1) and the results show that there is no statistically significant difference at the level (0.05) between the average of the two groups in the test of previous information in the geography, and thus the two groups are equal in the previous information as shown in Table 2 below.

Table 2: T - test value calculated and tabulated in the previous information

Statistical significance	Value t		Degree of free	standard deviation	SMA	No.	set
		calculate					
Not function	Is a function	0.570	58	2.468	14.67	30	test
				2.040	14.33	30	exact

2. Intelligence test: The researcher relied on the Danels test to infer the forms to measure intelligence between the two research groups. It is a non-verbal test that can be applied to the research age group (Al-Obeidi and Al-Dulaimi, 2004). After each application of the test, according to the arithmetic mean and the deviation of the scores of the students of the two research groups, the significance of the differences between the scores of the students of the two research groups was found. T.test was used for two independent samples at the level of (0.05) and the degree of freedom was 58. This means that there is no statistically significant difference between the two groups: Experimental and Control, which shows their equivalence within the variable intelligence and Table 3 below illustrates this.

Table 3: T-Test Value in the Intelligence Variable for the Research Groups (Experimental and Control)

Statistical significance	Value t		Degree of free	standard deviation	SMA	No.	set
		calculate					
Not function	Is a function	2	0.936	4.523	38.50	30	test
				3.710	37.70	30	exact

3 - Metacognitive skills before the researcher: The researcher applied the metacognition skills scale appendix (2) to the fifth grade literary students before starting the actual teaching, in order to measure the students' skills of metacognition and used the T-test for two independent samples to calculate. There was no statistically significant difference at the level of (0.05) between the two groups, which indicates the equivalence of the two groups in this variable as shown in Table 4 below.

Table 4: Arithmetic mean, standard deviation and T calculated value for comparison between the two research groups in a variable (metacognitive skills)

Statistical significance	Value t		Degree of free	standard deviation	SMA	No.	set
		calculate					
Not function	Is a function	2	0.103	6.879	101.80	30	test
				8.114	101.60	30	exact

Search Requirements

Determination: for the study material, the researcher relied on the textbook for fifth grade literary studies prepared by the Ministry of Education for the academic year (2016-17), which included chapters I, II and III.

The test measures the extent to which the behavioral goals achieved all levels of Bloom's Taxonomy (remember, understanding, application, analysis, synthesis, evaluation), respectively (61, 51, 32, 29, 21, 9). The research confirmed the accuracy of the derivation of the objectives through the opinions of experts and specialists (Annex 1 was 213). The researcher prepared the teaching plans related to the teaching of the experimental group and the geography determining them using the cognitive exposure schemes as well as the teaching plans related to the teaching of the control group and the same material. The researcher presented these 22 study plans for each group: a group of Experts and Specialists Supplement (1).

Setting Up the Search Tool (Test):

The researcher prepared an objective test after the multiple-choice type, which followed the following steps in preparation of the achievement test:

Preparation of the test map as required when preparing achievement tests, ensured the selection of a sample of questions that measure the behavioral objectives to be measured, and the researcher prepared a test map of the subject (fifth grade literary studies) studied in the experiment. Subjects, in the light of the pages of each of the topics covered in the test, divided by the total number of pages of topics, and calculated the levels of goal levels based on the number of behavioral goals in each level according to the objectives of each topic to the total number of goals, and set the number of test paragraphs B (4) 0) Objective paragraph of multiple choice type.

The researcher formulated test clauses that measured the cognitive levels of Bloom's Taxonomy (knowledge, understanding, application, analysis, synthesis, and evaluation). A group of experts and specialists in Arabic language and methods of teaching were consulted and in the light of their opinions and observations necessary adjustments were made necessary until it became final.

As a sincerity test, the researcher adopted the objective paragraphs to measure the extent of achieving the objectives as a preliminary measure to verify the accuracy of the apparent form of the paragraph. Ebell states it is best to logically examine the paragraphs of the test and estimate validity as it appears in the measurement via experts or arbitrators 55 (1972 and Ebell). These experts confirmed the validity of the apparent form of paragraphs, especially after minor amendments to the form of paragraphs, until the rate of 100% agreement was attained.

- Test Instructions: The researcher gave the following instructions:

Answer Instructions:

A. Without your name, description, and division in the exact location of each.

Answer all 40 test items.

The answer to the paper itself.

Correction Instructions

The researcher developed a typical answer to the test paragraphs, where a score of one was allocated to the paragraph that refers to the correct answer, and zero to the incorrect answer and the abandoned paragraphs, which carry more than the choice of treatment of the incorrect paragraph, were treated so that the highest score for the test was 40 and the lowest degree zero.

