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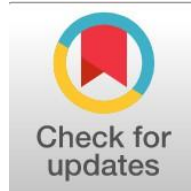
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Mental Flight and Cognitive Feedback In Concept Acquisition and Mental Wandering Among Students Of The College Of Education

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Abstract

General Background: Educational research increasingly considers learners' internal cognitive processes and information processing during learning. **Specific Background:** In the General Teaching Methods course, students may experience difficulties in acquiring educational concepts and maintaining focused attention. Brainstorming and cognitive feedback are presented within a constructivist framework as strategies for organizing ideas, connecting knowledge, correcting misconceptions, and supporting attention. **Knowledge Gap:** The study addresses the need to examine these two strategies through a comparative three-group design involving a traditional teaching condition. **Aims:** The study aims to identify the effectiveness of brainstorming and cognitive feedback in educational concept acquisition and reducing cognitive wandering among third-year History students. **Results:** The quasi-experimental study involved 93 students divided into two experimental groups and one control group. The educational concept acquisition means were 61.13 for the first experimental group, 56.10 for the second experimental group, and 45.60 for the control group. The cognitive wandering reduction means were 82.28, 75.84, and 65.33, respectively. ANOVA results showed significant differences among the groups for both outcomes, with further comparisons favoring the first experimental group. **Novelty:** The study compares brainstorming and cognitive feedback simultaneously with a traditional teaching condition across two learning outcomes. **Implications:** The findings support consideration of these strategies in Teaching Methods courses and provide a basis for further research and teacher training concerning active learning, cognitive self-regulation, and attention guidance.

Key Findings Highlights:

The first experimental group recorded a mean of 61.13, compared with 56.10 and 45.60 in the other groups.

Post-test means for the second outcome were 82.28, 75.84, and 65.33, respectively.

One-way ANOVA showed significant differences among the three groups for both measured outcomes.

Keywords: Brainstorming Strategy, Cognitive Feedback, Educational Concepts, Cognitive Wandering, Teaching Methods

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Introduction

Educational research today is directed at the internal cognitive processes of learners and the information processing mechanisms involved, rather than the external instructional variables. To this end, the present study aims to investigate the effectiveness of two teaching strategies, Mental Soaring (Brainstorming) and Cognitive Feedback, in facilitating the acquisition of educational concepts and reducing cognitive wandering among basic education college students enrolled in a General Teaching Methods course. Based on constructivist theory, which sees learning as an active, continuous process of cognitive framework restructuring, this research emphasises the role of innovative instructional strategies. Mental Soaring triggers idea generation and high order thinking. Cognitive Feedback refines understanding and addresses misconceptions. Combined, these strategies optimise the allocation of attention, maximise deep conceptual understanding, and minimise off-task mental drift.

A quasi-experimental design with two experimental groups and one control group was used to achieve the research objectives and to test the two formulated null hypotheses on the possible differences in performance among the study groups. The study was spatially and temporally limited to third-year undergraduate students of the Department of History, College of Education, University of Babylon, during the first semester of the academic year. The instructional content focused on key topics from the syllabus for General Teaching Methods. These topics were presented in the form of behavioural objectives at various levels of Bloom's cognitive taxonomy.

The general structure of this work is spread over four chapters. The first chapter lays out the basic structure by specifying the research problem, the theoretical importance, the main aims, the null hypotheses, the delimitations and the key operational terms. The second chapter provides a detailed literature review and theoretical frameworks, exploring constructivism, the targeted instructional strategies, educational concept acquisition, cognitive wandering, and pertinent prior empirical research. Chapter three presents the research methodology and field procedures including the experimental design, sample selection, equivalence of the baseline group, instructional planning, and the development and psychometric validation of the two primary measurement instruments: the Educational Concepts Acquisition Test and the Cognitive Wandering Reduction Scale. Finally, in the fourth chapter, the statistical results are presented, followed by a detailed discussion, practical recommendations on education and suggestions for future research.

Chapter One / Introduction to the Research

First: The Research Problem: Educational research has witnessed a significant shift in focus over the past two decades, moving from studying external factors influencing learning, such as the professor's personality and clarity of expression, to studying students' internal processes of knowledge formation and acquisition. This encompasses existing information and the associated information-retrieval and processing capabilities. Contemporary approaches now stress defensible conceptions and reconceptualizations, webs of relations, and common confusions in the acquisition of concepts. In addition, it will maximize and enhance students' creativity and strengths, aiming to improve their academic performance and develop their physical, intellectual, emotional, and social aspects [1].

The researcher reviewed some previous studies and literature on the acquisition of educational concepts, such as Al-Jubouri (2020) and Al-Abadi (2021), which indicated weaknesses in the process of acquiring these concepts among university students. The weakness stems from an overreliance on teaching this course in standard orthodoxies that do not exercise students' minds [1] [2].

The random shifting of ideas, or cognitive wandering, is one of the greatest challenges of the educational process, as students wander away from the topic of learning. It makes students lose much of the content or ideas being worked on in the lesson. Other reasons for cognitive wandering include ambiguity in learning aims, limited use of active learning techniques, poor self-regulatory proficiency, and external or internal distractions. Thus, research on reducing cognitive wandering is valuable, as it can reallocate attention, redirect thought to the task at hand, and empower students to pursue their learning better. Thus, the research problem is to answer the following question:

(Effectiveness of "brainwashing" strategy and "cognitive feedback" strategy on achieving some educational concepts and minimizing cognitive wandering — a study with students in the College of Education "Teaching Methods" course?)

