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The Impact of using Cognitive Trips Across Web Quest in the Development of Mathematical Concepts for Seventh Graders in Geometric Units in Yemen Schools

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ABSTRACT

This study aimed to investigate the effect of teaching using tablet computers and educational applications on the academic achievement of seventh-grade students in mathematics in Sana'a, Yemen. The study sample consisted of 87 students, purposefully selected, and randomly divided into two groups: experimental (45 students) taught using tablet computer applications, and control (42 students) taught using traditional methods. Using a reliable and valid achievement test, the study found statistically significant differences in students' academic achievement levels (recall, comprehension, understanding, application, and higher-order thinking skills). These differences were attributed to the teaching method using tablet computers, favoring the experimental group. The study recommends implementing innovative solutions to transform the educational process significantly. This can be achieved by integrating tablet computers and educational applications into the learning process, making them the focal point of the teaching process.

***Keywords**: Educational Applications, Tablet Computers, Academic Achievement, Mathematics.*

Introduction

The current era is witnessing tremendous developments in the field of information and successive changes in science and technology. As we see in the field of education, the integration of technology is increasingly becoming a focal point for enhancing learning experiences and outcomes. Especially in mathematics education, where abstract concepts often pose challenges for students, making use of digital tools promises to engage students and promote deeper understanding. This rapid development and successive changes in information and knowledge, and the revolution of inventions, necessitate keeping pace with rapid and successive developments in various fields of science and knowledge, including teaching. Teaching is an essential aspect of human life. It has imposed on teachers the need to learn how to use information and communication technologies and integrate and employ them as effective tools in the educational process. It is not only about knowing how to operate the machine but also how to use it to meet students' needs to achieve the desired learning outcomes. Therefore, Al-Far (2000) pointed to the need to focus on the learner's role in learning through research, experimentation, and investigation methods. However, integrating information technology into the educational process poses a continuous challenge for teachers; they need to provide new effective teaching methods that enable the learner to learn independently and work within a team to achieve the desired goals under the teacher's guidance. The computer is considered an advanced technology that can provide an integrated approach and curriculum for teaching and learning various subjects and academic topics at a time when ministries of education are working to develop well-equipped schools.

Dealing with innovations in information technology and employing them in education is a necessity imposed by the requirements of the technology age. Cognitive and technological developments have become significant factors in achieving quality in educational institutions. This has imposed on teachers and students the need to acquire new skills and abilities that enable them to employ e-learning techniques and use them effectively (Abu Khatwa, 2011).Learning mathematics necessitates the

acquisition of specialized skills, particularly in visualizing geometric shapes and understanding the relationships between them. Mastery of geometry, in particular, hinges on a set of unique abilities, including comprehension and practical application. Learning geometry demands that students possess sensory perception and visual adaptability. Consequently, the integration of audiovisual teaching aids to cultivate these specialized skills has become imperative. Central to this endeavor is the role of instructional tools like computers, which wield a profound influence by stimulating and eliciting responses from learners. This influence extends beyond the classroom, ensuring the persistence of its impact in subsequent educational contexts.

In this regard, Hassanein (2006) pointed out the need to find an influential and pioneering teaching strategy that keeps pace with technological progress and utilizes the Internet as an inexhaustible source of knowledge to enrich the educational process with modern, effective methods that transform the teaching process into an enjoyable and efficient learning process for students without wasting time and effort for the teacher. Web quest cognitive trips are one of the models of e-learning that combines educational planning and the use of computers and the Internet to help students invest their time and develop higher-order thinking skills, in addition to teaching students discovery and problem-solving skills to find appropriate solutions to the problems and tasks at hand.

Artino (2008) substantiated the contention that extant pedagogical approaches employed by educators often inadequately facilitate the comprehensive development of students' conceptual understanding, encompassing proficiency in mathematical problem-solving and spatial visualization skills. Consequently, educational establishments are impelled to judiciously leverage accessible resources in the instructional milieu, cognizant of selecting modalities and methodologies congruent with contemporary advancements.

The successful preparation of learners in the twenty-first century relies on their cognitive abilities and the effective use of information and communication technologies in education. Educational tools and stations are also utilized to enhance lessons and improve students' learning experience, leading to better academic performance and cognitive development.

