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THE IMPACT OF INTERACTIVE ACTIVITIES BASED ON WEBQUEST IN DEVELOPING PROBLEM-SOLVING SKILLS AMONG COMMUNITY MEMBERS

ABDULLAH SULIMAN ALMUTLAQ
DEPARTMENT OF EDUCATIONAL TECHNOLOGY, COLLEGE OF EDUCATION, QASSIM UNIVERSITY, SAUDI ARABIA

RANA IBRAHIM ALASQAH
DEPARTMENT OF EDUCATIONAL TECHNOLOGY, COLLEGE OF EDUCATION, QASSIM UNIVERSITY, SAUDI ARABIA

Abstract:
The study aimed to explore the impact of interactive activities based on WebQuest on developing problem-solving skills among community members. To achieve this objective, the study adopted the quasi-experimental method. The study sample involved (60) participants from Saudi community aged between (13-18) years, who were randomly selected and distributed into two experimental groups in a random manner to determine the impact of the two types of WebQuest (short-term/long-term). The study instrument was a test to measure problem-solving skills. The study came up with several key findings, most prominently that interactive activities based on both types of WebQuests (short-term/long-term) positively influenced the development of problem-solving skills among community members. However, no statistically significant differences were detected at the established significance level between the mean post-test scores of participants in the two experimental groups (short-term/long-term) regarding problem-solving skills. Interactive activities based on WebQuest stimulated participants' creativity and helped them apply knowledge, as well as enhanced critical thinking and expanded their cognitive horizons.

Keywords: Interactive Activities, Community Members, WebQuest, Problem-solving Skills.

INTRODUCTION:

Considering the rapid advancement and development in various fields of life, modern education has focused on leveraging digital technology and enhancing the role of the individual. This aims to foster development in various aspects, including cognitive, social, and psychological growth, through engaging in interactive activities of different types. Such activities significantly influence the formation of an individual's personality within their community, broaden their cultural horizons, and equip them with diverse knowledge. When participants engage in interactive activities, they participate actively in collaborative work, discover their interests, develop their talents, and skills such as time management and organization. Therefore, interactive activities would contribute to achieving several educational objectives that educational institutions strive for, such as creating effective participants capable of serving their community and country.

According to this context, WebQuest have been arose as one of the collaborative inquiry activities, that drive participants to seek information and knowledge by guiding their exploration of specific electronic sources on the internet and collaborating within a group to produce a useful digital product. This supports the modern educational approach that focuses on teaching participants how to acquire knowledge independently (Halat & Kaiqrakus, 2014). Learning based on a deep understanding of knowledge enables participants to apply, produce, and use that knowledge to solve problems they encounter in their lives (Saba et al., 2023). WebQuests are "an inquiry-oriented activity that allows students to use the Internet to acquire new knowledge and expand their understanding" (p.5) (Salem, 2022).

The philosophy of WebQuests is grounded in a set of theories, such as the communicative theory, which highlights learning via digital networks and bringing technology and online tools into education. This approach engages participants through interactive activities and other means to maintain an active role for the individual and motivate them to learn (Barkley, 2010). WebQuests are regarded as effective activities that allow participants to exchange ideas and feelings through internet tools, using these tools to facilitate collaborative work in completing tasks and learning together remotely (Perifanou, 2025). WebQuests significantly support project-based learning (PBL) as a constructive learning approach, helping participants to acquire knowledge at a high level and develop social skills while being able to solve everyday life problems (Krajcik & Blumenfeld, 2006).

WebQuests rely on social constructivist theory, which emphasizes that people learn through communicating and socially engaging with others (Moedritscher, 2006). In this approach, learning occurs through tasks situated in a collaborative learning environment characterized by dialogue and acceptance of others' opinions. participants utilize technologies to construct their own knowledge through interactive activities that allow for their active participation in building meaningful knowledge (Salem, 2022). Meaningful learning is enduring, as it connects

what the learner acquires to their prior experiences, tends to align new information with sensory experiences, and links it to reality using real or embodied models. This is what WebQuest encompasses their components, by applying knowledge and producing useful outputs such as electronic mind maps and others.

WebQuests, as classified by Dodge (2001) and Seitkazy et al. (2016), are divided into two main types, Short-term WebQuests and Long-term WebQuests. Short-term WebQuests are tasks that last from one to four days. Their goal is to access and understand information sources then retrieve them; thus, to acquire and integrate knowledge. The tasks of these WebQuests require simple mental processes, such as accessing and retrieving information sources. They are used by non-practicing and novice Internet users. The individual presents the results of the WebQuest in a simple way, such as a short presentation, discussion, or answering specific questions. Their impact on developing critical thinking skills and soft skills for example communication, time management, and professional skills and other skills among participants has been proven (Medvedeva, 2023; Bilir & Özdilek, 2024). The other type is the Long Term WebQuest, which is a task that lasts from approximately one week to one month. The goal is to answer questions central to the work task, apply and evaluate knowledge, and provide the individual with in-depth thinking skills. The tasks of these WebQuests require advanced mental processes such as analysis, synthesis, and evaluation. They are used by participants capable of using computers and their programs, where the individual presents the WebQuest results presented as oral presentations, research, publishing pages on the Internet, or presenting conceptual maps. Their impact has been proven in developing the depth of knowledge, developing critical thinking. It also promotes interest in the content and engagement in learning, improving motivation to achieve, communication skills, using the Internet, programming, and other skills (Zhou et al., 2012; Al-Harbi, 2020; Al-Mohammadi, 2023).