Secondly, the importance of the Research: According to the constructivist approach, learning is a change in a person's cognitive apparatus as it adjusts to the external environment. These adaptations take place to compensate for the contradictions that arise from their involvement in the abstract sort of world. Learning is an active, continuous, constructive process that involves change in an individual's cognitive structures. In the educational process, the teacher serves as a guide, and the learner is the end user of that process [3].

Starting from this point of view, new strategies and models for teaching are developed based on the constructivist theory. This is to help with the understanding of concepts, facts, and information. The literature has shown that such strategies can positively impact these variables. From an educational perspective, a plan is a deliberate, systematic sequence of processes designed to accomplish a macro goal or micro goals (Henriksen, 2023). At the heart of any educational strategy is ensuring that the learner gains knowledge that is relevant and action-oriented. Brainstorming and cognitive feedback are among the methods that have gained acceptance and approval for implementing this type of learning [4].

Brainstorming is an effective learning strategy to develop cognitive thinking in students, as it helps organize thoughts and concepts in our minds before learning the actual concept. Some people feel talking about it helps focus and minimize cognitive drift. It focuses students' attention on the main topic or point of discussion, rather than on linking new information to prior knowledge. This strategy also helps build higher-order thinking in students, such as analysis, evaluation, and inference, and helps students think critically and creatively. The quality of learning and the ability to grasp complex concepts in courses, particularly in teaching methodologies, are positively affected [5].

Cognitive feedback is an educational method used to promote students' retention of learned information and concepts. This not only helps reinforce what you have learned but also helps retain it for a longer term. One of the most important aspects is that it reinforces for learners what they know and what they need to revisit. It also serves to reform the fallacy and to establish critical and analytical reasoning. Moreover, this technique helps learners link new information to existing knowledge and logically structure the elements, so that it minimizes cognitive overload and improves the efficiency and depth of learning and understanding the specifics of the course content, particularly in areas that require the understanding of educational concepts that are more complex, e.g., teaching methods [6].

The acquisition of concepts is important because it offers individuals a degree of stability or consistency when dealing with varied environmental stimuli. When most people think of something, whether it be things, situations, events, or ideas, they process them through a mental representation of such that consists of two or more common features that make it qualify to belong to a certain category that we call a concept; this helps us manage the infinite variety that exists by mental categorization of things. There are millions of cognitive (and mental) structures that are parts of our mental world and are needed in different types within our cognitive network. If data were not organized, it would become nearly impossible to obtain. Concepts are useful in that they allow us to organize and store massive amounts of information efficiently. Once an idea is formed, less effort is expended to process incoming data related to that concept, as each instance of incoming information must be treated not as a separate type [7].

Thus, reducing cognitive wandering becomes vital to increasing learning efficiency. As a result, it steers students away from the information and concepts they tend to drift toward mentally, preventing a wandering mind. When cognitive wandering is minimized, learners can better understand the relationships between parts of the coursework, leading to increased comprehension of course content and academic achievement, thereby improving the quality of learning. An effective teaching systematizes the learning process, while effortless wandering in the mind reduces learning and is the opposite of self-regulation and attentive awareness, which are developed in students with practice. This enables them to control their thinking processes and monitor their level of focus during learning. This increased focus helps reduce cognitive errors and improve the ability to retrieve information and concepts when needed. It also enhances students' ability to engage positively with various educational activities and ultimately leads to the integrated development of their cognitive and mental skills [8].

Third: Research Objective and Hypotheses: The current research aims to identify the effectiveness of the two strategies (mental wandering and cognitive regression) in acquiring educational concepts among students of the College of Education in the Teaching Methods course and in reducing their cognitive wandering.

To achieve the objective of the current research, the researcher formulated the following two null hypotheses:

1. There is no statistically significant difference at the 0.05 level between the mean scores of the first experimental group, who will study the teaching methods course using the "brainwashing" strategy, and the mean scores of the second experimental group, who will study the same course using the "cognitive feedback" strategy, and the mean scores of the control group, who will study the same material using the traditional method, on the educational concepts acquisition test developed for this research.
2. There is no statistically significant difference at the 0.05 level between the mean scores of the first experimental group, who will study the teaching methods course using the "brainwashing" strategy, and the mean scores of the second experimental group, who will study the same course using the "cognitive feedback" strategy, and the mean scores of the control group, who will study the same material using the traditional method, on the cognitive wandering reduction test developed for this research.

Fourth: Research Scope: The research is limited to:

1. Spatial Scope: College of Education/University of Babylon.
2. Temporal Scope: First semester of the academic year (2024-2025).
3. Human Scope: University of Babylon/Department of History – Third Year.
4. Subject Matter Scope: The content of the Teaching Methods course (teaching theories, teaching terminology, teaching skills, effective teaching, differentiated instruction, common teaching methods, inquiry-based teaching methods, individual and cooperative learning methods, mastery teaching methods).

Fifth: Defining Terms:

1. **Effectiveness: Defined by:**
 - (Al-Tamimi et al., 2018) as: "The extent to which students have made progress towards achieving specific educational objectives" [9].
 - Operational Definition: The amount of change or improvement in the performance or educational outcomes of the research sample resulting from the application of the two strategies adopted by the researcher. This is measured by

the statistical differences in the mean scores of the three groups across the tests used in the research.

