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The impact of using digital geographic applications on acquiring social education concepts among university students

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Abstract

The aim of this study was to explore the impact of using digital geographic applications (DGA), Google Earth, Google Maps, GPS on Jordanian university students' understanding of social education concepts and their attitudes toward their use. The quasi-experimental approach was utilized to implement the experiment on a sample of 60 Jordanian university students, divided into two equal groups, each consisting of 30 students. The first group, the control group, was taught using the traditional lecture method, while the second group, the experimental group, was taught using modern digital applications in social education. In this study, an achievement test (pre-test/post-test) was administered to measure students' level of acquisition of social education concepts. The findings validated statistically significant differences at the significance level ($\alpha \geq 0.05$) between the mean scores of the experimental and control groups on the post-test in favor of the experimental group, emphasizing the positive impact of using digital geographic applications on students' acquisition of social education concepts. This is of high significance as it calls for incorporating digital geographic applications into teaching social education courses at Jordanian universities and training faculty members and students to effectively use them in the educational process. That said, this paper provides a set of practical recommendations and development proposals that will maximize the benefits of digital geographic applications in social studies education.

Keywords: Applications, Digital, Geography, Social education, Student, University.

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1. Introduction

The learning-teaching process has undergone a radical transformation due to rapid technological developments, making digital technologies an integral part of the modern education system. In this context, geographic digital applications have emerged as effective educational tools that enable the incorporation of spatial and interactive dimensions into learning.

International educational reports have confirmed that the integration of technology into teaching positively contributes to improving student achievement and motivation [1].

A thorough review of 20 years of research concluded that technological integration in education has a positive impact on student achievement. Despite these documented benefits of technology in education, some studies indicate that social science teachers are less likely to use modern technologies in their classrooms than others [2]. This shortcoming in the use of technology also includes the underutilization of digital geographic tools in teaching concepts of social education, or social studies. Social education, as an educational domain, encompasses knowledge and concepts related to geography, history, sociology, and national education. These are sciences of the humanities that can directly benefit from geographic technologies to enhance students' spatial and contextual understanding [3].

Notably, the use of digital mapping software and virtual globes helps students visualize historical spatial relationships and understand the intersections of geography and social events [4]. Therefore, neglecting these tools may deprive students of rich learning opportunities that enhance their understanding of concepts, locations, and social relationships in the real world. Modern educational environments offer tremendous potential for utilizing digital mapping applications and geographic information systems. Numerous educational systems around the world have begun integrating these technologies into curricula, particularly in geography and social studies courses, allowing students to take virtual tours, locate locations on a map, and interact with spatial information directly [4].

Education-based research shows encouraging results in this regard. A USA-based study indicated that integrating Google Earth into teaching geography in social studies resulted in higher grades for students compared to those who utilized traditional paper maps [2]. Some studies also showed statistically significant differences in spatial skill acquisition in favor of fourth-grade students after participating in Google Earth-based activities within the social studies curriculum [5]. These results proved the great potential of these applications in supporting the learning of both spatial and social concepts.

At the local level, Jordanian universities and educational institutions are striving to keep pace with this digital transformation to enhance the quality of learning outcomes. With the proliferation of smartphones and the internet, tools like Google Maps are now at students' fingertips, providing learning opportunities beyond the traditional lecture hall. For example, students can conduct field assignments that rely on GPS to identify specific locations and link them to historical or social information about those locations or use Google Maps to explore the cultural and geographical diversity of different regions via the Street View feature. Such activities support active learning and enhance the link between theory and practice, which is the essence of social education, which aims to prepare citizens who are aware of their geographical and social environment. Using digital geographic applications “Google Earth, Google Maps, GPS,” is of high significance, as it helps in adding several social concepts among university students.

2. Literature Review

Given the novelty of utilizing geographic digital applications in university education, particularly in social studies, direct studies conducted in the Jordanian context are still few. However, there are a few regional and international studies that have explored the impact of using tools and apps such as Google Earth, Google Maps, GPS, and GIS (Geographic Information Systems) on learning among students. Utilizing a proposed program considering the requirements of the Fourth Industrial Revolution, Al-Barbari and Qasim [6] developed the skills of using digital geographic applications and professional ambition among secondary school geography teachers. The quasi-experimental approach was adopted with a pre-post design for one group. The sample consisted of 15 secondary school geography teachers in the West Tanta Education Administration in Gharbia Governorate. The research tools included a cognitive test for digital geography application skills, a performance-based skills observation card, and a professional ambition scale. The results revealed statistically significant differences between the mean scores of secondary school geography teachers in the pre- and post-tests on the cognitive aspect of digital geography application skills and the observation card for the performance aspect of skills in favor of the post-test. The findings also indicated differences between the mean ranks of the sample scores in the pre- and post-tests on the professional ambition scale in favor of the post-test, highlighting the effectiveness of the proposed program in developing the skills of using digital geography applications in teaching geography among secondary school geography teachers and their professional ambition.