Thus, they can solve their real problems in meaningful tasks in various academic subjects (Fujitani & Ota, 2011, pp. 3-10).Mathematics teaching has recently witnessed tremendous developments to keep pace with the characteristics of the scientific era and the explosion of scientific knowledge. The optimal use of educational technologies and cognitive and technical expansion with creative scientific skills inspires these developments. The vision of new learning in mathematics education that incorporates innovative technologies requires changing teaching methods and roles by focusing on an integrated view of the practical and theoretical aspects of teaching mathematics for various purposes (Al-Shatnawi& Al-Obaidi, 2006). Hammad and Al-Sawi (2002) emphasized that the most critical latent factors behind students' poor achievement and low level, as well as the weakness of their cumulative average, are teaching methods and techniques used in instruction, the teacher, curricula, and examinations.

A Web Quest is a teaching method where students engage in online inquiry, using web resources to explore topics or solve problems. Educators design Web Quests to encourage higher-order thinking through a structured sequence of tasks, promoting student-centered learning. Teachers act as facilitators, promoting collaboration, critical thinking, and information literacy. Studies conducted on the Web Quest cognitive journey strategy have proven its effectiveness in raising student achievement and supporting the acquisition of concepts in various academic subjects, including mathematics. For example, Jumaa and Ahmed (2012) confirmed that the Web Quest cognitive journey strategy is one of the modern trends through which we achieve effective and active learning in the educational process. Allan and Street (2007) confirmed the effectiveness of the Web Quest method in training mathematics teachers, as well as in developing their positive attitudes. While the results of Abu Kharma's (2013) study indicated the importance of education using cognitive trips in developing and acquiring critical thinking and scientific concepts, the results of Al-Omari's (2010) research indicated that using cognitive trips, a computerized mathematics approach, in learning mathematical concepts contributes to students' enjoyment of their experience.

It is clear from the above that there is interest at the global and local levels alike in using cognitive trips in teaching in general and in mathematics instruction, in particular, given the positive evidence that this approach is developing thinking skills, creative skills, and students' achievement. Of the studies that I have reviewed in this field, they dealt with the effect of employing Web Quest cognitive trips in teaching curricula. Some studies were in the field of science, some in languages and social studies, and some in the field of mathematics. Some studies examined the effect of cognitive trips in

developing critical thinking, some in developing motivation, some in acquiring scientific and mathematical concepts, some in developing reflective thinking, others in developing critical thinking, some in developing direct and delayed achievement among students, and some examined students' attitudes towards them. This study focused on the application of Web Quest in the development of students' understanding of mathematical concepts.

In my experience as a mathematics teacher in Yemen, I noticed that the education systems there are witnessing rapid developments. There has been tremendous progress in the field of information and communication technologies, with the services, knowledge, and databases they provide, as well as renewed books and information sources, and specialized and diverse educational websites on the Internet. It is essential to take advantage of them to serve the educational process in general and mathematics, in particular, as it represents the language of the mind and the pinnacle of abstract thinking that encourages reflection and innovation in various fields of knowledge that contribute to building students' skills and abilities and developing mathematical concepts. Mathematics is a science that turns the world into symbolic codes and symbolic relationships. Yet despite its increasing importance, diversity of uses, and applications, many students in Yemen have difficulties in mathematics in their dealing with geometric shapes and concepts and finding relationships between them. This may be due to the students' weakness in understanding geometric mathematical concepts.

Al-Far (2000) emphasized the importance of focusing on learners' roles in the learning process through research, experimentation, and investigative methods. Integrating information technology into instruction poses a perpetual challenge for educators. They must devise novel and effective teaching approaches that empower students to learn independently while collaborating within a team, all guided by the teacher. Computers represent advanced technology that offers a comprehensive framework for teaching and learning across various subjects. Educational ministries worldwide are striving to equip schools with these technologies.

Artino (2008) noted that traditional teaching methods in many schools remain inadequate in developing essential skills such as problem-solving and spatial visualization. Mathematics education has undergone significant developments to align with contemporary scientific advancements and creative problem-solving skills. To achieve the desired outcomes, educational institutions must integrate technological resources into their teaching processes.

Al-Omari (2010) discovered that using computerized mathematics curricula enhances students' enjoyment and comprehension, provided that mechanical education principles align with teaching practices. Abu Kharma's (2013) findings highlighted the importance of employing cognitive trips in education for developing critical thinking and acquiring scientific concepts. Studies exploring the WebQuest cognitive trip strategy have demonstrated its effectiveness in improving student achievement and concept acquisition across various subjects. For example, the research conducted by Jumah and Ahmad (2012) confirmed that the WebQuest cognitive trip strategy fosters effective and active learning. Allan and Street (2007) underscored its effectiveness in training mathematics teachers and positively enhancing their attitudes.