2. Mindfulness Strategy: Defined by:

- (Al-Fares, 2022) As: "Mindfulness is when the learner's mind is preoccupied with thoughts or feelings unrelated to the current learning situation, leading to distraction and poor concentration during learning" [10].
- Operational Definition: The researcher used the brainstorming strategy with third-year history students (first experimental group) as a structured method that allows students to visualize the ideas and concepts of the topic before learning. This aims to focus their attention, organize their thinking, and connect new information with prior knowledge, thus contributing to increased acquisition of educational concepts, reduced cognitive wandering, and improved problem-solving.

3. Cognitive Feedback Strategy: Defined by:

- Al-Ubaidi (2023) states, "Cognitive feedback is the information a learner receives about their performance or responses during the learning process. Its purpose is to correct errors, enhance understanding, and guide them toward better performance, thereby contributing to the development of awareness of cognitive processes and improved self-learning" [4].
 - Operational Definition: A strategy used by the researcher in teaching the prescribed chapters of the Teaching Methods course to third-year history students (second experimental group) by challenging traditional ideas with the question "Why?" to elicit creative ideas to replace conventional ones. This helps students acquire educational concepts, reduces cognitive wandering, and equips them with the information and skills to connect the lecture topics.
1. **Acquiring Educational Concepts: Definition:**
 - (Al-Tamimi et al., 2018) define it as: "Retaining, utilizing, and applying information in different situations. This acquisition of educational concepts depends on the student's prior knowledge of concepts, which is essential for acquiring new ones" [9].
 - Operational Definition: Retaining, utilizing, and applying information in different situations, measured by the student's score on the items of the Educational Concepts Acquisition test for the Teaching Methods course, designed for this research.
 2. **Reducing cognitive wandering is defined as follows:**
 - (Al-Fatlawi, 2022): It is the reduction of mental distraction in the learner during the learning process, by directing their thoughts and focus towards the learning task, thus contributing to increased understanding and comprehension and reducing mental wandering [11].
 - Operational definition: Operationally, reducing cognitive wandering refers to the score a student obtains on the test used in this research, which reflects their ability to control their attention and minimize random switching between ideas during the learning situation.

Chapter Two / Theoretical Aspect and Previous Studies

First Axis

First: Constructivist Theory: Constructivist teaching theory is based on constructivist philosophy, which focuses on values-based education and cognitive construction. Jean Piaget, the founder of constructivist theory, views learning as a developmental stage. This development leads to the student's awareness of the procedures used to learn. For him, learning is a process of creation and innovation, not merely random attempts leading to successful responses. Learning requires the student to think. As reasoning ability develops, the student makes fewer errors and can navigate their thoughts independently. Assimilation and adaptation change cognitive structures, and this process occurs because new learning can expose that previous cognitive structures were wrong, through the identification of existing and new learning [12].

Second: The Brainstorming Strategy:

1. Its Concept: The brainstorming learning strategy is a 21st-century learning strategy that facilitates students in developing their creative thinking and the power of scientific imagination by allowing them to deviate from the familiar world and express their ideas without the fear of being wrong or criticized. They then link these to a scientific or educational truth. Here, the focus is on developing mental flexibility and ensuring your thought horizons are wide, so that people can generate ideas, plan them, and assimilate them into new situations. Many higher-order thinking faculties, such as deduction, imagination, and problem-solving, also contribute to this [13].
2. Steps for Implementing the Brainstorming Strategy:
 - a. Preparing the Students. Prepare your students by creating a relaxed, engaging classroom atmosphere that defines the task's purpose and intent and creates a space where all can think freely and without constraint.
 - b. Introducing the Situation or Problem: The student presents a challenging, innovative educational idea or problem that requires imaginative, creative thinking to solve. b. Brainstorming Phase: Here, students are encouraged to share their

ideas without restrictions, explore out-of-the-box solutions and possibilities, and write down all ideas without critique or judgment.

- c. The Reality Return Phase: The ideas are evaluated, and those that are most realizable, relevant, or applicable are chosen and connected to scientific theory or targeted learning goals.
- d. Discussion and Evaluation: The tutor and learners discuss the end ideas, judging how original and appropriate they are, and promoting optimistic thinking and peer constructive evaluation [14].

Third: Cognitive Feedback Strategy:

1. Its Concept: One type of feedback strategy is cognitive feedback, i.e., feedback that provides students with explanatory information about their ideas and performance while learning. It exists to clarify misconceptions and improve comprehension of the topic matter. The goal of this strategy is to help students reflect on how they are learning so they can see what they have done correctly and what they need to change or do differently. This helps build their skills in self-regulation, critical thinking, and problem-solving.
2. Steps for Implementing the Cognitive Feedback Strategy:
 - a. Presenting the Learning Task: The instructor presents an activity, question, or cognitive problem that requires students to think, analyze, or apply knowledge.
 - b. Students' Performance of the Task: Students answer or complete the activity based on their prior knowledge and personal understanding.
 - c. Providing Cognitive Feedback: The instructor provides qualitative feedback that clarifies the strengths and weaknesses of students' responses, explaining the scientific reasoning behind the correctness or incorrectness of the answer.
 - d. Correcting and Deepening Understanding: The professor and students discuss errors or gaps in knowledge, and misunderstandings are corrected, and correct knowledge is built interactively.
 - b) Evaluation and Follow-up: Students are asked to apply what they have learned in new situations to ensure correct learning has occurred, and they are provided with additional support when needed. [15]

Fourth: Concepts: Concepts are the building blocks of knowledge, and their importance has increased in the present time more than ever before, due to the explosion of knowledge and the expansion of its branches, and the difficulty of mastering all aspects of any branch. Therefore, the professor's concern has shifted to helping students understand and become aware of the material's conceptual and logical structure. There are some differences between concepts and facts on the one hand, and between them (i.e., concepts) and generalizations on the other. Facts represent the individual elements or parts that make up a concept, and a concept is a collection of facts (Butrus, 2019: 54). The formation and comprehension of concepts depend on the student's ability to grasp the underlying relationships among a large group of facts, information, and things. Learning concepts also helps the student organize the learning situation into a pattern, reducing its complexity and ambiguity. Understanding and perceiving the relationships between concepts and recognizing their results help acquire skills [16].