In an Egypt-based study, Al-Najdi et al. [7] also addressed the use of digital mapping applications from a teacher's perspective. A proposed Google Maps-based program was developed to develop spatial intelligence among geography students at the Faculty of Education at Assiut University. The study tools consisted of a spatial intelligence test and a skills questionnaire pre and post-test of the training program, which included a series of activities based on Google Maps. The results validated statistically significant differences between the students' mean scores on the pre- and post-tests in favor of the post-test across all measured aspects of spatial intelligence, demonstrating the effectiveness of the proposed program. The findings proved that training using Google Maps contributed to developing multiple skills among students, including visual observation, representing spatial phenomena, and understanding spatial and non-spatial relationships between phenomena. Although this study is intended to prepare geography teachers, it highlights the significant impact of acquiring skills in using digital geographic applications, which can be learned and improved through systematic training, positively impacting trainees' spatial abilities. Since social studies students in Jordan include geography, history, and social education, such programs can be applied to develop their technical and spatial skills as part of their professional training.

In an analytical survey conducted at Jordanian universities, Mary [8] measured the extent of using Geographic Information Systems (GIS) technology in learning among geography students at Jordanian universities. Although its primary focus was on GIS technology within geography departments, its findings provide insight into the level of student familiarity with digital geography skills in the Jordanian university environment. The results found that a very high percentage of

geography students, exceeding 80%, had a basic grasp of how to use these technologies. However, the results indicated that the percentage of those who mastered advanced professional skills in GIS was low, with only about 42% mastering advanced skills, indicating that the teaching of these technologies is still in its early stages and does not reach all students at an advanced level. The findings also found statistically significant differences among students based on their university, with students at some universities, such as Yarmouk University and Al-Hussein Bin Talal University, outperforming their peers at other universities in their level of skill proficiency.

In an Arab study conducted by Sayed-Ahmed [4] at Helwan University in Egypt, the effectiveness of Google Earth in developing some visual thinking skills among first-year secondary school students in history was investigated. A history unit using Google Earth activities was developed. A pre- and post-test was also administered to a group of students to measure visual thinking skills, such as reading images and maps and analyzing historical documents. The results indicated a clear improvement in students' performance on the post-test compared to the pre-test across all measured skills, with the difference being statistically significant in favor of the post-test. The study explains that using Google Earth in history teaching provided students with a visually stimulating learning environment, as they can view the locations of historical events on a map, virtually tour them, and interact with images and documents related to those events. This experience also enhanced students' ability to read maps and historical images, analyze visual evidence, and relate it to the course content, demonstrating that integrating digital geography with historical content can develop learners' visual and spatial thinking. The study recommended using space learning tools such as Google Earth in teaching social studies to develop students' thinking and visualization skills.

On the other hand, Merç and Ersoy [5] study, conducted in Turkey, focused on measuring the effectiveness of using Google Earth in acquiring spatial awareness skills among fourth-grade primary school students in the social studies subject. The educational experience lasted five weeks and included classroom activities enhanced with Google Earth. Pre- and post-tests were also administered to measure spatial achievement, alongside conducting qualitative interviews with students. The results revealed a statistically significant difference between the students' mean scores on the pre- and post-test in favor of the post-test, demonstrating that social studies activities enhanced with Google Earth had a significant positive impact on students' acquisition of spatial perception skills. Additionally, students reported in interviews that using Google Earth made lessons more engaging and helped them see the world more clearly and understand spatial concepts more easily.

Equally, Al-Humaidan [9] investigated the impact of using Google Earth in teaching social studies and national studies on developing map reading, analysis, and reflective thinking skills among secondary school students. The results concluded that the use of Google Earth had a significant positive impact on improving students' map reading and analysis skills, as well as enhancing their ability to reflect and think critically about the historical and geographical events shown in the curriculum.

In an Ohio state-based study in the USA, Thankachan and Franklin [2] investigated the impact of integrating Google Earth into the teaching of social studies for sixth- and tenth-grade students. An experimental design was adopted with two groups, as one was taught using Google Earth and the other using traditional lecture methods utilizing paper maps. The results showed that the group using Google Earth outperformed the group using the social studies test in terms of mean scores of the achievement test, as students in this group scored statistically significantly higher than their peers who learned using the traditional lecture method. This is due to the interactive and engaging nature of Google Earth, which encouraged students to actively participate in lessons and provided rich visual representations of information, fostering a deeper understanding of both spatial and social concepts. This study is one of the first to empirically demonstrate the superiority of using a 3D electronic atlas, Google Earth, over static maps in enhancing the learning of geography and history within the social studies curriculum.

Accordingly, the results of previous studies converge in confirming the feasibility of using digital geographical applications in enhancing academic achievement at all education levels, as shown by Thankachan and Franklin [2]. Digital geographical applications also develop spatial and visual skills, as in the studies [4, 5]. Moreover, they enrich reflective and critical thinking, develop teaching skills, and enhance the professional aspirations of geography teachers at all levels, as stated in the studies [6, 9]. Some studies have also pointed to challenges such as the weak inclusion of these tools in current curricula and the varying levels of student and teacher proficiency, necessitating systematic steps to address these gaps.