The crux of the research problem in this study arises from the pressing demand for novel pedagogical methods that deviate from conventional approaches within the mathematics curriculum, in particular in relation to the teaching and learning of mathematical concepts. While educators possess expertise in teaching fundamentals and methodologies, they may grapple with a shortage of technological and pedagogical know-how. This challenge is particularly acute for many teachers in Yemen. Enter the Web Quest cognitive trips—a constructive model designed to bridge the technological and pedagogical gaps among mathematics educators. This model equips teachers with essential strategies for leveraging computers and technical techniques in teaching, rooted in processes of inquiry and exploration on the internet. It aims to streamline access to information, nurture various cognitive skills (such as analysis, comprehension, and perception), and bolster computer literacy among students. This approach also empowers students to become intrepid explorers in their cognitive journeys, catering to their unique needs and cultivating positive attitudes toward learning. Additionally, it offers ample opportunities for students to access diverse information sources and enhances their capacity for peer discussion and collaboration.

Given this context, we sought to develop a comprehensive understanding of the Web Quest cognitive trip strategy and explore how it can prove beneficial to both male and female schoolteachers. Their role as teachers has transcended mere information dissemination and now encompasses guiding, counseling, and facilitating students' educational journeys. Teachers are increasingly tasked with

surmounting the challenges and obstacles students encounter in grasping complex facts and information. Thanks to advanced technological tools, students can swiftly access the information they require with minimal effort, thereby preparing them for self-directed learning and augmenting their cognitive and sensory skills. These skills, in turn, enhance their research, discovery, and knowledge-building capabilities.

Considering these considerations, the primary research question guiding this study is as follows:

- How does the utilization of WebQuest cognitive trips influence the development of mathematical concepts among seventh-grade students in the geometry unit within Yemeni schools?

Objectives of the Current Study

To address the pressing need for innovative pedagogical methods in the mathematics curriculum, this study aims to achieve several specific objectives:

Firstly, it seeks to assess the impact of WebQuest cognitive trips on the development of mathematical concepts among seventh-grade students, with a particular emphasis on the geometry unit within Yemeni schools. By doing so, the study aims to provide empirical evidence of the effectiveness of this e-learning approach in enhancing students' grasp of complex mathematical ideas.

Secondly, the research aims to determine the extent to which the use of WebQuest cognitive journeys contributes to improving students' cognitive skills of analytical thinking, as well as understanding and problem-solving abilities to master mathematical concepts. These skills help focus on the broader educational benefits of this teaching strategy.

Further, the study aims to discover the factors that encourage the use of WebQuest cognitive journeys in the mathematics curriculum. As well as encouraging students' attitudes towards learning mathematics and their levels of participation when they are exposed to this educational approach. Gaining a clear insight into these motivational aspects can help teachers design their own methods that better suit students' needs.

Furthermore, the research aims to study the practical aspects that help implement cognitive trips in the classroom and to evaluate the extent of teachers' readiness to use it and the technology-based teaching method, as well as the ability of students to continue with this approach to learning.

Also, this study seeks to know the long-term impact of cognitive journeys and their ability to apply mathematical concepts independently in real-world contexts. Understanding how this teaching approach affects students outside the classroom helps teachers and policymakers make appropriate decisions.

Finally, provide recommendations for practical steps for teachers, curriculum designers, and policy makers to facilitate the effective integration of technology-based teaching methodologies, such as WebQuest, for mathematics education in Yemeni schools. In addition, it enhances mathematics education and provides students with the necessary skills.

Methodology

This study employed a quasi-experimental methodology with a pre-post design involving two unevenly sized groups to assess the impact of utilizing WebQuest cognitive trips on the development of mathematical concepts among seventh-grade students in Yemeni schools. This necessitated the creation of two groups: one experimental and the other a control group with the same teacher. The experimental group received instruction using the WebQuest method, while the control group received traditional classroom instruction. Both groups covered unit six (measurement) from the seventh-grade mathematics textbook during the second semester of the 2015/2016 academic year. Data collection occurred in two stages: pre-intervention (before implementing the WebQuest method) and post-intervention (following the WebQuest method). Statistical analysis was conducted to validate the study's hypotheses.