Fifth: Reducing Cognitive Wandering:

1. Its Concept: Focusing on reducing cognitive wandering is a twenty-first-century pedagogy that seeks to help students learn better by encouraging them to think less about what else they could be doing while learning. This idea describes the learner's skill in guiding and directing their thinking so that mental resources are allocated effectively to related learning tasks rather than shifting nearly constantly from one unconnected thought or stimulus to another. Reduced cognitive wandering enhances attention quality and increases information-processing efficiency, contributing to academic performance and comprehension.

On top of that, having students' attention on their study materials rather than random cognitive wandering helps develop their self-regulation abilities by teaching them to monitor their own thoughts and regulate the flow of those thoughts during learning. Those with cognitive wandering skill sets do a better job of tuning out distractions, both mentally and emotionally, and are in a better position to focus on the educational results they hope to achieve. This idea is one of the basic elements of effective cognitive functioning, better learning motivation, and more independent students who control their learning, are mindful, and act with intention.

2. Skills for Reducing Cognitive Wandering:

- a. Focus and attention: the student directs attention to the important learning aids and ignores distractions.
- b. Think self-control: How to structure our thinking process and avoid flitting between ideas or concepts.
- c. The objective of learning is set: A clear objective helps direct mental effort in the right direction and prevents distraction from unnecessary thoughts.
- d. Cognitive self-awareness: The learner's awareness of their thinking processes and monitoring of their level of focus during learning.
- e. Time and Effort Management: Distributing cognitive effort and time across educational tasks effectively reduces unnecessary wandering. [17]

Second Axis: Previous Studies:

Several studies have addressed the acquisition of educational concepts among students in the College of Education, given their importance in preparing and qualifying teachers both cognitively and practically. A study by Al-Hadidi, Saddam Muhammad, and Saja Ahmed Al-Badrani (2020), titled "Generative Learning in Acquiring Islamic Concepts and Developing Reflective Thinking," found that the experimental group outperformed the control group and demonstrated positive attitudes towards this strategy. Another study, titled "The Effectiveness of the Achieved Guidance Strategy in

Acquiring Educational Concepts and Scientific Argumentation Skills," showed that applying this strategy to students of the College of Education led to a clear development in their ability to understand educational concepts and grasp the relationships between them, compared to the traditional method [18].

Chapter Three / Research Methodology and Procedures

First: Research Methodology: The researcher adopted the experimental method, considered one of the most precise methods of educational research, as it relies on conducting experiments to test research hypotheses.

Second: Experimental Design: The researcher adopted a quasi-experimental design because it was suitable for the current research. The researcher used three groups: two experimental groups and one control group, as shown in Diagram (1).

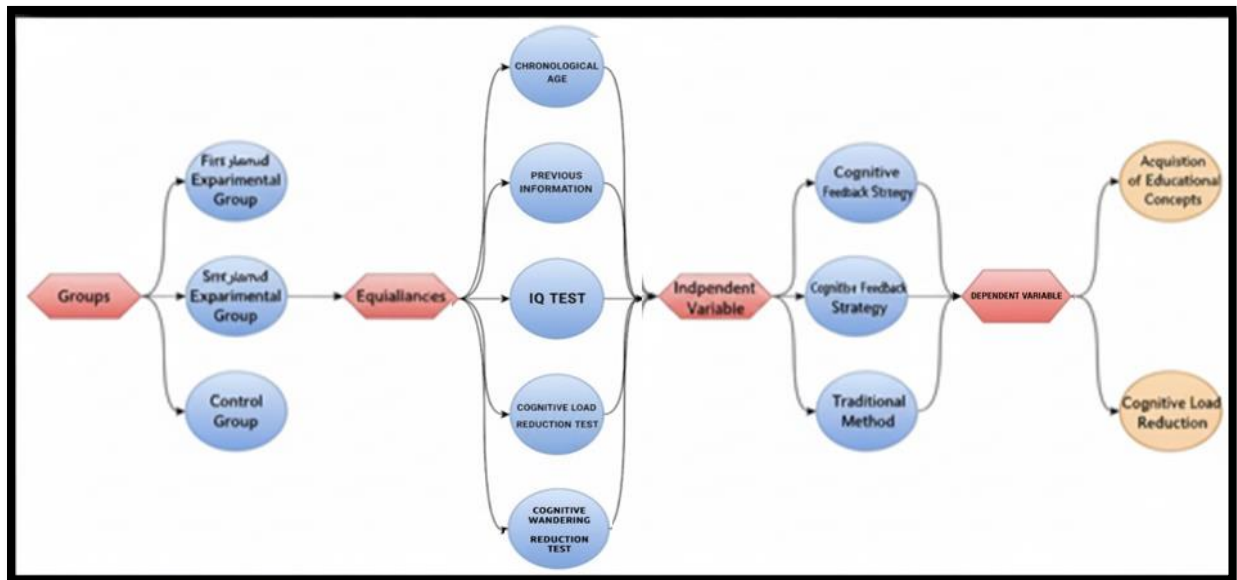


Diagram (1): Experimental Design of the Three Research Groups

Third: Research Population and Sample:

1. Research Population: The current research population consists of third-year students in the History Department, College of Education, University of Babylon, for the academic year 2024-2025.
2. Research Sample: The current research sample is divided into two parts:
 - a. Departmental Sample: The researcher selected the History Department at the University of Babylon.
 - b. Student Sample: The researcher visited the third-year history department, which had three sections (A, B, and C). Section A was randomly selected to represent the first experimental group, whose students would study using the brainstorming strategy. This group consisted of 32 students. Section B was chosen to represent the second experimental group, whose students would study using the cognitive feedback strategy. This group consisted of 31 students. Section C was selected to represent the control group, whose students would study the same material using the traditional method. This group consisted of 30 students. Therefore, the total number of students in the research sample was 93 after exclusion. Table 1 shows this:

Table 1: Distribution of the research sample students across the three sections

The group	The hall	Total students		
		The whole	Excluded	After exclusion
Experimental Group 1	A	34	2	32
Experimental Group 2	B	33	2	31
Control Group	C	33	3	30
the total		100	7	93

Fifth: Equivalence of the two research groups: The researcher ensured equivalence using the following variables: (chronological age calculated in months, prior knowledge test, Raven's Intelligence Scale, last year's grades, cognitive wandering reduction test). The following table shows the equivalence in terms of the arithmetic mean and standard deviation, along with the results of the one-way ANOVA.

Table (2): Arithmetic Mean and Standard Deviation of the Three Groups with Research Variables

Chronological age calculated in months			Testing prior knowledge		
The group	arithmetic mean	standard deviation	The group	arithmetic mean	standard deviation
Experimental Group 1	200,91	3,083	Experimental Group 1	32,84	3,081
Experimental Group 2	200,55	3,275	Experimental Group 2	33,26	2,966
Control	200,83	3,621	Control	32,63	2,157

Group			Group		
Raven's Intelligence Test			Last year's grades		
Experimental Group 1	42,25	5,477	Experimental Group 1	71,34	9,029
Experimental Group 2	41,42	5,208	Experimental Group 2	62,65	6,035
Control Group	42,37	3,864	Control Group	64,93	7,909
Cognitive Wandering Reduction Test					
Experimental Group 1	78,56	15,046			
Experimental Group 2	77,26	13,760			
Control Group	77,17	13,684			

Table (3): Results of one-way ANOVA for the students of the three research groups

Variable	Source of Variation	Sum of squares	Average of squares	Degree of freedom	F value		Level of significance
					Calculated	The schedule	
Chronological Age	Between Groups	403□157	701□78	2	2.148	3□150	Non-significant
	Within Groups	204□3298	36.647	90			
	Total	3455,607		92			
Prior Knowledge Test	Between Groups	2,088	1.044	2	0.143		
	Within Groups	656,868	7,299	90			
	Total	658.966		92			
Raven's Intelligence Scale	Between Groups	5.268	2.634	2	0.0409		
	Within Groups	5865.634	65.174	90			
	Total	5870.902		92			
Last Year's Grades	Between Groups	022□440	011□220	2	2□31		
	Within Groups	867□8576	585□98	90			
	Total	9016.889		92			
Cognitive Wandering Reduction Test	Between Groups	36.489	18,244	2	8,779		significant
	Within Groups	187.067	2,078	90			
	Total	223.556		92			

Fourth: Controlling Extraneous Variables: Non-experimental variables that could affect the Experiment's validity were controlled.

Fifth: Research Requirements: To fulfill the research requirements, the researcher undertook the following procedures:

1. **Defining the Curriculum:** The researcher described the curriculum to be taught to the students in the two research groups during the Experiment. The curriculum included topics from the Teaching Methods course: teaching theories, teaching terminology, teaching skills, effective teaching, differentiated instruction, common teaching methods, inquiry-based teaching methods, individual and cooperative learning methods, and mastery-based teaching methods.
2. **Formulating Behavioral Objectives:** The researcher formulated (215) behavioral objectives, distributed across the six levels of Bloom's Taxonomy: remembering, understanding, applying, analyzing, synthesizing, and evaluating.
3. **Preparing Lesson Plans:** The researcher prepared lesson plans for the topics in the Teaching Methods course to be taught during the experiment, in line with the course content and the formulated behavioral objectives. These plans were based on the brainstorming and cognitive feedback strategies for the students in the two experimental groups, and on the traditional method for the students in the control group.