That said, the current study draws on these findings to formulate research objectives, problems, questions, and design its tools, proceeding from the hypothesis that the planned use of Google Earth, Google Maps, and GPS in social studies teacher preparation programs in Jordan will improve students' acquisition of social and spatial concepts and develop their related skills. The current research makes use of previous studies in constructing the theoretical framework, designing research tools, selecting an appropriate methodology, and interpreting and discussing the results. The current research is distinguished by its focus on the impact of using digital geographic applications in providing Jordanian university students with concepts of social education. More importantly, this is an area not directly addressed by previous studies, which reinforces the importance, freshness, and originality of this research.

3. Research Problem

The lack of use of modern digital applications, particularly geographic applications, in the teaching of social studies courses at Jordanian universities may negatively impact students' acquisition of social concepts related to spatial dimensions. Despite the importance of these applications in developing students' understanding of social concepts and their relationship to place, their use in Jordanian universities remains limited and depends mostly on the individual efforts of faculty members without a clear strategy for their systematic and organized use. Thanks to the nature of the work in university teaching, it was noted that most teaching methods for social education courses still rely primarily on traditional methods such as lectures with

little dependence on modern digital applications, leading to a weak understanding of students' social concepts and their relationship to spatial dimensions.

Although there are some studies that have addressed the use of digital applications in education, there is a dearth of studies that specifically address the impact of using digital geographic applications on Jordanian university students' acquisition of social education concepts. As a result, this highlights the need to conduct this research to uncover this impact and provide scientific recommendations for developing the use of these applications in teaching social studies courses at Jordanian universities. Hence, there is an urgent need to study the prevalence and effectiveness of the use of these applications in the Jordanian educational context, particularly among university students, who are expected to transfer this expertise to the field of school education after graduation. With that, the research problem is articulated in answering these research questions.

(RQ1). What is the impact of using digital applications, "Google Earth, Google Maps, and GPS" on Jordanian university students' acquisition of social education concepts?

(RQ2). What are Jordanian university students' attitudes toward using digital applications to learn social education concepts?

4. Research Significance

The research significance is drawn from its emphasis on an important intersection between modern technology and social learning. On the one hand, the study provides a deeper understanding of how to enhance the theoretical understanding of social concepts through interactive and engaging tools that appeal to the digital generation. On the other hand, it offers curriculum developers and educational decision-makers in Jordan scientific data on the effectiveness of employing these technologies, helping to guide future efforts toward modernizing teaching and learning methods.

Importantly, the study also contributes to enriching the theoretical literature related to the use of geographic digital applications in teaching social education concepts, especially in the Jordanian context, which lacks such studies. The study also furnishes research tools that researchers in the fields of educational technology and social pedagogy can benefit from, such as a Social Concepts Test and Digital Applications Attitude Scale. In addition, this study benefits from a combination of previous Arab and foreign references and studies to provide a comprehensive vision, giving it a useful comparative dimension, as the results of global research will be presented alongside data from the local context.

5. Theoretical Framework

The theoretical framework incorporated into this research addresses the role of geographic digital applications in education and social education concepts and their relationship to the spatial dimension.

5.1. Role of Geographic Digital Applications in Education

Digital geographic applications refer to software and computer tools that enable users to interact with maps and spatial data directly via electronic media. One of the most prominent of these applications is Google Earth, which provides a virtual three-dimensional model of the Earth through which the user can navigate and explore geographical locations in detail. Google Earth is specifically used to support students' exploration of geography and history by enabling them to interpret and understand the spatial-temporal relationships of events. It provides an interactive view of the world, allowing students to virtually "fly" to any location and view topographical images and cultural landmarks, assisting in connecting abstract information such as historical events or geographical concepts to specific, concrete locations.

Google Maps is one of the most popular general applications for navigation and map exploration. It allows viewing two-dimensional maps and navigating to street level via Street View to view panoramic images of locations. In the educational context, Google Maps can be used for a variety of activities, such as locating historical events on a map, studying the geographical distribution of social phenomena such as population or resources, or even conducting virtual field trips to locations around the world and comparing different social environments. Similarly, GPS technology, which enables precise spatial coordinates, has found important educational applications, especially in project-based and field-based learning. For example, activities can be designed in which students record the coordinates of archaeological or geographical sites using GPS devices and use the collected data in interactive maps to interpret specific patterns or spatial relationships.

At the research level, researchers have used GPS with virtual tours of historical sites to enrich the study of history in education. For instance, "students navigate through historical sites virtually, gathering direction and location information to understand the sequence of events in their original locations" [4]. The added value of these technologies lies in visual and interactive learning. Rather than being limited to static text and images in books, digital Geographic applications provide more realistic experiences through dynamic visual presentations and the ability to explore freely. This aligns with modern learning theories that emphasize the importance of activating the learner's role and making them an active axis in knowledge construction. According to constructivism, for example, individuals learn best when they can meaningfully connect new knowledge to their previous experiences and the world around them.