Statistical Analysis of Test Items

Statistical analysis is a basic and important step in the analysis of the test paragraphs achievement. This test was applied to the sample consisting of (20) students randomly selected from the fifth grade literary students of (Adhamiya) and junior high (good), the researcher adopted the method of extremist groups of the total degree in the calculation The following is an explanation of the procedures of statistical analysis of the test paragraphs: -

1. The difficulty level of paragraphs: A calculation of the difficulty coefficient for each of the test items found between (0.31-0.74), and that the test paragraphs were acceptable if the difficulty coefficients were below 20.0 (Bloom, 1971, P: 107). All test paragraphs were of acceptable difficulty according to the Bloom standard, because they range between (20, 0 -, 0,80).
- 2 - The power of paragraph recognition: The researcher calculated the discriminatory strength of each paragraph of the test paragraphs found between 0.33-0.70, and (Ebel) found that the test paragraphs are good if the strength of discrimination is 0.30 or more, (Ebel, 1972, P: 407), meaning that all test paragraphs fall within the acceptable range.
- 3 - The effectiveness of the wrong alternatives: After the researcher conducted the necessary statistical processes for this, the wrong alternatives to the paragraphs of achievement test attracted more students from the lower group than the upper group, so it was decided to keep these alternatives without any change; as a negative signal and effective count existed.
- 4 - The stability of the test: The researcher verified the most important characteristics of the achievement tests, namely the stability of the test and the validity of the agencies: The researcher adopted the Alpha Cronbach equation in the calculation of the stability of the test after application to a sample (30) of students selected from Waziriya Junior High for girls. The stability coefficient equation equals 78.0, which is a good constancy coefficient (Abu Lebda, 2008, 223).

Test Validity

In addition to the apparent validity of the test achieved by the researcher with the logical examination of paragraphs at the beginning of its preparation, the data was verified once again for the sincerity of the content, intended to represent coverage of all content of the material to

be measured, and this means that the test found sincerity; sincerity of content exists when the paragraphs are comprehensive for all. The study material was agreed upon by the school and the students (Alkwafh, 2003), and the researcher verified the validity of the content of the test using the test map prepared to ensure representation of the content of the subject and behavioral goals during the D Experience.

Metacognitive Skills Scale

The researcher measured the skills of metacognition (Schrodanison, Schraw, and Deunision, 1994), after localization by the researcher O Najjar, Obeidat, 2011; and prepared for the environment (Jordanian) after the researcher verified the validity of the Arabic (Jordanian) version of the Iraqi environment. During his presentation to experts (10) and specialists in Arabic and English at Yarmouk University Jordan, psychological measurement of the level of metacognitive thinking in adults and adolescents included the first dimension of knowledge. The second dimension is the organization of knowledge, and (Kumar 1998), and testing the sample of individuals to assess the impact of metacognitive thinking and the ability to make a decision, and re-anaylsis of the global factor of the scale resulting in three dimensions:

1. Organization of knowledge and the ability to plan, manage information.
2. Knowledge of knowledge which refers to discretionary, procedural and conditional knowledge.
3. Knowledge processing which refers to the strategies and skills used in information management.

To ensure the correctness of the translation and make observations about the scale and then make adjustments to some paragraphs, the final measure consists of 42 paragraphs where response alternatives represent the degree of practice of the skill and were rated on a scale (always, often, sometimes, rarely and absolutely). The alternatives were given grades (5, 4, 3, 2, 1) broken down into three areas (Najjar and Obaidat, 2011):

1. Organization of knowledge: 18 paragraphs.
2. Knowledge of knowledge: 12 paragraphs.
3. Knowledge processing: 12 paragraphs.

To verify the stability of the scale and its validity on the Iraqi environment, a sample of 50 female students of fifth grade literary studies was chosen randomly from two preparatory schools (Tayiba and Adhamiya), and after completion of the application of the measure according to its stability coefficient equation (Alpha Cronbach), a stability coefficient of 81.0 was found which is a good coefficient of stability.