Sixth: Research Instruments: To identify the effect of the brainstorming and cognitive feedback strategies on the acquisition of educational concepts among third-year history students, the researcher developed two measurement instruments: an educational concepts acquisition test and a cognitive wandering reduction test. The following outlines the stages involved in creating these instruments:

First: The Educational Concepts Acquisition Test

1. Test Objective Definition: The purpose of this test is to assess third-year history students' grasp of the concepts mentioned in the Teaching Methods course during the academic year (2024-2025).
2. Operationalizing the Test Dimensions: The test dimensions were operationalized by adhering to the processes involved in acquiring school learning (i.e., definition, differentiation, and application).
3. Construction of the Test Items: The researcher constructed (60) test items of this kind, followed by four choices, one correct and one incorrect. Each concept was measured with three items that captured its operational process (definition, differentiation, and application).
4. Test Instructions: The researcher prepared the test instructions in two parts.
 - a. Directions: These included the test purpose, the number of items, how to answer with an example, the number of choices, and the time allowed to respond.
 - b. Scoring the test: One correct answer per item was scored 1, while an incorrect answer was scored 0; items left blank or with more than one answer were treated as wrong.
5. Validity of the test: To determine the test's face validity, its preliminary form was submitted to a group of experts and specialists in education and teaching methods. At a minimum, more than 80% of its items had an agreement rate (as defined by the agreement percentage formula). In view of experts' observations and suggestions, changes in the wording of some items on the preliminary test led to a 60-item final test.
6. Pilot Test:
 - a. Pilot Test: To clarify the test instructions and items and determine an appropriate time for the test, the researcher administered the test to a pilot sample of 34 male and female students at the University of Kufa/College of Education. The test was conducted under the researcher's direct supervision, and the researcher also documented all problems encountered by other researchers when administering the International CEF test. There were no reports of clarity in the instructions or items in the pilot. I calculated the average time of the sample, which is 85 minutes; this is the test time.
 - b. Statistical Analysis Sample: After conducting a pilot test and ensuring the clarity of the test instructions and items, and determining the appropriate time for its administration, the researcher administered the test at Al-Mustansiriya University/College of Education to a statistical sample of (100) male and female students. This was done to support statistical analysis of the test's assessment of educational concept acquisition. The test was administered under the researcher's direct supervision. After completion of the scoring, the students' scores were arranged in descending order from highest to lowest, in preparation for the statistical analysis of the test items, which included the following:
 - Item Difficulty Index: When calculating the difficulty index for each multiple-choice test item, the researcher found that the index ranged from 0.31 to 0.68, indicating that the test was appropriate and valid.
 - Item Discrimination Index: After calculating the discrimination index for each test item, the researcher found that the three levels ranged from 0.30 to 0.62, indicating that all test items were of good quality.
 - How Effective Are Wrong Choices: We calculated the effectiveness of wrong choices for each test question, and it ranged from -0.036 to -0.298. That is, it was of such a nature that it brought in the maximum number of students from the bottom group and the minimum from the top group.
7. **Reliability of the test:** The researcher used the split-half method to estimate the reliability coefficient, which is the most widely used method for measuring test reliability. The Pearson correlation coefficient was computed using the split-half method; the result was corrected using the Spearman-Brown formula (0.902). The test is said to have good reliability.

Second: Cognitive Wandering Reduction Test:

1. Development of test items: The Cognitive Wandering Reduction Test, a 36-item objective (multiple-choice) test, was developed.
2. Test Directions: Instructors provided students with specific instructions on how to answer test items, illustrating what a correct answer looks like, so students do not lose marks due to misunderstandings of what constitutes an accurate answer. The instructions also covered the marking allocation for each question and the time allocation for each item.
3. Model Answer Key: A model answer key was generated for each test item, giving 1 point for a correct answer and 0 for an incorrect answer.
4. Validity of the test: Face validity was ensured by the initial version, which was briefly presented to experts and specialists in education and teaching methods. Using Cooper's agreement rate formula, the maximum agreement rate of 100 was achieved for at least 80% of each item (108/132, 81.8%). We revised and modified some things, while others were cancelled, based on their recommendations. The test that enabled them to achieve the highest testability was a 36-item final version.
5. Application Test Application to the First Pilot Sample: For the Cognitive Wandering Reduction Test, a pilot sample consisting of (30) male and female students at the University of Kufa/College of Education was selected. This pilot test was conducted to ensure that items and test instructions were clear, identify any ambiguous items, and estimate the time needed to finish the test. Accordingly, the test was allowed 80 minutes.
6. Step 3: Applying the test to the second exploratory sample: After the items and test instructions were clarified, and ambiguous items were identified and clarified, the test was administered to a sample of 100 male and female students at Al-Mustansiriya University/College of Education. This was a psychometric validation test to assess the properties of the test items.
7. Scoring of the test: The researcher scored the test by assigning 1 point for the correct answer, 0 points for the wrong answer, and 0 points for the answer that was not submitted, for a total score of 36 points.
8. Statistical Analysis of Test Items: After correcting the responses, the researcher arranged the scores in descending order from the highest score (35) to the lowest score (6). Thus, the number of students in the upper and lower groups was (54), as the scores in the upper group ranged from (35-15) and in the lower group from (12-6). Therefore, the test items were

statistically analyzed after being administered to the pilot sample to ascertain their discrimination index, difficulty, the effectiveness of the alternatives, and their reliability, as follows:

- Discrimination Index: The discrimination power equation was applied to the items, and discrimination power ranged from 0.32 to 0.61, as shown. These values are considered good.
- Item Difficulty Index: The results showed that the index ranged from 0.33 to 0.70. Based on this, the test items' difficulty level is considered appropriate; therefore, all test items are acceptable with a proper difficulty index.
- Effectiveness of the Alternatives: After calculating the efficacy of the incorrect alternatives, it was found to range between (-0.07 and -0.27). This indicates that the incorrect alternatives attracted more students from the lower group than from the upper group. Therefore, the researcher decided to retain the item alternatives.
- Test Reliability: After administering the test, the Kuder-Richardson formula (-20) was used to calculate the reliability of the test items using internal homogeneity, as it is the most suitable method for objective tests. The reliability coefficient was 0.86, indicating a high degree of reliability.