The importance of WebQuests in their ability to support and develop some 21st century skills among community members, such as integration and cooperation, critical and creative thinking, digital literacy, and the development of electronic skills (Maravelaki, 2016; Salem, 2022; Al-Toubi & Mai, 2024). The more an individual participates in the learning process, the more knowledge and skills they will acquire (Wu et al., 2017). WebQuests combine systematic educational planning with the effective use of technology to achieve effective learning and contribute to preparing the individual for life; to be an effective and useful individual for his community and country.

Given the significant advancements of the present era and the exponential growth of knowledge across various disciplines, there exists a critical need to prepare participants with the essential skills and capabilities necessary to meet future cognitive, social, and technological requirements (White, 2013; Shouman et al., 2023; Sahli & Sahli, 2024), including problem-solving skills, which Rahman (2019) characterized this as the most critical competency required by contemporary community and an essential component for strengthening students' comprehension of knowledge while preparing them to face future life challenges (p.71).

The importance of developing problem-solving skills among members of community lies in making the participants capable of reaching solutions to problems on their own, which increases self-confidence and pushes them towards discovery and achievement. It also develops the individual's spirit of investigation, by applying the steps of the scientific method in research and thinking through practicing various activities, as it enables to observe, build ideas, discuss and analyze them, and make decisions, which in turn allows for the continuity of lifelong learning through their cooperation with others to solve future problems (Lee & Kim, 2021; Chen et al., 2023; Al-Momani & Mahasneh, 2023).

A substantial body of literature has highlighted the critical importance of 21st century skills overall, and specifically the role of problem-solving. They recommended employing modern technologies to develop these skills among teenage community members (Al Saidi, 2020; Mahmud & Wong, 2022; Alturki & Aldraiweesh, 2023; Özer, 2024). WebQuests are considered as the main practical activities on problem-solving, as they enable participants to distinguish knowledge and develop various skills (Chang & Liang, 2018; Abdel Latif, 2020; Yılmaz & Koçak, 2024).

The above demonstrates the importance of utilizing interactive activities based on WebQuest to develop the skills of community members. These activities combine precise educational planning, effective use of the internet, and the ability to organize cognitive navigation processes. By integrating three-dimensional virtual worlds, WebQuests become more enjoyable and engaging for the individual. They engage participants in a social atmosphere and creative activities, which improves their critical thinking and encourages them to transfer the impact of learning by applying the skills and knowledge they acquire. This will develop and enhance participants' problem-solving skills, enabling them to be effective in their communities and their homeland.

Research problem:

Based on the significant interest in the skills of community members at both local and global levels, Educational institutions has focused on intensifying efforts in digital inclusion in various educational fields, and on acquiring and developing the necessary 21st century skills among Saudi community members, including problem-solving skills that enhance their higher-order thinking levels and equip them with the ability to distinguish and apply knowledge (Greiff & Martin, 2018; Zhang & Li, 2020; Snyder & Brown, 2021; Liu & Cheng, 2024).

Despite the substantial efforts on the ground, they remain less than what is hoped for and expected from the educational system. Some educational studies have indicated a weakness in participants' problem-solving skills and their focus on memorization and retrieving of information without understanding and the ability to apply it (Lee & Chang, 2019; Johnson & Smith, 2020; Alkest et al., 2024). Some studies, such as Alves and Costa's (2020) and Smith and Ranasinghe's (2017), have shown that the lack of participants' skills, including problem-solving skills, may stem from the utilization of conventional instructional practices.

To achieve the goals of the Kingdom's Vision (2030) in preparing participants with 21st century skills, including problem-solving, many studies have recommended the necessity of employing modern technologies that activate the role of the individual and enable them to acquire social and personal skills necessary in the work environment and community (Al Saidi, 2020; Garrison & Vaughan, 2021).

Given the specificity of participants in the age group of 13-18 years old, which is the adolescence stage, and their inclination towards using modern technologies, it is required to train them to use these modern technologies in problem-solving (Voogt & Roblin, 2017; Greenfield, & Subrahmanyam, 2017). Interactive activities based on WebQuests are among the most focused technologies on problem-solving, as the results of many studies have proven the impact of WebQuest in improving various skills, self-learning, communication, and collaboration, in addition to developing 21st century skills such as digital citizenship (Maravelaki, 2016; Agad et al., 2019; Zhao & Zeng, 2019; Dodge, 2020; Selwyn & Facer, 2020 Khan & Khan, 2021). These studies recommend conducting similar studies that reveal the impact of WebQuest on the development of other skills, such as problem-solving skills among community members.

Studies that examined the differences between short-term and long-term WebQuest designs demonstrated variability in determining the most suitable framework. The study by Medvedeva (2023) and the study by Bilir and Özdilek (2024) indicated that short-term WebQuests were more effective in fostering soft skills, critical thinking, and positive technology-related attitudes. Research conducted by Zhou et al. (2012), Al-Harbi (2020), and Al-Mohammadi (2023) revealed the superiority of long-term WebQuests in fostering critical thinking abilities, deepening knowledge comprehension, and enhancing participants' English reading and writing proficiencies. In contrast, the findings of Mohammed and Ammar (2019) indicated no significant distinction between WebQuest formats (short-term versus long-term) in developing computer literacy skills, and these studies recommended conducting similar investigations that investigate the differences between short-term and long-term WebQuests and their role in fostering other skills. Thus, the current study aimed to reveal the impact of different interactive activities based on WebQuests (short-term - long-term) on the development of problem-solving skills among community.