In this research, the traditional method of teaching was lecture-based, where the teacher delivers lectures and explains concepts, theories, and problem-solving methods, and uses textbooks. The students are usually asked to solve a set of problems assigned by the teacher, where the students practice applying the concepts that are taught. In traditional classroom settings characterized by limited student engagement, interactions between students and teachers predominantly occur within the confines of the classroom, with scant avenues for collaborative learning. In such environments, students often prioritize rote memorization and procedural problem-solving techniques, while the teacher assumes a central role in the educational process. Evaluation predominantly relies on tests and problem sets to assess student comprehension and mastery of content.

In contrast, the WebQuest method begins with an introductory overview of the unit's topic, providing context and relevance to real-world engineering applications. Students have access to curated online resources related to the unit topic. These resources are carefully selected to enhance understanding and engagement. In addition, WebQuests often include elements of cooperative learning where students work in groups to complete assignments, share results, and provide peer reviews. This plays a role in developing students' teamwork and communication skills. Assessment and feedback in WebQuests include various formats such as online quizzes, reflective journals, or multimedia presentations. Educational technology in general, of which WebQuest is one of its methods, caters to different learning styles and preferences and self-learning in which students have the flexibility to advance at a pace that suits them and to revisit concepts or resources as needed to deepen their understanding. Here the evaluation is continuous with immediate feedback, allowing for continuous improvement.

Study Participants

The study encompassed 87 female seventh-grade students at Al-Zahra School, affiliated with the Education Directorate of the Al-Thawra District, during the 2015/2016 academic year. This school was chosen for its readiness to implement WebQuest-based teaching. The collaboration of the school's principal and mathematics teacher with the researcher facilitated study procedures and helped control potential extraneous variables. Two relatively similar sections were randomly selected, with Section A (comprising 45 students) designated as the experimental group, instructed using the WebQuest method, and Section B (comprising 42 students) designated as the control group, receiving conventional teaching.

For teaching the experimental group, the researcher conducted activities for each concept of the sixth unit (Measurement) for seventh-grade geometry using the WebQuest method. This material was reviewed by a committee of experts specialized in curriculum, teaching, and educational technology at the Faculty of Educational Sciences at the University of Jordan. The set was designed using FrontPage and implemented in a computer lab to be compatible with the

WebQuest Method

After that, a test was created from the questions at the end of this unit by the researcher to evaluate the mathematical concepts in geometry (unit five) from the mathematics book for the seventh grade during the second semester of the 2015/2016 academic year. This objective test consists of 20 multiple-choice items, each containing four alternatives and one correct answer, covering mathematical concepts within the units taught via WebQuest.

The unit contains 8 concepts (types of angles, relationship between angles, vertically opposite angles, parallel lines, perpendicular angles, congruent triangles, coordinate system, and reflection)To validate the mathematical concepts test, two aspects of validity were considered:

- **Content Validity:** The test underwent review by an expert committee comprising 11 referees specialized in mathematics curricula, teaching methods, mathematics educational supervision, and mathematics teaching. Their feedback was considered to refine the question wording and eliminate redundant items. The final test comprised 20 multiple-choice questions, each followed by four alternatives, with one correct answer. Each question was worth one mark, resulting in a total test score of 20 points.
- **Construct Validity:** The test's construct validity was assessed by administering it to a sample of 42 seventh-grade female students who were not part of the study group. The correlation coefficient between each item and the overall score on the mathematical concepts test was computed. These coefficients are presented in Table 1.

Table 1: The correlation coefficient between each item and the overall score on the mathematical concepts test was computed

Item Number	Correlation Coefficients	Item Number	Correlation Coefficients	Item Number	Correlation Coefficients	Item Number	Correlation Coefficients
1	.302	6	.511	11	.314	16	.406
2	.379	7	.479	12	.443	17	.303
3	.485	8	.521	12	.376	18	.459
4	.511	9	.310	14	.463	19	.402

In Table 1, the item correlation coefficients with the total score of the mathematical concepts scale among seventh-grade students fall within the range of 0.303 to 0.521. These values, deemed suitable for the present study, affirm the construct validity of the mathematical concepts scale.