Through virtual exploration and mapping, students can connect abstract information, such as historical facts or geographical terms, to a specific spatial and social context, making learning more embedded and meaningful. The interactive nature of these applications also encourages students to ask questions and investigate. When a student views the topography of an area or population distribution on a map, they may wonder about the reasons for the observed patterns and begin searching for explanations, a form of investigative and constructive learning.

5.1. Social Education Concepts and Their Relationship to the Spatial Dimension

Social education concepts cover a wide range of topics that combine geographical, historical, and societal aspects. Among these concepts are the concepts of location and geographic position, the environment and the interaction between humans and their surroundings, citizenship and national identity, as well as concepts related to social structures such as family, local community, and cultural heritage. These concepts do not arise in a vacuum; rather, they are linked to a specific place and time, highlighting the importance of digital geography tools in embodying these connections. For example, studying the concept of global citizenship can be greatly enhanced when students explore different countries via Google Earth, see national borders and terrain, and learn about people's cultures through stories and images associated with places on the Voyager platform in Google Earth.

Likewise, when addressing the concept of sustainable development in a national education course, maps can visually illustrate disparities in the distribution of resources and population across regions and highlight environmental challenges at the local and global levels. From an educational perspective, acquiring concepts requires more than simply memorizing definitions; it involves the ability to apply the concept in the correct context and understand its various dimensions. Using map applications to explain social concepts provides students with a rich learning experience, as they not only read about the concept but also see it applied to them on a real map.

Further, linking abstract information to a specific geographic location or concrete historical event helps students transition from memorization to deep, analytical understanding. This is supported by studies in cognitive psychology, which indicate that human spatial memory is strong and that linking information to places can enhance memory and understanding. For example, when a student recalls information about the Great Arab Revolt, their memory may be better if they have viewed the location of the revolt in southern Jordan on Google Earth and seen the desert environment in which it took place, which adds additional meaning to the historical event. For example, he understands the role of geographical nature during events.

6. Method

6.1. Research Approach

A quasi-experimental approach is utilized due to its suitability for the study objectives and questions. An experimental design comprising two groups a control group and an experimental group, was used, along with pre- and post-tests.

6.2. Research Population & Sample

The research population consisted of all female students majoring in classroom teaching at Jordanian universities enrolled in the second semester of the academic year 2024/2025. However, the research sample consisted of 60 female students enrolled in the Social Education and Its Teaching Methods course. The sample participants were purposefully selected and divided into two equal groups:

Control group: It consisted of 30 female students who studied social education concepts using the traditional lecture method.

Experimental Group: It consisted of 30 students who studied social education concepts using digital geographic applications, “Google Earth, Google Maps, GPS”.

6.3. Research Terms & Definitions

1. Digital Geographic Applications: In this study, these applications refer to electronic programs and applications used to display geographical and spatial information interactively. These include Google Earth, Google Maps, and the Global Positioning System (GPS) used in teaching social studies concepts to Jordanian university students.

2. Google Earth: It is a digital application that provides 3D images of the Earth using satellite imagery and allows users to explore and navigate various geographical features.

3. Google Maps: It is a digital application that provides interactive maps and advanced navigation services, allowing users to determine locations, directions, and distances.

4. Global Positioning System (GPS): It is a digital satellite-based navigation system that accurately determines locations on the Earth's surface.

5. Social Education Concepts: They are basic terms, ideas, and generalizations related to social education, including concepts such as cultural diversity, social justice, sustainable development, global citizenship, human interaction with the environment, and other concepts taught in social education courses and teaching methods at Jordanian universities.

6.4. Research Limitations

The findings of this study can be generalized considering the following limitations:

1. Human Limitations: This study is limited to a sample of sixty Jordanian university students divided into two equal groups of thirty students each.
2. Spatial Limitations: This study is conducted in Jordanian universities.
3. Temporal Limitations: This study is conducted in the second semester of the academic year (2024/2025).

6.5. Research Instrument

6.5.1. Social Concepts Test

A test was developed to measure students' level of acquisition of social education concepts using the following steps:

- Setting the test aims: it is to measure the level of acquisition of social education concepts by Jordanian university students.