Research Questions and Hypothesis:

Research Question 1: What is the impact of interactive activities based on short-term WebQuests on developing community members' problem-solving skills?

Hypothesis 1: There is a statistically significant difference at the significance level ($\alpha \leq 0.05$) between the average scores of the members of the first experimental group (short-term WebQuest) in the pre- and post-test of the problem-solving skills test, in favor of the post-test.

Research Question 2: What is the impact of interactive activities based on long-term WebQuest on developing community members' problem-solving skills?

Hypothesis 2: There is a statistically significant difference at the significance level ($\alpha \leq 0.05$) between the average scores of the members of the second experimental group (long-term WebQuest) in the pre- and post-test of the problem-solving skills test, in favor of the post-test.

Research Question 3: What is the impact of the differences between short-term and long-term interactive activities based on WebQuests on the development of problem-solving skills among community members?

Hypothesis 3: There is no statistically significant difference at the significance level ($\alpha \leq 0.05$) between the average scores of the two experimental groups in the post-test of problem-solving skills.

THEORETICAL FRAMEWORK:

WebQuest:

Dodge (2001) defined WebQuest as: "directed educational activities based on research and investigation, and aiming to develop various mental abilities such as understanding, analysis, and synthesis in the learner, and relying partially or entirely on electronic resources that develop them on the web and are pre-selected, and which can be integrated with other sources such as books, magazines, and CDs" (p. 6). They are procedurally defined as: interactive electronic activities that proceed according to six basic stages: introduction, tasks, operations or procedures, sources, evaluation, and conclusion, which assist the individual in the processes of searching and investigating the information contained through pre-selected sources, developing the researcher's personality and various thinking skills, and encouraging him to work collaboratively to design an electronic mind map that embodies the experiences and skills he has acquired, with the aim of developing problem-solving skills.

According to previous studies in the field of WebQuest (Dodge, 2001; Seitkazy et al., 2016), WebQuest have been classified into two types based on a set of factors, namely:

Table (1) *A comparison between the two types of WebQuest*

Comparison	Short Term WebQuest	Long Term WebQuest
Duration	from one to four days	from one week to one month

Aim to	Accessing, acquiring, understanding and retrieving sources of knowledge	Answering questions that are central to the work task and in which knowledge is applied
Field or Specialization	learning a specific topic from a single discipline	multiple disciplines and the neglecting of barriers between them
Requirements	utilizes simple mental processes such as recall, comprehension, and application	complex educational objectives at higher levels of thinking (synthesis, analysis, evaluation).
Use it with	participants who are beginners in using the Internet and computers	participants who are able to use research tools and programs professionally
Tasks	Simple tasks such as a short presentation, discussion, or answering specific questions	Required research tasks may be in the form of a presentation, mind maps, or publishing scientific content on the web

Problem-solving skills:

Our current era is witnessing astonishing cognitive and technological development, resulting in numerous problems that participants face daily in their lives. Life in various aspects is constantly changing and evolving, making it imperative for participants to acquire various skills to help them cope with these changes. This includes problem-solving ability, recognized as one of the critical skills required in the twenty-first century. Problem-solving can be understood as an intentional process in which learners analyze challenges and develop solutions through inquiry, experimentation, and reflection (Zhou et al., 2018).

Likewise, Goodrich & Namkung (2019) defined problem-solving skills as "cognitive skills for developing a solution to a puzzling problem or situation. The individual comes to mind with a number of possible solutions based on analyzing its dimensions and the elements that could contribute to its solution and arrives at a set of solutions from which to select the best one" (p. 258). It is operationally defined as a systematic cognitive process through which participants effectively utilize information and prior experiences to address authentic problems and generate solutions. It includes: the skill of defining the problem, the skill of gathering information, the skill of formulating hypotheses, the skill of testing the validity of hypotheses, and the skill of applying the solution and generalizing the results.

There is no single method that participants can accept to reach a successful solution to all problems; In recent years, numerous studies and researches have emerged on how to learn the basics of problem-solving. These studies have revealed that problem-solving approaches vary from one situation to another and from time to time. Although the approach claims that an individual takes varies from one problem to another and from one individual to another, some basic steps have been identified for problem-solving in general. The first of these was the Dewey (1933) model, which consists of five steps: perceiving and feeling the problem, identifying and defining the difficulties, proposing a set of possible solutions to the problem, selecting the best solution from among the proposed solutions, and implementing the proposed solution.

The importance of problem-solving skills in an individual's life is highlighted by their position at the top of the learning pyramid. They are considered as a fundamental component of higher-order thinking skills. This represents an effort consistent with the information processing model, whereby participants execute behavior informed by acquired information, which facilitates the regulation of their thought processes and the retention of problem-relevant experiences. Therefore, teaching and learning problem-solving skills facilitates the individual's finding solutions to the problems they face and extends this learning by transferring the effect of learning to new, similar situations and problems (Mahria, 2016).