Assessment of Mathematical Concepts Test Reliability

To ascertain the reliability of the Mathematical Concepts Test, it was initially tested with a sample for both construct validity and reliability, which is under the purview of the Education Directorate in Thawra District, Sana'a, the capital. The following aspects were investigated:

- **Determining Test Duration:** The test's time limit was established by computing the average time taken by both the quickest and slowest students to complete the test, resulting in an optimal time frame of 30 minutes.
- **Ensuring Clarity of Test Items:** During the finalization of the test, certain questions and illustrations were revised to enhance their clarity, as some had initially posed comprehension challenges for the students.
- **Assessing Question Difficulty and Discrimination Coefficients:** The difficulty coefficients for test items ranged from 0.24 to 0.86, with an ideal range falling between 0.30 and 0.70. Discrimination coefficients for individual items ranged from 0.03 to 0.66, with items of superior quality exhibiting discrimination coefficients of no less than 0.20. Table 2 provides a detailed breakdown of the difficulty and discrimination coefficients for each test question.

Table 2: Difficulty and Discrimination Coefficients of the Mathematical Concepts Test

Question Number	Discrimination Coefficients	Difficulty Coefficients	Question Number	Discrimination Coefficients	Difficulty Coefficients
1	0.21	0.74	11	0.20	0.68
2	0.36	0.24	12	0.10	0.80
3	0.51	0.62	13	0.24	0.78
4	0.66	0.42	14	0.27	0.68
5	0.12	0.27	15	0.39	0.77
6	0.03	0.44	16	0.66	0.42
7	0.33	0.30	17	0.27	0.53
8	0.24	0.30	18	0.48	0.39
9	0.40	0.69	19	0.33	0.86
10	0.33	0.56	20	0.54	0.30

- **Test Reliability Assessment:** The test's reliability was assessed using the Kuder Richardson 20 (KR-20) equation, which quantifies the internal consistency of tests where one point is awarded for a correct answer and zero for an incorrect one, as described by Zaytoon(1999). The reliability coefficient obtained using the KR-20 equation was 0.79, indicating a high level of reliability that is well-suited for this study. Additionally, reliability was confirmed using the Spearman-Brown split-half method, yielding a reliability coefficient of 0.776 for the mathematical concepts scale. These reliability coefficients are deemed appropriate for the present research.
- **Verification of Independent Variables:** To ensure the comparability of the experimental and control groups regarding their mathematical concepts proficiency, t-values were calculated based on the pre-measurement scores of the mathematical concepts scale. The results of this analysis are presented in Table 3.

Table 3: Descriptive Statistics and t-Test for Significance of Pre-Measurement Mean Score Differences on the Mathematical Concepts Scale Based on Training Program

Group	n	Mean	SD	t	DF	Sig.
Experimental	45	11.47	1.342	1.446	85	.152
Control	42	10.76	2.962			

Table (3) shows no statistically significant differences between the experimental and control groups on the pre-mathematical concepts scale, indicating equivalence of the two groups on the mathematical concepts scale.

Study Variables

This study examined two primary types of variables: independent and dependent. The independent variable in this study was the teaching method, categorized into two distinct levels: the WebQuest cognitive trips approach and the conventional teaching method. The dependent variable was the development of mathematical concepts in the seventh-grade students.

The experimental design was structured around two groups: an experimental group (EG) and a control group (CG). Both groups were administered a pre-test (O1) and a post-test (O2) measuring their mathematical concepts. The experimental group (EG) received instruction using the WebQuest cognitive trips (X), whereas the control group (CG) continued with the traditional teaching method. The detailed structure is as follows: The experimental group underwent a pre-test (O1) followed by the treatment, which consisted of educational material designed based on WebQuest cognitive trips (X), and then a post-test (O2) to assess the development of their mathematical concepts. The control group, by contrast, only took the pre-test (O1) and post-test (O2) without receiving any intervention.

In this design, "O1" represents the pre-test, "X" indicates the WebQuest cognitive trips treatment applied to the experimental group, and "O2" represents the post-test used to measure the students' mathematical concept development after the intervention.

Statistical Analysis

To address the research questions and test the study's hypotheses, a combination of descriptive and inferential statistical methods was utilized. Descriptive statistics, including means and standard deviations, were computed to summarize the data. Inferential statistics were applied using one-way analysis of covariance (ANCOVA) to assess the impact of the independent variable, the teaching method, on the dependent variable of mathematical concept development. ANCOVA was used to control for pre-test scores and to determine whether the use of WebQuest cognitive trips had a statistically significant effect on post-test performance.

The magnitude of the effect was measured using Eta Square (η^2), which provided an estimate of the effect size and indicated how much of the variance in post-test scores could be attributed to the teaching method.