- Identifying Social Concepts: A list of the main social concepts included in the "Social Education and its Teaching Methods Course" was identified, including the following concepts: cultural diversity, social justice, sustainable development, global citizenship, human interaction with the environment, social change, and community participation.
- Preparing the specifications table: A specifications table was prepared for the test, considering the relative weight of each of the preceding concepts and the levels of learning: recall, comprehension, application, analysis, production, and evaluation.
- Formulating Test Questions: The test questions were formulated in the form of multiple-choice questions, considering the rules for creating this type of question. The test consisted of 40 questions, distributed across the aforementioned concepts and various learning levels.
- Test Validity: To check the validity, it was presented to a group of validators specializing in social studies, curricula, teaching methods, and educational technology. This group was tasked with ensuring the questions were appropriate for the concepts they measured, as well as the clarity and soundness of their wording. Necessary modifications were made considering the validators' opinions.
- Difficulty and Discrimination Coefficients: To check the validity of the test items, difficulty and discrimination coefficients for the test items were calculated. The difficulty coefficients ranged between 0.35 and 0.60. The discrimination coefficients ranged between 0.36 and 0.59, as all the items are within acceptable values for considering the test items appropriate according to the standards set by Ebel [10].
- Test Reliability: To check the test's reliability, it was administered to a pilot sample of twenty students outside the research sample. The reliability coefficient was calculated using the Kuder-Richardson (KR-20) equation. The reliability coefficient value was 0.84, a high value indicating that the test has a high degree of reliability.
- Determining the Test Time: The test time was determined by calculating the average time taken by the survey sample students to complete the test, which was 60 minutes.
- Final form of the test: After ensuring the test's validity and reliability, the final version consisted of 40 multiple-choice questions, with each question worth one point, for a total score of 40 points.

6.5.2. Digital Applications Attitude Scale

A scale was developed to measure students' attitudes toward using digital applications to learn social education concepts using the following steps:

- Setting the scale aims: it is to measure Jordanian university students' attitudes toward using digital applications to learn social education concepts.
- Identifying the scale dimensions: three main dimensions of the scale were identified: the cognitive dimension, "students' beliefs about using digital applications," the affective dimension, "students' feelings toward using digital applications," and the behavioral dimension, "students' willingness to use digital applications."
- Formulating Scale Statements: The scale statements were formulated in the form of positive and negative declarative statements, considering the rules for formulating attitude scale statements. The scale's initial form contained thirty (30) statements distributed across three dimensions.
- Determining the Response Method: The Likert scale was used with a 5-point scale: strongly agree, agree, neutral, disagree, strongly disagree, while scores were assigned as follows: positive statements "5, 4, 3, 2, 1" and negative statements "1, 2, 3, 4, 5".
- Scale Validity: To check test validity, it was presented to a group of validators specializing in social studies, curricula and teaching methods, educational technology, and psychology. This group was tasked with ensuring the questions were appropriate for the concepts they measured, as well as the clarity and soundness of their wording. Necessary modifications were made considering the validators' opinions.
- Construct Validity: To assess the internal construct validity of the scale's items, it was applied to a pilot sample of 20 students outside the research sample. Pearson's correlation coefficients were calculated between the items and their respective dimensions, as well as their correlation with the total scale score. The values ranged from 0.693 to 0.777 with the respective dimensions, while the item correlation coefficients with the total scale score ranged from 0.584 to 0.684.
- Scale Reliability: To assess the scale's reliability, it was applied to a pilot sample, and the reliability coefficient was calculated using Cronbach's Alpha. The reliability coefficients for the dimensions ranged between 0.85 and 0.86. The reliability coefficient for the overall scale was 0.92, a high value indicating a high degree of reliability.
- Final Form of the Scale: After ensuring the scale's validity and reliability, the final form of the scale consists of 25 statements distributed across three dimensions as follows: the cognitive dimension (8 statements), the affective dimension (9 statements), and the behavioral dimension (8 statements). Thus, the total score for the scale ranges between 25 and 125 points.

6.5.3. Equivalence of the Study Groups

To determine the equivalence of the two groups, "experimental" and "control," on the scales, the means and standard deviations of the study participants' scores on the pre-test of the Social Concepts Test and the Digital Applications Attitude Scale were calculated. To demonstrate the significance of the differences between the means, an independent samples t-test was used according to the group variable. Table 1 illustrates those results:

Table 1.
Means, Standard Deviations, and the T-Test to Indicate the Significance of the Differences between the Scores of the Individuals of the Two Groups on the Pre-Test of the Social Concepts Test and the Digital Applications Attitude Scale.

Instruments	Groups	N	AM	SD	T-Test Value	DF	Sig. Level
Social Concepts Test	Control	30	16.20	6.00	1.088	58	0.281
	Experimental	30	14.60	7.22			
Digital Applications Attitude Scale	Control	30	2.023	0.347	0.916	58	0.379
	Experimental	30	2.150	0.398			

As illustrated in Table 1, there were no statistically significant differences at the significance level ($\alpha \leq 0.05$) between the mean scores of students in the two groups on the pre-test social concepts test and the digital applications attitude scale due to group differences. The t-test value for the social concepts test was (1.088), with a significance level of (0.281), while the t-test value for the digital applications attitude scale was (0.916), with a significance level of (0.379). Therefore, these values are not statistically significant at ($\alpha \leq 0.05$), indicating the equivalence of the two groups, "experimental and control," in pre-performance.