Problem-solving serves as an effective instrument for cultivating scientific thinking while equipping participants with the capacity to formulate ideas, conduct analysis, and engage in decision-making. It helps participants to adapt to different societies and makes them self-reliant (Lee & Kim, 2021; Chen et al., 2023). In addition, it highlights the individual's personality and increases their self-confidence and abilities. Because of their self-reliance in collecting facts, understanding information, and criticizing it (Cevik et al., 2015), it also increases competition among peers, leading them to creativity and scientific excellence (Hämäläinen et al., 2019), and changes the individual from a memorizer and retriever of knowledge to a producer and applicator of it in new situations, which achieves the desired goals (Pakarinen & Kikas, 2019).

RESEARCH METHODOLOGY:

This study aimed to explore the impact of different interactive activity designs based on WebQuests on developing problem-solving skills among members of the Saudi community. It aimed to investigate the effect of an independent variable on a dependent variable, as they exist in the real world-that is, without the researcher controlling them. The study relied on a Quasi-Experimental approach with two experimental groups to address the research questions and test the validity of the hypotheses.

Experimental design of the research:

Table (2) *Experimental design of the research*

Groups	Pre-measurement	Experimental treatment	Post-measurement
1 Experimental group	Problem-solving skills test	Short Term WebQuests	Problem-solving skills test
2 Experimental group		Long Term WebQuests	

Study population and sample:

Study population: The study population represents all Saudi adolescents between the ages of 13 and 18 years old.

Study sample: A simple random sample of (60) participants were selected from Saudi community.

Research procedures:

1. **Instructional Design for Study Interventions**

Designing interactive activities based on WebQuests (short/long term) requires reliance on a model of instructional design that offers a high level of organization and quality framework. After reviewing some literature and books on instructional design and its models, this study adopted the general "ADDIE" model for content construction and the design and development of experimental interventions; for several reasons, including that it is considered as the foundation for all instructional design models, encompassing all processes involved in other models, and due to its clarity, flexibility, and comprehensiveness compared to other design models, making it suitable for instructional design in general (Al-Ubaid & Al-Shaya, 2020). The general model includes five main phases: Analysis, Design, Development, Implementation, and Evaluation. This aims to reach the final executable and reliable experimental interventions for the study.

2. **Development of the Study Instrument (Problem-Solving Skills Test):**

To answer the research questions and validate its hypotheses, it is essential to collect the necessary data from the sample participants to determine the impact of different interactive activities based on WebQuests (short-term/long-term) on problem-solving skills among community members. A test was developed to measure problem-solving skills. Considering the educational objectives and the sequence of problem-solving skills, in addition to the determination of the level of each objective and skill, a test was prepared to assess problem-solving skills of community members, which included five items categorized according to problem-solving skills and consisted of objective questions in the form of multiple-choice.

After defining the objective of the test, formulating its items, preparing the test specification table, and establishing its instructions, a preliminary version of the problem-solving skills test was developed. To confirm the validity of the test in measuring what it was intended for, several methods were employed:

− Content Validity: The content validity of the test was ensured by preparing a specification table for the test, which includes the relative weights of the objectives and topics.

− Face Validity: After preparing the preliminary version of the problem-solving skills test, it was presented to a panel of experts and judges specialized in the educational field and instructional technology for evaluation. Based on feedback and suggestions from the judges, necessary adjustments were made to prepare the test for measuring internal validity.

− Internal Consistency: The test was conducted on survey sample involving (30) participants who were not part of the main sample. During this process, internal consistency was verified, meaning the homogeneity of the problem-solving skills test items and their cohesion with each other. This process involved calculating the Pearson Correlation Coefficient between each item's score and the total test score. The correlation coefficients are displayed in Table (3).

Table (3) *Correlation coefficients between the scores of each question on the test and the overall test score.*

Paragraph	Correlation coefficient	Paragraph	Correlation coefficient	Paragraph	Correlation coefficient
1	0.845**	10	0.842**	19	0.906**
2	0.863**	11	0.870**	20	0.910**
3	0.854**	12	0.798**	21	0.794**
4	0.829**	13	0.794**	22	0.876**
5	0.902**	14	0.845**	23	0.906**
6	0.927**	15	0.889**	24	0.854**
7	0.885**	16	0.865**	25	0.794**
8	0.788**	17	0.845**	26	0.785**

| 9 | 0.874** | 18 | 0.901** | | |

**Significant at a significance level of (0.01)

Table (3) shows the correlation coefficients between the scores of the problem-solving skills test questions and the total test score ranged from (0.927 to 0.785). These are positive correlation coefficients that are statistically significant at the (0.01) level, demonstrating the coherence and consistency of the problem-solving skills test questions with one another.

After confirming the validity of the test, the items of the problem-solving skills test were analyzed to determine the appropriateness of study sample questions (members of the Saudi community in adolescence) in terms of difficulty using difficulty coefficients. Additionally, the discriminatory potential of the problem-solving skills test questions was assessed using discrimination coefficients to reveal each question's ability to distinguish between high and low performers on the test.

Discrimination coefficients range from (-1 to +1), with a low discrimination considered to be below (0.2). When the discrimination coefficient equals zero, it indicates the item's inability to discriminate, and when the discrimination coefficient equals one, the item is perfectly discriminating (Alaam, 2018). The discrimination coefficient for each test item was calculated by means of the method mentioned in (Al-Sheikh et al., 2020), as follows:

– The scores of the survey sample in the test were arranged in ascending order.
– The highest 26% and the lowest 26% of the total scores on the test were identified, resulting in 8 participants in each group.
– The variance in correct responses between the lower-achieving and higher-achieving groups for each test item was determined, followed by calculation of the discrimination coefficient using the following equation:

Discrimination coefficient for each item = (Number of correct responses in the high-performing group – Number of correct responses in the low-performing group) ÷ (Combined total of both groups) / 2.