Several additional statistical techniques were employed to ensure the validity and reliability of the mathematical concept scales. The point-biserial correlation coefficient was calculated to validate the construct validity of the test, ensuring that the items on the test were appropriately measuring the intended mathematical concepts. The internal consistency of the mathematical concept scales was assessed using the Kuder-Richardson 20 (KR-20) formula, which is a measure of reliability. In addition, the Spearman-Brown equation was used to correct the split-half reliability method, further ensuring the consistency and reliability of the test.

These statistical procedures helped confirm the robustness and accuracy of the results, providing a solid foundation for determining the effectiveness of WebQuest cognitive trips in developing students' mathematical concepts.

Results

The research question posed was as follows: "What impact does the implementation of WebQuest cognitive trips have on the development of mathematical concepts among seventh-grade students during the geometry unit in Yemeni schools?"

To address this question, the study computed the mean and standard deviations for both the pre-and post-measurements of two groups: the experimental group exposed to the WebQuest teaching method and the control group. These measurements were taken on the mathematical concepts scale among seventh-grade students in Yemeni schools. The results are presented in Table 4.

Table 4:. Mean and standard deviations between the experimental and control groups in the pre- and post-measurements of the mathematical concepts scale

Group	Pre-measurement		Post-measurement	
	Mean	SD	Mean	SD
Experimental	11.47	1.342	16.69	1.311
Control	10.76	2.962	13.95	2.603
Total	11.13	2.286	15.37	2.450

Table (4) illustrates that the mean score of participants in the experimental group for the mathematical concepts scale was 11.47 in the pre-measurement and increased to 16.69 in the post-measurement. Conversely, the mean score for participants in the control group was 10.76 in the pre-measurement and rose to 13.95 in the post-measurement. To ascertain the group to which these differences can be attributed, a one-way ANCOVA analysis was conducted, as depicted in Table (5).

Table 5: Results of one-way ANCOVA analysis of the post-measurement of the mathematical concepts scale between the experimental and control groups

Source	SS	df	MS	F	Sig.	(η2)
Pre-test	96.759	1	96.759	31.651	.000	.274
Teaching Method	122.696	1	122.696	40.136	.000	.323
Error	256.791	84	3.057			
Total	516.230	86				

Table (5) reveals statistically significant differences at the 0.05 significance level in the performance of the experimental and control groups on the mathematical concepts scale among seventh-grade students in Yemen after the treatment. Consequently, we reject the null hypothesis, which posited no statistically significant differences at the 0.05 level in mathematical concepts among seventh-grade students in Yemeni schools resulting from the variance in teaching methods, specifically between WebQuest cognitive trips and the traditional approach. This finding underscores distinctions between the two groups attributable to the instructional program.

To discern the group to which these differences can be attributed, we calculated the adjusted mean scores for both the experimental and control groups, as detailed in Table (6):

Table 6: The adjusted mean scores on the mathematical concepts scale for both the experimental and control groups based on the program variable

Group	AdjustedM	SE
Experimental	16.529	.262
Control	14.124	.271

The outcomes presented in Table (6) reveal that the adjusted mean score for the experimental group was 16.529, surpassing the adjusted mean score of the control group, which stood at 14.124. This indicates that the differences favor the experimental group, signifying that the performance of the experimental group in the post-measurement outperformed that of the control group.

In order to assess the effect size, we calculated Eta square, resulting in a value of 0.12. This translates to an effect size of 0.323, suggesting that approximately 32.3% of the variance in the mathematical concepts scale between the experimental and control groups can be attributed to the utilization of the WebQuest cognitive trips teaching method.

Discussion

This study holds considerable importance for several reasons. Firstly, it offers a valuable opportunity to discern the roles played by both teachers and students in the implementation of educational materials through WebQuest cognitive trips. This investigation aligns with the contemporary shift toward redefining educational technology and curriculum development. By shedding light on the dynamics between teachers, students, and technology, the study contributes to a deeper understanding of the evolving educational landscape.

Secondly, the research has the potential to significantly enrich the knowledge, beliefs, and attitudes of both students and teachers concerning WebQuest cognitive trips. This pedagogical approach, rooted in inquiry, targets and retrieves information from relevant Internet sources directly linked to assigned tasks, and represents an innovative teaching strategy. By facilitating rapid and accurate access to essential information with minimal effort, this study aims to broaden perspectives and enhance the appreciation of WebQuest cognitive trips as an effective educational tool.

An example of one of the concepts is the concept of parallel lines and how it was dealt with in the traditional way and WebQuest.