Seventh: Statistical Methods: The researcher used SPSS statistical software to conduct the research and analyze the results.

Chapter Four / Presentation and Interpretation of Results

First: Presentation of Results

- The First Main Hypothesis: To verify the hypothesis, the researcher calculated the arithmetic mean and standard deviation for the students in the research groups. Table 4 illustrates this:

Table (4): Arithmetic Means and Standard Deviations of the Three Research Groups in the Test of Acquiring Educational Concepts

The group	Number of individuals in the sample	arithmetic mean	standard deviation
Experimental Group 1	32	61,13	3,405
Experimental Group 2	31	56,10	3,134
Control Group	30	45,60	2,647

Table (5): One-way analysis of variance for the three research groups in the test variable: acquisition of educational concepts for the teaching methods course.

Source of Variation	Sum of squares	Average of squares	Degree of freedom	F value		Level of significance (5%)
				Calculated	The schedule	
Between groups	3306.200	1653.100	2	26.046	3.15	significant
Within groups	3282.200	63.469	90			
The whole	6588.400		92			

Therefore, the null hypothesis is rejected, and the alternative hypothesis is accepted, in favor of the first and second experimental groups.

Table (6): Calculated and tabulated Scheffé values for comparing the mean scores of the three research groups on the test of acquiring educational concepts.

The group	Sample size	arithmetic mean	Scheffé value		Level of significance (5%)
			Calculated	The schedule	
First Experiment	32	61,13	15,53	3,98	significant
Controller	30	45,60			
Second Experiment	31	56,10	10,5		significant
Controller	30	45,60			
First Experiment	32	61,13	5,03		significant
Second Experiment	31	56,10			

The table above shows the results of the differences between the three research groups in the test of acquiring educational concepts. To determine the differences between the first experimental group and the control group, the results showed that the students in the first experimental group outperformed those in the control group. The researcher also performed calculations to compare the second experimental group with the control group, indicating that the students in the second experimental group outperformed those in the control group. Furthermore, the results of the third post-test comparison between the two experimental groups showed differences in the test of acquiring educational concepts, favoring the first experimental group.

- Results related to the second null hypothesis: To verify the hypothesis, the researcher calculated the arithmetic mean and standard deviation for the students in the research groups. Table (7) illustrates this:

Table (7): Arithmetic means and standard deviations of the three groups in the cognitive wandering reduction test

The group	Number of individuals in the sample	arithmetic mean	standard deviation
Experimental Group 1	32	82,28	19,934
Experimental Group 2	31	75,84	14,806
Control Group	30	65,33	8,531

To test the significance of differences among the three groups, the researcher used a one-way ANOVA, as illustrated in Table 8 below.

Table (8): Results of one-way ANOVA for the scores of the three research groups in the post-test of reducing cognitive wandering

Source of Variation	Sum of squares	Average of squares	Degree of freedom	F value		Level of significance (5%)
				Calculated	The schedule	
Between groups	1997.489	998.744	2	52.989	3.15	significant
Within groups	1696.333	18.848	90			
The whole	3693.822		92			

Therefore, the null hypothesis is rejected, and the alternative hypothesis is accepted, in favor of the first and second experimental groups.

Table (9): Calculated and tabulated Scheffé values for comparing the mean scores of the groups on the cognitive wandering reduction test.

The group	Sample size	arithmetic mean	Scheffé value		Level of significance (5%)	
			Calculated	The schedule		
First Experiment	32	82,28	16,95	2.86	significant	
Controller	30	65,33	10,51			significant
Second Experiment	31	75,84				
Controller	30	65,33				
First Experiment	32	82,28	6,44			significant
Second Experiment	31	75,84				

The table above shows the results of the differences between the three research groups in the cognitive wandering reduction test. To determine the significance of the difference between the first experimental group and the control group, it was found that the students in the first experimental group outperformed those in the control group. The first experimental group also outperformed the control group in reducing cognitive wandering, as shown in Table 9 above. The first experimental group outperformed the second in the cognitive wandering reduction test, and the second group outperformed the control group. The table clearly shows that the first experimental group outperforms the second in reducing cognitive wandering.

Secondly: Interpretation of Results:

- These combined efforts helped focus the students on the essential ideas while reducing cognitive distraction from irrelevant stimuli and cognitive wandering, enabling them to understand more efficiently.
- The brainstorming technique allowed students to take time to organize the facts and ideas they had before learning, creating an organized knowledge network and ensuring that new information could be connected to their existing knowledge.
- This form of cognitive feedback motivated learners to revisit the content they had learned and recall information, thereby reinforcing cognitive retention and enabling the correction of mental mistakes to develop a higher level of concept acquisition.
- The two strategies allowed the students to self-monitor and control their attention, thereby reducing mind wandering, as they were more aware of their focus during learning and were able to better redirect their attention when they became distracted.

Third: Conclusions: In light of the research findings, the following can be concluded:

1. This mind-flight strategy fosters a sense of novelty in academic achievement, driving students' motivation to understand scientific concepts more deeply, as emphasized through role-play or by expressing the idea in as many ways as possible. On the contrary, since the traditional method is limited to conventional ways of presenting information that do not trigger higher-order thinking skills, the scope of learning and the depth of understanding are limited.
2. A cognitive feedback strategy refines ideas and focuses on the information most salient and consequential to student achievement. This facilitates knowledge retention and organization. On the other hand, conventionally, there is no organized screening for ideas; therefore, ideas that are not necessarily part of the initial discourse can stray from the focus, resulting in a loss of the main idea and leaving the reader with a deficit in the scientific idea.
3. The cognitive feedback approach encourages students not to let their minds roam free but instead to sort and unpack their thoughts. This incentivizes them to minimize mental wandering more flexibly and dynamically during problem-solving. By contrast, the classic method does not offer tools to categorize or filter ideas, making it harder for students to limit mind-wandering, which in turn hampers the creative abilities they can develop.