Accordingly, the difficulty and discrimination coefficients for each item on the problem-solving skills assessment were computed, as presented in Table (4).

Table (4) *Difficulty and Discrimination Coefficients for Problem-Solving Skills Test Questions*

Paragraph	Difficulty coefficient	Discrimination Coefficients	Paragraph	Difficulty coefficient	Discrimination Coefficients
1	0.70	0.50	14	0.37	0.37
2	0.67	0.50	15	0.47	0.75
3	0.57	0.37	16	0.33	0.50
4	0.73	0.37	17	0.40	0.62
5	0.67	0.75	18	0.80	0.50
6	0.60	0.50	19	0.47	0.50
7	0.70	0.50	20	0.63	0.37
8	0.37	0.75	21	0.60	0.37
9	0.47	0.37	22	0.50	0.37
10	0.47	0.62	23	0.40	0.37
11	0.40	0.62	24	0.60	0.37
12	0.50	0.37	25	0.43	0.50
13	0.40	0.25	26	0.57	0.37

Table (4) demonstrates that the problem-solving skills assessment items employed in this study possess acceptable difficulty coefficients, ranging from (0.33 to 0.80). Furthermore, the test items effectively differentiate between high-performing and low-performing participants, with discrimination coefficients spanning from (0.37 to 0.75). These findings confirm the instrument's validity in distinguishing between high-ability and low-ability participants within the community sample.

A reliable test consistently produces equivalent results when administered repeatedly under comparable conditions (Obaidat et al., 2016). The reliability of the problem-solving skills test scores was established through the split-half method, utilizing the Guttman Split-Half Coefficient and the Kuder-Richardson Formula 20 (KR-20), which is appropriate for this test format. According to Blerkom (2009), reliability represents the degree of consistency among items measuring the same construct. In such instances, reliability can be verified either through the split-half technique or by applying internal consistency formulas, such as the Kuder-Richardson Formula 20 (KR-20) designed for dichotomously scored items (0,1). The reliability coefficients obtained for the problem-solving skills test utilized in this study were statistically robust and acceptable, yielding a KR-20 reliability coefficient of (0.962) and a Guttman split-half reliability coefficient of (0.974). Consequently, these findings indicate that the test possesses sound psychometric properties, confirming its appropriateness for implementation in the present study. Following confirmation of the test score reliability, the required administration time and scoring procedure were established based on the pilot application conducted with the sample participants. After fulfilling the previous steps, the readiness of the test for actual implementation was ensured. The final form of the test consists of six pages, with the first page containing the test name, individual data, test instructions, and a preliminary question.

Each subsequent page includes a skill related to problem-solving, along with a simplified explanation and five questions for each skill. The total is 26 points, with one point assigned for each question in the problem-solving skills test.

3. Equivalence of research groups:

The results of the pre-test of problem-solving skills were analyzed to determine the extent of equivalence of the groups before the main experiment, by calculating the differences between the two main research groups (short-term WebQuests/long-term WebQuests) by applying an Independent Samples T Test to compare the average scores of the two groups under study in the pre-test to ensure the equivalence of the two groups at the pre-test level. The following table shows the equivalence results:

Table (5)

Groups	No.	Arithmetic mean	Standard deviation	T value	Freedom level	significance value	Significance level
1 Exp-group	30	12.57	2.622	1.196	58	0.237	Not statistically significant
2 Exp-group	30	13.43	2.979				

As evident from Table (3), the t-value failed to achieve statistical significance, with no significant differences observed at the 0.05 confidence level between groups on the pretest measure. This confirms the comparability and equivalence of groups before experimental implementation, thereby establishing that subsequent post-treatment differences result from manipulation of the independent variable (i.e., short-term versus long-term WebQuests) rather than from baseline group disparities.

It should be noted that the t-test was employed in its various forms to compare study group scores across pre- and post-assessments, as the score distributions for all study groups demonstrated normality in both measurement phases. Consequently, parametric statistical procedures were utilized to enhance result reliability. Table (6) presents the Shapiro-Wilk test results confirming the normal distribution of scores.

Table (6) *Results of verifying the normality of the distribution of study groups' scores*

Measuring instrument		Groups	Application	Shapiro-Wilk	
				statistical value	significance
Problem-solving skills test	1	Experimental group	Pre	0.968	0.482
			Post	0.939	0.088
	2	Experimental group	Pre	0.969	0.521
			Post	0.974	0.651

It is obvious from the previous table that the Shapiro-Welch test values were not statistically significant at a confidence level of (0.05) at all levels. The lack of significance of these values confirms the normality of the distribution of scores at all levels of the study groups. The condition of the normal distribution is one of the most important conditions of the T-Test. Therefore, the T-Test was used to fulfill the conditions for its use.

RESEARCH RESULTS AND INTERPRETATIONS

The first question:

The study's first question stated: "What is the effect of designing interactive activities based on short-term WebQuests on developing problem-solving skills among community members"?

To answer this question, the study's first hypothesis was tested, which states: "There are statistically significant differences at the level of ($a \geq 0.05$) between the average scores of the members of the first experimental group (short-term WebQuests) in the pre- and post-test of the problem-solving skills test, in favor of the post-test".