The concept of parallel lines, which are lines that lie within the same plane and do not intersect, is of great importance in geometry. These lines maintain a constant distance from each other at all points, regardless of their extension. This unchanging distance is a crucial defining characteristic of parallel lines and is symbolically denoted by ∥.

To facilitate understanding among students, the initial focus is on showing that parallel lines show identical directions. The unchanging distance between them along its entire length serves as a visual representation of equal distance. For example, Railroad Tracks: Parallel rails embody this concept by running side by side without converging. Opposite sides of a rectangle: In a rectangle, each pair of opposite edges act as parallel lines, displaying this geometric principle. Ruled lines on a sheet of paper: Parallel horizontal lines on a lined sheet of paper are a direct, everyday example of parallelism.

When introducing this concept, students engage in practical applications. First, they tackle the exercises on page 167, providing hands-on experience with parallel lines to enhance theoretical understanding. Students then independently complete the tasks on page 168, enabling them to apply the knowledge gained independently. Finally, students collaborate in pairs for the initial exercise on page 169, promoting collaborative learning and deeper understanding through peer interaction. This systematic approach ensures that students gain a comprehensive understanding of parallel lines through a combination of theoretical teachings and practical exercises.

The educational approach identified as WebQuest is distinguished by its reliance on an inquiry-based framework that utilizes digital tools to support student learning. To expound upon the topic of parallel lines using the WebQuest methodology, an interactive assignment can be designed to guide students towards discovery through online platforms.

Commencing the instructional session with a thorough introduction, students are presented with a detailed explanation of parallel lines. Subsequently, students are tasked with identifying instances of parallel lines in real-world contexts by leveraging a variety of online resources.

The progression of the WebQuest Activity unfolds as follows:

- **Initiation**
  - **In-depth Overview:** Students commence by exploring educational websites such as Khan Academy to acquire a foundational understanding of parallel lines.
- **Assigned Activity**
  - **Digital Exploration:** Students are directed to locate three concrete examples of parallel lines by browsing through online sources, thereby establishing a link between the concept and its practical implications.
- **Practical Involvement**
  - **Phase 1:** Students visit specific online platforms like Doodle Learning to delve deeper into the characteristics of parallel lines. Phase 2: They interact with instructional videos, including those on platforms like YouTube, to visually grasp the concept. Phase 3: Using tools like Paint, students create their own parallel lines and verify equidistance by measuring the distance between them. Phase 4: By exploring platforms like Pinterest for images of parallel lines in architectural contexts, students analyze the application of parallel lines in design and construction.
- **Evaluation**
  - **Presentation:** Students are required to develop a presentation or report summarizing their findings, incorporating graphs, definitions, properties, and practical examples of parallel lines to consolidate their research effectively.
- **Conclusion**
  - **Intellectual Discussion:** Ultimately, students engage in a conversation reflecting on how online exploration facilitated a deeper comprehension of parallel lines, highlighting the benefits of utilizing a variety of digital resources for educational objectives.

An illustrative example of a WebQuest Activity is presented:

- **Initiation**

Students commence their educational journey by studying parallel lines on the Khan Academy website to establish a theoretical basis.

- **Assigned Task**

Afterwards, students are prompted to identify three real-life examples of parallel lines, such as railway tracks, the edges of a rectangle, or lines on a page.

- **Practical Involvement**
  - Step 1: Students refer to resources like Math is Fun for further insights into parallel lines.
  - Step 2: They utilize tools like GeoGebra to construct and measure parallel lines, fostering a hands-on educational experience.
  - Step 3: By collecting and archiving images of parallel lines in architectural, natural, and artistic settings, students enhance their understanding through diverse illustrations.
- **Evaluation**

Students compile their research into a presentation encompassing definitions, characteristics, diagrams, and real-world instances of parallel lines.

- **Conclusion**

The activity concludes with a discussion on how various online resources contributed to a comprehensive and enriched understanding of parallel lines.

Through the implementation of the WebQuest approach, students actively engage in an immersive learning process, utilizing digital resources to explore, comprehend, and apply the concept of parallel lines in diverse contexts.

The study provides a platform to explore students' views on the mathematics subject and the new teaching strategy used as future research perspectives is crucial for tailoring educational approaches to their needs and preferences. This understanding can help educators and policymakers make informed decisions regarding curriculum design and teaching methodologies that resonate with students, ultimately fostering a more engaging and effective learning experience.

This study was subject to some limitations and scope considerations. The scope of this research was limited to the lessons included in the geometry unit of the mathematics curriculum for the seventh grade in Yemen. While mathematics education extends beyond this unit, this focused approach allows for an in-depth examination of the impact of WebQuest cognitive journeys within a specific subject area.