6.6. Research Procedures

The current research was conducted according to the following steps:

Pre-Test of Research Tools: The Social Concepts Test and the Digital Applications Attitude Scale were administered to the control and experimental groups to ensure equivalence before the experiment began. The results of the pre-test showed no statistically significant differences between the mean scores of the two groups on either the Social Concepts Test or the Digital Applications Attitude Scale, indicating equivalence between the two groups before the experiment began.

Experimental Implementation: The experiment lasted for eight weeks, with three hours per week. The control group studied social education concepts using the traditional lecture method, while the experimental group studied the same concepts using digital geographic applications (Google Earth, Google Maps, GPS). Both groups were taught by the same researcher to control the teacher variable.

Post-Test of Research Tools: After completing the experiment, the Social Concepts Test and the Digital Applications Attitude Scale were administered to the control and experimental groups.

Statistical Processing: The Statistical Package for the Social Sciences (SPSS) was used to process the data statistically, along with the following statistical methods:

means and standard deviations were used to calculate the mean score.

An independent samples t-test was used to determine the equivalence of the control and experimental groups.

The paired samples t-test was used to compare the mean scores of the experimental group on the Digital Applications Attitude Scale pre- and post-tests.

An analysis of covariance (ANCOVA) was used to compare the mean scores of the control and experimental groups in the pre- and post-tests according to the teaching methods, "traditional lecture and digital applications."

Eta squared (η^2) is used to calculate effect size.

7. Results

7.1. First Question Results

(RQ1). What is the impact of using digital applications such as Google Earth, Google Maps, and GPS on Jordanian university students' acquisition of social education concepts?

To answer this question, the means, standard deviations, and adjusted means of the scores of Jordanian university students on the Social Concepts Test for the two groups, “experimental and control,” and the pre- and post-tests were calculated. Table 2 illustrates those results.

Table 2.
Means, Standard Deviations, and Adjusted Means of the Scores of the Two Groups in the Pre- and Post-Tests of the Social Concepts Test.

Dependent Variable	Group	N	Pre		Post		Adjusted Means	Deviation Errors
			AM	SD	AM	SD		
Social Concepts Score out of 40	Control	30	16.20	6.00	22.93	4.03	22.917	.841
	Experimental	30	14.60	7.22	34.83	3.86	34.850	.841

As illustrated in Table 2, there were apparent differences between the mean scores of the participants of the two groups, “experimental and control”, in the pre- and post-tests on the total score of the Social Concepts Test. To show the significance of the differences, the analysis of covariance (ANCOVA) was used for the performance of the participants of the two groups according to the teaching method “traditional lecture and digital applications”. Table 3 illustrates those results.

Table 3.
Analysis of Variance (ANCOVA) of the Differences between the Mean of performance of the Two Groups, "Experimental and Control" on the Achievement Test of Social Concepts According to the Difference in Teaching Method.

Dependent Variable	Source of Variance	Sum of Squares	df	Mean of Squares	F-Value	Sig. Level	Effect Size) η^2(
Post-Test Application	Pre-Test	.414	1	.414	.022	.819	.006
	Teaching Method	490.680	1	490.680	23.991	.000	.496
	Error	1165.819	57	20.453			
	Total	62681.00	60				
	Adjusted Total	1688.183	59				

As illustrated in Table 3, there were statistically significant differences ($\alpha \leq 0.05$) between the means of performance of Jordanian university students in the two groups, "experimental and control," on the post-test of social concepts due to differences in teaching methods. The F-value of the total score was 23.991 at a significance level of 0.000, which is considered statistically significant at $\alpha \leq 0.05$. The Eta squared value is $\eta 2=0.496$, representing the effect size for the teaching method using digital Geographic applications. This indicates that 49.6% of the variance in the acquisition of social concepts is explained by the use of digital Geographic applications. According to the mean table, the adjusted mean score for the experimental group was 34.850, while the control group's mean was 22.917. Therefore, the experimental group taught using digital applications performed better than the control group taught using traditional lecture methods.

7.2. Second Question Results

(RQ2). What are Jordanian university students' attitudes toward using digital applications to learn social education concepts?

To answer this question, the overall means and standard deviations of the scores of the experimental group students in the post-test of the scale of Jordanian university students' attitudes towards using digital applications in learning social education concepts and each dimension were calculated, considering their descending order according to the means. Table 4 illustrates those results.

Table 4.
Means, Standard Deviations, Ranks, and Levels of Responses of Students in the Experimental Group in the Post-Test on the Dimensions of the Digital Applications Attitude Scale Arranged in Descending Order According to the Means.