To test the hypothesis, descriptive analysis of the problem-solving skills assessment was conducted. Subsequently, a paired samples t-test was employed to examine the statistical significance of mean score differences between pre- and post-test measurements for the first experimental group. The findings are presented as follows:

Table (7) *Descriptive analysis of the first experimental group in the pre- and post-applications of the problem-solving skills test*

Group	Application	No.	Arithmetic mean	standard deviation
first Experimental group (Short Term WebQuests)	Pre	30	12.57	2.622
	Post	30	20.33	3.078

As shown in Table (7), the first experimental group (short-term WebQuests) obtained a pretest mean of (12.57) with a standard deviation of (2.622), whereas the posttest mean was (20.33) with a standard deviation of (3.078).

Table (8) *Significance of the differences between the average ranks of the scores of the first experimental group in the pre- and post-application of the test*

	Group	T value	Freedom	Significance value	Significance level	Cohen's value (d)	Effect size
first Experimental group (Short Term WebQuests)		24.509	29	0.000	Statistically significant	5.71	too big

*Tabular t-value at 29 degrees of freedom and 0.05 level = 2.045

Table (8) demonstrates that the calculated t-value (24.509) exceeded the critical t-value (2.045) at 29 degrees of freedom, achieving statistical significance at the α = 0.05 level. Application of Cohen's d to assess effect size revealed a substantial impact, with a coefficient value of 5.71 for the implementation of short-term web-based WebQuests on problem-solving skills performance. According to Cohen's (1988) interpretive framework, effect sizes ranging from 0.2 to 0.4 represent small effects, those between 0.5 and 0.7 indicate medium effects, while values of 0.8 or above signify large effects.

Consequently, the first study hypothesis was confirmed, stating: "There is a statistically significant difference at the level of (a ≥ 0.05) between the average scores of the participants of the first experimental group (short-term WebQuests) in the pre- and post-measurements of the problem-solving skills test, in favor of the post-measurement."

Interpretation and discussion of the results of the first question and the first hypothesis:

The results indicated that short-term WebQuest activities were effective in strengthening participants' ability to solve problems. These results may be explained by the nature of short-term WebQuests, which are structured to cultivate independent learning skills and target particular educational objectives, while also fostering rapid knowledge acquisition that enables learners to understand and apply new information effectively. They were structured to accommodate diverse abilities and proficiency levels, rendering them appropriate for all age demographics, particularly adolescents. These WebQuests also mitigated cognitive overload stemming from the processing of extensive information, making them well-suited for tasks requiring prompt responses. They enabled participants to concentrate on specific objectives without diversion.

The short-term WebQuests were designed to enable participants to engage in learning and interact with varied and stimulating activities, which heightened their motivation and active involvement, while delivering a guided learning experience. This approach facilitated the researcher's delivery of systematic instruction oriented toward accomplishing specific educational objectives, while directing learners to examine pertinent materials and providing them with opportunities to implement their newly acquired knowledge in practical, real-world situations. This rendered the learning experience more closely aligned with real-world contexts.

One possible explanation is grounded in cognitive load theory: short-term WebQuests may help learners process information efficiently by limiting overload and supporting faster comprehension. This result is supported by constructivist theory, which maintains that meaningful learning transpires when participants actively engage in knowledge construction through authentic experiences. Short-term WebQuests are structured to involve participants in the knowledge-building process by exploring informational resources, interacting with WebQuest content, and assigning them diversified roles that address their varied needs while fostering learner autonomy.

In addition to the theory of insightful learning (exploration), which suggests that learning occurs through practical experience and direct interaction with content, short term WebQuests rely on providing quick and effective experiences that allow participants to explore information in a manner consistent with their abilities and interests and apply what they have learned in different contexts. This emphasis on a specific practical activity, which progresses through discrete, systematic, and cohesive steps, contributes to participants' comprehensive understanding and facilitates knowledge retention in long-term memory. The authentic learning experiences embedded within short-term WebQuests also strengthen participants' comprehension, thereby supporting the further development of their diverse skills and knowledge base.

The integration of contemporary technologies and pedagogical approaches also contributed to achieving this result, including the incorporation of digital environments such as web-based platforms and virtual 360° experiences, which enriched the educational context and attracted participants at this developmental stage. Additionally, the short-term WebQuests integrated multimedia elements (text, images, videos, illustrations, and hyperlinks) into the learning experience, rendering it more engaging and interactive, thereby enhancing participants' comprehension of the presented content.

This finding aligns with the research conducted by Agad et al. (2019) and Rubin (2018), both of which demonstrated the significant impact of WebQuest implementation on enhancing critical thinking and problem-solving abilities among participants within this particular age range. This finding also aligns with the research of Bilir and Özdilek (2024) and Medvedeva (2023) regarding the effectiveness of short-term WebQuests on various competencies among community members. Conversely, this result diverged from the studies conducted by Al-Mohammadi (2023), Al-Harbi (2020), and Zhou et al. (2012), whose findings demonstrated the superiority of long-term WebQuests.

The second question:

The second question of the study stated: "What is the effect of designing interactive activities based on long-term WebQuests on developing problem-solving skills among community members?"

To address this question, the researchers examined the validity of the study's second hypothesis, which states: "There is a statistically significant difference at the level of (a ≥ 0.05) between the average scores of the members of the second experimental group (long-term WebQuests) in the pre- and post-test of the problem-solving skills test, in favor of the post-test".