This study was for the seventh grade in a public school in Yemen, and its results were limited to this group. This was done at Al-Zahraa School in Sana'a, Yemen, to control this research environment. The research took place in 2015-2016 in the second semester, and all of this may affect the generalizability of the study results. Despite this, the study provides insight into mathematics education in Yemen and abroad.

Furthermore, the results obtained in response to the research question demonstrate statistically significant differences, with a significance level of 0.05, between the experimental and control group participants in their development of mathematical concepts among seventh-grade students in Yemen. These differences overwhelmingly favor the experimental group, highlighting the significant impact of utilizing WebQuest cognitive trips on enhancing the acquisition and development of mathematical concepts within the context of seventh-grade mathematics education, specifically at Al-Zahra School affiliated with the Education Directorate of Al-Thawra District.

This positive result can be attributed to several key factors. First and foremost, using WebQuest Cognitive Journeys can effectively attract students' attention through the activities carried out by the experimental group of students. This approach enables students to engage in knowledge exploration, identify cognitive content related to mathematical concepts, navigate this content, and present Interpretations and derivation of intellectual solutions. This comprehensive approach entails examining mathematical concepts, facts, theorems, and results, promoting a deeper understanding of engineering concepts and enabling students to address evaluative questions more effectively.

In addition, the use of WebQuest cognitive journeys may enhance motivation for active computer-based learning. In every aspect of the cognitive journey, students are mentally engaged, prompting them to use cognitive abilities that go beyond mere memorization and recall, which may encourage students to collect, analyze, apply, and build structures and mental images that link previously learned concepts with newly encountered concepts. As a result, cognitive development is facilitated.

Furthermore, the positive impact of WebQuest cognitive trips on the development of mathematical concepts may well be attributed to its ability to stimulate students' motivation and maintain their engagement. It underscores that effective learning takes place when mathematical concepts are acquired. This approach also acknowledges students' capacity for abstract thinking and the creation of abstract mental representations of mathematical concepts. These factors contribute to the establishment

of a rigorous educational environment conducive to the acquisition and development of mathematical concepts contained within the curriculum. WebQuest cognitive trips enable students to organize their knowledge, concepts, and facts by establishing relationships to explain phenomena and extend their practical applications. This affords students a valuable opportunity to construct mental representations of mathematical concepts embedded in the educational content.

The findings of this research align with previous studies conducted by Al-Omari (1999), Al-Omari (2010), and Abu Kharmah (2013), all of which revealed that the use of WebQuest cognitive trips enhances the acquisition of mathematical concepts.

Teachers need training to prepare them regarding the use of cognitive journeys and selection of web questions in teaching mathematical concepts. It is important to explore any obstacles or challenges that teachers face in integrating these methods into their educational practices. These challenges may include limited access to technology, lack of awareness or understanding of the educational benefits, or restrictions within the educational system, as well as scarcity of financial resources. Hence the importance of providing continuous professional development opportunities for teachers to enhance their skills in utilizing knowledge journeys and web tasks effectively.

This includes workshops, seminars, or peer learning communities that focus on sharing best practices and resources. The availability of resources such as time, funding, and technological infrastructure to support teachers in implementing these methods must be taken into consideration. Suggest strategies to allocate resources more effectively to facilitate the integration of cognitive journeys and web assignments into the curriculum.

Recommendations

Drawing from the study's results and conclusions, the following recommendations and suggestions are presented:

- Although the traditional method of teaching a geometry module in mathematics has its advantages, the WebQuest method provides a more dynamic and engaging approach that promotes critical and collaborative thinking and real-world application of geometry. By leveraging technology and online resources, WebQuests provides students with a richer learning experience tailored to meet the demands of the modern educational landscape.
- Incorporate mathematical curricula with educational activities designed to motivate students to investigate and explore information through the international information network.
- We advocate for training programs for teachers to integrate cognitive journeys and web assignments. Curriculum developers should include cognitive journeys in the seventh-grade math curriculum. Investment in infrastructure and technology is needed for digital learning tools. Collaboration, sharing experiences, and support among educators is encouraged.
- Promote awareness among education supervisors regarding the benefits of WebQuest cognitive trips and provide training courses for mathematics teachers to effectively utilize this approach in the teaching and learning of mathematics.

Declarations

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Conflict of Interest

The authors declare that they have no competing interests.

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