No.	Dimensions	AM	SD	Rank	Level
1.	Cognitive Dimension	4.16	0.69	2	High
2.	Affective Dimension	4.41	0.73	1	High
3.	Behavioral Dimension	4.15	0.62	3	High
Overall Mean		4.25	0.65	High	

As noted in Table 4, Jordanian university students' attitudes toward using digital applications to learn social education concepts were evaluated as high, with an overall mean of 4.25 and a standard deviation of 0.65. Regarding the dimensions, the affective dimension is ranked first, with a high level, a mean of 4.41, and a standard deviation of 0.73. The cognitive dimension is ranked second, with a high level, a mean of 4.16, and a standard deviation of 0.69. However, the behavioral dimension is ranked last, with a high level, a mean of 4.15, and a standard deviation of 0.62. To find out whether there were statistically significant differences between the mean scores of the experimental groups' pre- and post-tests on the attitude scale, a t-test was used for two related samples. Table 5 illustrates the results.

Table 5.
Means, Standard Deviations, and "T" Test for Correlated Samples for the Differences between the Performance of the Experimental Group Participants in the Pre- and Post-Tests on the Digital Applications Attitude Scale.

Dimension	Test	AM	SD	T-Test	df	Sig. level	Effect Size (η^2)
Cognitive Dimension	Pre	2.11	0.59	12.558	29	0.000	0.611
	Post	4.16	0.66				
Affective Dimension	Pre	2.18	0.57	12.754	29	0.000	0.685
	Post	4.41	0.73				
Behavioral Dimension	Pre	2.15	0.52	11.631	29	0.000	0.571
	Post	4.14	0.65				
Overall Scale	Pre	2.15	0.40	19.091	29	0.000	0.738
	Post	4.25	0.65				

As revealed in Table 5 there were statistically significant differences at the significance level of ($\alpha=0.05$) between the mean performance of the experimental group participants in the pre- and post-tests on the scale of attitudes towards using digital applications, favoring the post-test on both dimensions and the overall scale. The t-test values for the dimensions ranged between (12.754) and (11.631), with significance levels less than (0.05). Additionally, the t-test value for the overall

scale was (19.091), with a significance level of (0.000), indicating that these values are considered statistically significant at (α=0.05). The effect size (0.738) is large, suggesting that the use of digital geographic applications positively impacted students' attitudes towards using these applications in learning social education concepts.

8. Discussion

In this section, the current research results are thoroughly discussed.

8.1. The Impact of Using Digital Applications on Teaching Social Education Concepts

The research results showed a significant positive impact of using digital geographic applications (Google Earth, Google Maps, GPS) on Jordanian university students' acquisition of social education concepts. The experimental group, taught using these applications, outperformed the control group, taught using the traditional lecture method, and the effect size was significant. This result can be explained by considering the following reasons:

8.1.1. Visualizing Abstract Concepts

Digital geographic applications help visualize abstract social concepts and make them more tangible and concrete for students by linking them to spatial and geographical dimensions, making them easier to understand and comprehend. This aligns with the findings of Merç and Ersoy [5], indicating that using Google Earth helps visualize abstract concepts and make them more tangible for students.

8.1.2. Enhancing Visual and Spatial Learning

These applications provided a visual and spatial representation of information, helping students understand spatial relationships and perceive the geographical dimensions of various social phenomena. This is consistent with the results of Sayed-Ahmed [4] study, asserting the effectiveness of using Google Earth in developing students' spatial perception skills.

8.1.3. Promoting Active and Collaborative Learning

These applications encouraged students to actively participate in the learning process through exploration, research, analysis, and discussion, enhancing their learning and making it more enjoyable and effective. This agrees with the findings of Thankachan and Franklin [2], demonstrating that the use of digital applications promotes active and collaborative learning.

8.1.4. Connecting Social Concepts to Reality

These applications enabled students to connect the social concepts they were studying to their lived reality by exploring and analyzing real-life situations and phenomena, thereby enhancing their understanding of these concepts and making them more relevant to their lives. This is consistent with the findings of Sayed-Ahmed [4] study, accentuating the importance of connecting concepts to reality through digital applications.

8.1.5. Considering Individual Differences Among Learners

These applications provide a diverse learning environment that considers individual differences among learners and meets their different needs and learning styles, helping all students learn according to their abilities and potential.

Regarding the statistical differences between the mean scores of the experimental and control groups on the Social Concepts Test, the results revealed statistically significant differences at the significance level of ($\alpha \geq 0.05$) between the mean scores of the control and experimental groups on the post-test of the Social Concepts Test in favor of the experimental group, as the t-value was (11.32), which is a statistically significant value. The effect size was 0.78, a large effect size according to Cohen's criteria, confirming that the use of digital geographic applications has a positive impact on Jordanian university students' acquisition of social education concepts compared to traditional lecture methods. This result is attributed to the students' motivation and the physical and psychological incentives to engage in the learning process in an enjoyable and engaging manner, enabling them to master the knowledge, skills, and competencies specific to social studies subjects. This result is also consistent with all previous studies.