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

1. Adopting the mental wandering and cognitive feedback strategies within the teaching methods courses in colleges of education, given their effective role in improving the acquisition of educational concepts and developing focus and attention during learning.
2. Training faculty members in colleges of education to apply modern strategies based on analytical thinking and cognitive self-regulation, thereby contributing to reducing cognitive wandering and enhancing the efficiency of active learning.
3. Redesigning university curricula in a way that encourages students to engage in deep intellectual interaction and continuously review acquired knowledge, thereby reducing cognitive wandering and promoting achievement and organized thinking.

Fifth: Recommendations: To complement this research, the researcher suggests conducting the following studies:

1. Conducting follow-up studies that examine the effectiveness of the brainstorming and cognitive feedback strategies in developing other variables, such as critical thinking, problem-solving skills, or academic achievement in different subjects.
2. Conducting similar studies in other educational disciplines to verify the effectiveness of the brainstorming and cognitive feedback strategies in different learning areas, such as curriculum and teaching methods, or educational psychology.
3. Designing training programs for teachers and student teachers that include practical applications of brainstorming and cognitive feedback strategies within classroom settings, enabling them to employ these strategies in their teaching practices effectively.
4. Utilizing the research findings in developing teaching methodologies in colleges of education, so that they include applied units that integrate future thinking, cognitive review, and attention guidance, to enhance concept acquisition and reduce mental distraction among students.

Reference

1. R. G. Al-Jubouri, "The Low Level of Acquisition of Educational Concepts among University Students," Nasq Journal, vol. 14, no. 5, Baghdad, Iraq, 2020.
 2. H. A. Al-Abadi, "Educational Concepts and Their Relationship to Personality Types Among University Students," Ikleel Journal, vol. 41, no. 45, Baghdad, Iraq, 2021.
 3. S. K. Ayash, Constructivist Theory and Metacognitive Strategies. Amman, Jordan: Dar Al-Radwan for Publishing and Distribution, 2021.
 4. S. N. Al-Ubaidi, Constructivist Theory: The Future of Learning in the 21st Century (Models and Strategies). Amman, Jordan: Dar Amjad for Publishing and Distribution, 2023.
 5. N. S. Al-Samarrai, Modern Strategies in Teaching Methods. Amman, Jordan: Dar Al-Manahij for Publishing and Distribution, 2021.
 6. H. H. M. Al-Saadi, The Effective Teacher and Their Teaching Strategies and Models, 2nd ed. Diyala, Iraq: Al-Shuruq Printing and Publishing Office, 2020.
 7. S. M. Abdullah, Constructivist Learning and Educational Concepts. Lebanon and United Arab Emirates: Dar Al-Kitab Al-Jami'i, 2015.
 8. Z. Z. Tariq, The Cognitive Structure of Concept Acquisition: Learning and Teaching. Irbid, Jordan: Dar Al-Amal for Publishing and Distribution, 2022.
 9. Y. A. Al-Tamimi et al., Dictionary of Terms in Psychological, Educational and Physical Sciences. Amman, Jordan: Dar Al-Radwan for ISSN 2598-991X (online), <https://ijemd.umsida.ac.id>, published by Universitas Muhammadiyah Sidoarjo
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Publishing and Distribution, 2018.

10. R. M. Al-Fares, *Constructivist Theory and Science Teaching Strategies*, 2nd ed. Amman, Jordan: Dar Al-Shorouk for Publishing and Distribution, 2022.
11. H. Al-Fatlawi, *Psychology of Psychology and Teaching Methods*. Babylon, Iraq: Al-Sadiq Foundation for Publishing and Distribution, 2022.
12. N. Abdul-Amir and A.-A. D. Atef, *Constructivist Theory: Active Learning and Creativity*. Amman, Jordan: Dar Al-Ayyam for Publishing and Distribution, 2020.
13. J. A. F. Muhammad, *Teaching Strategies and Enjoyable Learning: Applied Models*. Amman, Jordan: Al-Muttahida for Publishing and Distribution, 2022.
14. M. I. Al-Bawi and T. H. Al-Shammari, *Contemporary Models and Strategies in Teaching and Assessment*. Damascus, Syria: Dar Amal Al-Jadeeda for Publishing, Printing and Distribution, 2020.
15. S. G. T. Al-Safrawi, *Active Learning Strategies: Scientific Activities and Applications*. Amman, Jordan: De Bono Center for Thinking Skills, 2020.
16. S. A. Zayer and I. F. Al-Bayati, *Serious Creativity and Creative Writing*. Amman, Jordan: Dar Al-Radwan for Publishing and Distribution, 2020.
17. K. Dakhil, S. Muhammad, and M. A.-M. Al-Kinani, *The Psychology of Education: Between Theory and Practice*. Beirut, Lebanon: Dar Al-Nahda Al-Arabiya, 2020.
18. S. M. Al-Hadidi and S. A. Al-Badrani, *Generative Education in Acquiring Islamic Concepts and Developing Reflective Thinking*. Amman, Jordan: Arab Community Library for Publishing and Distribution, 2020.