Validity of the Scale

Discriminatory honesty is one of the basic indicators of constructive honesty which requires two extreme groups for the total degree, based on the degrees of stability of the size of the sample size (50 students). After analyzing the answers and identifying the extremist groups of the total score by 50% in each group (the size of each group is 25 students), T test for two independent samples was used. In the calculation of the T value in terms of the difference between these two groups, it was found that the scale is able to distinguish between the two extremes, as the T value calculated by the difference (T), which is greater than the value of the tabular T (T_{table}) Degree Freedom (48) at (5%)

Procedures for applying the experiment:

1. The test applied the above information on 26/10/2016
2. The metacognitive skills tribal scale was applied on 24/10/2016
3. The research sample began teaching and learning on (2/11/2016) with three lessons per week for each group and the experiment included the first semester of the academic year (2016-2017).
4. The metacognition scale was applied on 5/1/2017.
5. Achievement test was applied 7/1/2017.

Statistical methods to achieve the research objectives, hypotheses, data analysis and statistical processing, include the following: Equation of Objective Paragraphs, Equation of Effectiveness of False Alternatives, Alpha-Cronbach Equation, T-T Test.

Presentation and Interpretation of Results

The procedures adopted by the researcher and the results of the research are presented, analyzed and interpreted in the light of the educational literature and according to their objectives and hypotheses.

Presentation of Results

1. Achievement test results:

For the purpose of verifying the first zero hypothesis, which states that: "There is no statistically significant difference at the level of 05/0 between the average scores of the experimental group students who study geography subject knowledge schemes contradiction, and the control group students who study the same material in the usual way. From the achievement test the following data is extracted: the mean of the experimental group was 29.68, the standard

deviation 5.86 and appendix 25; for the control group the mean was 25.55, the standard deviation 5.06 and appendix 25.

For two independent unequal samples at the level of significance 0.05 and degree of freedom 58, the calculated T value 2.99, is greater than the tabular value 2.00, and Table 5 below shows this:

Table 5: Arithmetic mean and standard deviation of the scores of the two sample groups in the achievement test

Statistical significance	Value t		Degree of free	standard deviation	SMA	No.	set
		calculate					
function	2.00	2.99	58	5.86	29.68	30	test
				5.06	25.55	30	exact

This indicates that the difference between the two means is statistically significant in favor of the experimental group studied according to schemes of knowledge conflict, and thus rejects the first zero hypothesis, that is:

There is a statistically significant difference at the level of significance (0.05) between the mean of the experimental and control group in the achievement test in chemistry.

The results of the second research hypothesis related to the metacognitive skills metric. There is no statistically significant difference at the level of 05/0 between the average scores of the experimental group students who are studying the schemes of knowledge discrepancy, and the control group students who study the same material in the normal way. The student results were calculated using the metacognitive skills scale. The statistical results showed that there is a difference between the average scores of the metacognitive skills scale between the experimental and control groups. For the experimental group this is 142.66, standard deviation is 15.197. The average scores of the metacognitive skills scale for the control group student is 101.87, standard deviation is 6.608 and the significance of this difference was calculated with the use of T-test for two equal independent samples at value 13.427 which is greater than the value of T tabular 2 at the level of significance of 0.05 with a degree of freedom of 58.

This means that the difference between the mean of the two groups is statistically significant in favour of the experimental group and Table 6 below illustrates this.

Table 6: Arithmetic mean, standard deviation, calculated and tabulated value of metacognitive skills scale scores for the experimental and control groups

Statistical significance	Value t		Degree of free	standard deviation	SMA	No.	set
	Test	calculate					
function	2	13.427	58	15.197	142.66	30	test
				6.608	101.87	30	exact

Interpretation of Results

1. Interpretation of the results related to the first hypothesis with reference to the results shown in Table 4 found superiority of the experimental group students who studied using the educational program according to the theory of information processing, over the control group in terms of academic achievement. Thus, the zero hypothesis related to the academic achievement is rejected for the following reasons:

A- The results of the current research are in agreement with the theoretical basis that the relationship between information processing and achievement is reciprocal. High achievement is related to the treatment of positive active information by the student and conversely with regard to low achievement. Thus, the results of the current research are consistent with the results of previous studies (Al-Ghurery, 2003) and (Al-Tamimi, 2011), (Al-Khazraji, 2011), (Al-Mulla, 2011) and (Salhi, 2014).

B - the nature of the presentation of educational material in a sequential and coherent manner, which increases the learner's efficiency to learn, and stimulates mental abilities to search for information and discover the relationship between them and link to previous knowledge, and encourages the learner to think about what is learnt and seek to organize and link it to the new subject and what is already known in order to enter and retrieve (recall) when needed.

C - Teaching according to schemes of knowledge conflict provides an opportunity for students to raise questions and makes students more active and participatory.

D - Use of educational activities with schemes of cognitive conflict that put students in a conflicting position shows them alternative perceptions, observations lead to confusion, challenge thinking and arouse curiosity to resolve conflict which increases achievement.