To assess the hypothesis's validity, descriptive analysis was conducted on the problem-solving skills assessment. Subsequently, a paired samples t-test was employed to evaluate the statistical significance of differences between the mean scores obtained by the second experimental group on the pre-test and post-test. The findings are presented as follows:

Table (9) *Descriptive analysis of the Second experimental group in the pre- and post-applications of the problem-solving skills test*

	Group	Application	Number of members	Arithmetic mean	standard deviation
Second Experimental group (Long Term WebQuests)		Pre	30	13.43	2.979
		Post	30	19.63	3.528

Table (9) indicates that the second experimental group (long-term WebQuests) achieved a mean score of (13.43) with a standard deviation of (2.979) during the pre-test administration, whereas the post-test administration yielded a mean score of (19.63) with a standard deviation of (3.528) for the same group.

Table (10) *Significance of the differences between the average ranks of the scores of the Second experimental group in the pre- and post-application of the test*

Group	T value	Freedom	Significance value	Significance level	Cohen's value (d)	Effect size
Second Experimental group (Long Term WebQuests)	18.587	29	0.000	Statistically significant	3.39	too big

*Tabular t-value at 29 degrees of freedom and 0.05 level = 2.045

Table (10) reveals that the computed t-value (18.587) exceeds the critical t-value (2.045) at 29 degrees of freedom and a significance level of $\alpha \leq 0.05$, indicating statistical significance. Upon applying Cohen's d formula to assess the effect size in paired samples, the results demonstrate a substantially large effect size. The value of Cohen's coefficient reached (3.39) for the use of long-term WebQuests in testing problem-solving skills. As Cohen (1988) stated that when applying the equation: If the effect size is between (0.2 and 0.4), the effect is considered weak, and if it is between (0.5 and 0.7), the effect is considered medium, but if the effect is (0.8) or greater, the effect is considered large.

Based on the aforementioned findings, the study's second hypothesis was confirmed, which states: "There are statistically significant differences at the level of (a ≥ 0.05) between the average scores of the participants in the second experimental group (long-term WebQuests) in the pre- and post-measurement of the problem-solving skills test, in favor of the post-measurement".

Interpretation and discussion of the results of the second question and the first hypothesis:

The study findings demonstrated the effectiveness of interactive activities utilizing long-term WebQuests in enhancing participants' problem-solving capabilities. This outcome can be attributed to several distinctive features of long-term WebQuests. Their design emphasizes the construction of comprehensive knowledge understanding and the generation of new insights through extended learning activities. Additionally, they facilitate the development of higher-order cognitive skills over prolonged periods. The flexible architecture of long-term WebQuests enables participants to access, revise, and engage with various activities across extended timeframes. These WebQuests incorporate interactive tasks organized in sequential phases that span considerable durations, aiming to promote profound and lasting learning through internet-based exploration. This approach cultivates proficiency in digital navigation and online communication, delivering an intensive and comprehensive learning experience that integrates theoretical concepts with practical application. By presenting cohesive content, long-term WebQuests encourage participants to advance systematically toward accomplishing defined learning objectives.

This result can also be interpreted through the lens of various educational theories, including the theory of multiple intelligences, as the design of long-term WebQuests incorporates diverse learning resources that accommodate individual differences and varied intelligences, along with activities requiring differentiated roles over extended

durations. This diversity enables participants to leverage their distinct abilities and strengths, resulting in a comprehensive and stimulating educational experience. This result is further grounded in social constructivist theory, as the design of long-term WebQuests encourages participants toward inquiry, autonomous knowledge construction, and practical application by promoting collaborative work and providing opportunities for engagement, interaction, and negotiation, while valuing diverse perspectives. Additionally, appropriate scaffolding is furnished, which cultivates their competencies for effective online research and assists them in achieving established objectives with optimal efficiency.

Furthermore, their alignment with elaboration theory is evident, as long-term WebQuests organize content at an expanded scope, encompassing multiple concepts and objectives concurrently, which are acquired over relatively prolonged periods. They are structured in sequential phases with logical progression, commencing with an introduction grounded in prior knowledge and culminating in a comprehensive synthesis. This approach facilitates participants' development of conceptual understanding, enabling them to establish connections among concepts, principles, and facts, thereby advancing their higher-order thinking capabilities. They also correspond with communication theory by providing long-term WebQuest activities that promote active individual engagement, offering tools to support collaborative work and online interaction, and enabling participants to contribute knowledge within digital communities, thus fostering the expansion of collective knowledge repositories.

The integration of contemporary technologies and pedagogical approaches also contributed to achieving this result, including the incorporation of digital environments such as web-based platforms and virtual 360° experiences, which enriched the educational context and engaged participants at this developmental stage. Moreover, the long-term WebQuests incorporated multimedia elements (text, images, videos, illustrations, and hyperlinks) in content delivery, which minimized participant distraction and sustained their attention to the learning experience, rendering it more compelling and interactive while enhancing their comprehension.

This finding corroborates the research of Agad et al. (2019) and Rubin (2018), which reported notable effects of WebQuest implementation on the development of critical thinking and problem-solving competencies among participants within this age demographic. It also aligns with studies conducted by Al-Mohammadi (2023), Al-Harbi (2020), and Zhou et al. (2012), which evidenced the positive impact of long-term WebQuests on diverse skill sets among community participants. Conversely, this result contrasts with the findings of Bilir and Özdilek (2024) and Medvedeva (2023), whose research concluded that short-term WebQuests demonstrated superior outcomes.