E - interest in the previous knowledge of the students, and through alternative perceptions, which creates a kind of imbalance between the previous experiences with the new experiences they have reached, which proves the new perception, as well as maintaining the absorption for a long time which consequently increases achievement.

F- Transfer of the focus of the educational process to the students who express their opinion and participate in the discussions and communicate with peers, which reduces the problem of shame in some students and reduces the level of fear and increases their self-confidence, which affects their academic achievement.

G -The class acts as a community whose members negotiate the activities and experiences contained in the opposing events through participation, presenting the perceptions of each student and communicating them to the community (class), thus increasing their ability to learn because they learn more when cooperating with their most knowledgeable and skilled peers and attain a common meaning with peers.

H - Cognitive discrepancy schemes arouse the attention of students and keep boredom away as each new piece of information or change heightens suspense and attention, which motivates them to learn.

These results were consistent with other study results (Qandil, 2003) and (Tsai, 2003) and (Madi, 2011), which showed the superiority of the experimental group who studied cognitive discrepancy schemes students over the control group who studied in the traditional way.

Interpretation of the results related to the second hypothesis regarding metacognitive skills finds that the experimental group students have superiority over the control group students in the metacognitive skills scale and are summarised below.

1. The organization of the content of the lesson in the form of schemes that include the previous perceptions and the event of contradiction and the correct perception and explanation and associated perceptions supported for each lesson of the subject to be taught provided the opportunity for students a comprehensive view of the subject of the lesson and the integration of parts of the subject of the lesson, which positively affected the skills beyond the knowledge
2. Engaging the attention of students and urging them to search for new scientific perception, because the presentation of the lesson depends on the provision of information in opposition to the previous experiences in their minds, leads to a conflict between previous experiences and new information provided, the imbalance of knowledge inspires them to question and research in their thinking.
3. Teaching by arranging the subject of the lesson in the form of steps established in the scheme of knowledge discrepancy made students aware of the relationships between concepts and perceptions and built meaning through these forms in the effort to make links with what has been studied, which leads to improved level of skills beyond knowledge.
- 4 - The opportunity provided by the students to research and investigate through the conflict and return to the balance of knowledge made students develop their understanding of scientific material and conduct the necessary treatment of their ideas, rebuilding them in an orderly manner, which led to improved skill levels beyond metacognition.
- 5 - The positive role of students and linking new information with previous information and the development of cognitive abilities through the enhancement of their new experiences led to the development of metacognition skills and increased effectiveness of participation in the lesson and this is confirmed by the results of the selection of metacognition scale, and these results are consistent with the results of previous studies (Tamimi, 2011).

6 - The effectiveness of schemes of knowledge discrepancy in the development of metacognitive skills and increased academic achievement of students in the subject of natural geography.

7 - Teaching according to the schemes of cognitive conflict helped students to practice mental processes that would stimulate their thinking in general and their ability to think supra-cognitively in particular through the skills of planning evaluation and organization.

Conclusions

The research findings are that the use of cognitive contradiction schemes in the teaching of geography has positive impact in raising the level of performance and the development of metacognition skills for fifth grade literary students. The two major findings are:

1 - The advantage of teaching schemes of knowledge discrepancy in the skills of metacognition for second grade students was compared to traditional methods and was found to have a large impact. The use of cognitive discrepancy schemes in the teaching of geography, because of its positive impact, raised the level of performance and the development of metacognition skills for second grade students.

2 - Developing some metacognitive skills among through their many activities makes learning meaningful based on understanding.

Recommendations for further research

1. Benefiting is necessary according to schemes of knowledge discrepancy in the teaching of natural geography in the preparatory stage.

2. Organizing continuous training courses for teachers of geography on how to teach schemes of knowledge conflict is essential.

3. Curriculum designers should take into account student knowledge environment and reflect on the way content is organized.

4. Attention must be made by teachers of fifth grade literary studies to use the schemes of knowledge discrepancy in the teaching of geography because of its positive impact in increasing achievement and the development of metacognition skills among students.

5 - Attention to the availability of materials and capabilities necessary to conduct scientific activities and sensory perceptions must be supported to improve achievement.

To complement this research, proposals are made for future studies that conduct research on:

1. The impact of schemes of knowledge discrepancy on achievement and other types of thinking (innovative, creative, reflective, scientific, critical and inferential).

2. The impact of knowledge discrepancy schemes on subjects and stages of study.



3. The extent to which students of the intermediate level achieve skills beyond knowledge.

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