The third question:

The third question of the study was, "What is the effect of different types of interactive activities based on WebQuests (short-term/ long-term) on the development of problem-solving skills among community members?" To address this question, the researchers evaluated the validity of the study's third hypothesis, which proposes, "There is no statistically significant difference at the level of (a ≥ 0.05) between the average scores of the two experimental groups on the post-test of problem-solving skills".

To examine the validity of the third hypothesis, an independent samples t-test was conducted to determine the statistical significance of differences between the mean scores of the two experimental groups (short-term WebQuests/long-term WebQuests) on the problem-solving skills post-test. The results are presented as follows:

Table (11) *Descriptive analysis of the two experimental groups in the problem-solving skills test for post-application*

Groups	Application	Number of members	Arithmetic mean	standard deviation
first Experimental group (Short Term WebQuests)	Post	30	20.33	3.078
Second Experimental group (Long Term WebQuests)	Post	30	19.63	3.528

Table (11) shows that the arithmetic mean of the first experimental group, which relied on short-term WebQuests, was (20.33) with a standard deviation of (3.078), while the arithmetic mean of the second group, which relied on long-term WebQuests the web, was (19.63) with a standard deviation of (3.528).

Table (12) *Significance of the differences between the average ranks of the scores of the two experimental groups in the post-application of the problem-solving skills test*

Groups	T value	Freedom	Significance value	Significance level	Aita Square η²	Effect size
first Experimental group* Second Experimental group	0.819	58	0.416	Not significant	0.01	low

*Tabular t-value at (58) degrees of freedom and (0.05) level = (2.009)

Table (12) demonstrates that the calculated t-value (0.819) falls below the critical t-value (2.009) at 58 degrees of

freedom and does not reach statistical significance. Upon applying the eta-squared (η^2) formula to assess the effect size in independent samples, the analysis revealed a negligible effect size, with an eta-squared coefficient of (0.01) for the comparison between the two types of WebQuests (short-term/long-term) regarding problem-solving skills performance. According to Mansour's (1997) classification criteria, an eta value of (0.01) represents a small effect size, a value of (0.06) indicates a moderate effect size, and a value of (0.14) or higher signifies a large effect size. Based on the descriptive analysis and examination of statistical differences between the groups on the problem-solving skills assessment, the study's third hypothesis was confirmed, which states that: "there is no statistically significant difference at the level of ($a \geq 0.05$) between the average scores of the two experimental groups in the post-test of problem-solving skills."

Interpretation and discussion of the results of the third question and the first hypothesis:

The study results indicated that there was no difference between the different interactive activities based on WebQuests (short-term/long-term) in developing the problem-solving skills of community members. This result can be attributed to the similarity of the nature of WebQuests. The techniques and methods used in designing and implementing short-term and long-term WebQuests were largely similar in terms of quality and interactive activities, which led to similar results. Moreover, WebQuests fundamentally employ structured and systematic phases designed to cultivate higher-order cognitive abilities, resulting in comparable improvements in problem-solving competencies across both groups. Notwithstanding the variation in WebQuest duration (short-term versus long-term), the characteristics of the learning activities and the degree of effort invested by participants may have been analogous. Additionally, the similarity in participants' baseline skill levels prior to the intervention further contributed to the convergence of outcomes in the post-test phase.

This finding is consistent with the research conducted by Muhammad and Ammar (2019) and Al-Halafi (2015), which concluded that no significant differences exist between the two types of WebQuests (short-term/long-term) regarding their impact on various individual competencies. It also corresponds with the studies by Agad et al. (2019) and Rubin (2018), which established their effectiveness in enhancing problem-solving abilities among participants within this age bracket. Furthermore, this result aligns with the research of Yılmaz and Koçak (2024), Al-Toubi and Mai (2024), and Salem (2022), which demonstrated that WebQuests contributed positively to advancing higher-order thinking skills, cultivating critical thinking abilities and digital citizenship, fostering school engagement, strengthening academic writing proficiency, developing soft skills, reducing writing apprehension, and enhancing life and career competencies, while additionally offering enriching learning experiences for community members across all age groups. While it differed from the study of Bilir and Özdilek (2024) and the study by Medvedeva (2023), which proved the superiority of short-term WebQuests, in addition to the study of Al-Mohammadi (2023), Al-Harbi (2020), and Zhou et al. (2012), which indicated the superiority of long-term WebQuests on the various skills of members of community.

Recommendations:

In light of the findings from this study, the researcher proposes the following recommendations:

– Utilize WebQuests as a tool for designing content and interactive activities in digital environments by instructional designers, aiming to facilitate learning and equip participants with important digital experiences and skills for their future professional lives.

– Train practitioners and professional trainers on the use of WebQuests that activate the role of the individual, which have proven effectively in developing the capacities and skills of community members, thereby facilitating the fulfilling of desired objectives.

– Encourage educational and training institutions to employ and integrate modern technologies such as virtual labs, virtual tours, and three-dimensional environments in training community members on various skills, and to get advantage from these in providing a rich and enjoyable experience for participants of different age groups.

– Focus on developing problem-solving skills among community members across various age stages, as these are as considered essential 21st century skills that contribute to shaping the individual's character and making them an active member of their community and country

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