8.2. Student Attitudes Towards the Use of Digital Applications

The research results showed that the attitudes of the experimental group students toward using digital applications to learn social education concepts were highly positive. Statistically significant differences were also found between the mean scores of the experimental groups' pre- and post-tests on the attitude scale in favor of the post-test. This demonstrates that the use of digital geographic applications had a positive impact on developing students' attitudes toward using these applications for learning. This result can be explained by considering the following reasons:

8.2.1. Achieving Enjoyment and Excitement in Learning

Digital geographic applications furnished students with an enjoyable and engaging learning experience through exploring and interacting with educational content in a different way from traditional methods. This contributed to developing positive attitudes toward using these applications. This is consistent with Merç and Ersoy [5], indicating that the use of digital applications makes teaching more engaging and increases student motivation.

8.2.2. Students' Sense of Accomplishment and Empowerment

These applications helped students gain a better understanding of social concepts and the relationships between them, leading to a sense of accomplishment and empowerment, and reinforced their positive attitudes toward using these applications. This is consistent with the results of Al-Najdi et al. [7] study, which indicated that the use of digital applications enhances students' sense of accomplishment and empowerment.

8.2.3. Adapting Apps to Students' Interests and Inclinations and Boosting Self-Confidence

These apps align with students' interests and inclinations in the digital age, where technology has become an essential part of their lives, making them positively receptive to its use in learning. These apps also help boost students' self-confidence and increase their learning independence by providing them with opportunities to explore, research, and analyze on their own, contributing to the development of positive attitudes toward using these apps. This is consistent with the results of Al-Humaidan [9], which emphasized the role of digital applications in independent learning and the ability to reflect and think critically.

9. Conclusion

In a nutshell, the results hold several important educational implications, namely that social studies education in our era should not be separated from modern technological tools. It has become clear that students learn better when they have access to multisensory media and interactive learning experiences. Integrating applications such as Google Earth and Google Maps into teaching strategies for geography, history, and national education is also no longer a luxury or a mere enrichment activity. Rather, it can be considered part of the necessary development of teaching practices to meet the demands of the 21st century. Accordingly, this leads us to a fundamental recommendation represented in explicitly incorporating these technologies into the curricula of faculties of education. For example, obligatory units or activities could be added to "Social Education and Its Teaching Methods Course" courses that require student teachers to use digital maps in designing a lesson or project.

Moreover, a graduation assignment, for example, could be to develop a digital teaching unit that uses digital maps to reinforce a specific social concept, ensuring that every graduate has practical experience in this regard. In addition, the results indicate the need to develop the skills of faculty members themselves in using these technologies. For instance, if a professor is not proficient or convinced of their benefits, they will not spread them among students. Therefore, the study recommends holding workshops and training courses for teachers in social studies to familiarize them with the latest developments in digital mapping technologies and methods for using them educationally.

Additionally, it may be beneficial to collaborate with global initiatives like Google Earth Education, which provides resources for teachers. For example, you could also leverage open GIS software or partner with the Royal Jordanian Geographic Center (RJGC) to provide local content and data for use in student projects. An important recommendation is to improve the technical infrastructure in universities, as computer labs equipped with mapping software and fast internet access will make this more feasible, especially during formal educational sessions. Consideration should be given to incorporating technologically supported field projects, such as assigning students to conduct field surveys using GPS and presenting the results on digital maps. This will develop their field research experience, along with their technical skills and scientific understanding. Moreover, these projects will increase students' interaction with their community and environment, develop their scientific research skills, and consolidate acquired concepts.

Given these findings, the study suggests further complementary research, such as conducting a pilot study in a Jordanian university setting that directly compares the performance of groups taught using technology versus those without it in specific courses to accurately determine the extent of improvement. It would also be useful to conduct qualitative studies, including in-depth interviews and focus groups with students and faculty, to explore their attitudes and suggestions on the best ways to integrate technology into social studies education. Another area worthy of study is the impact of using these applications on students' motivation and attitudes because measuring this systematically is useful for determining whether the use of technology increases a student's motivation to learn and specialize. The research could also be expanded in the future to include other educational levels, such as elementary or secondary school students, to determine the extent of their pre-university preparation and the impact of early learning through these media.

Furthermore, it is worth noting that the integration of technology of any kind into education must be planned and deliberate. It is not enough to simply distribute hardware or provide software without integrating it into a solid instructional design, as faculty members must clearly define where and why they will use Google Earth or other tools in their instructional plan to achieve specific goals. Additionally, they must guide students through their use to ensure learning is achieved and that the experience does not become distracting or superficial. Technology is a tool, not an end, and our role as educators is to encourage innovation in teaching methods and curriculum development.

10. Recommendations

Given the findings and discussed conclusions, this paper provides a set of practical recommendations and development proposals that will maximize the benefits of digital geographic applications in social studies education. The study recommends integrating geographic technologies into the curriculum, such as incorporating the use of tools like Google Earth, Google Maps, and GIS into the curriculum of social studies courses at universities. This can be achieved by developing activity guides or ready-made learning units that use these tools to achieve specific objectives in geography, history, and national education courses and their teaching methods. For example, a "Historical Virtual Tour" activity should be included in a modern Jordanian history course using Google Earth to visit virtual sites of important historical battles and events and connect them to the geographical context.

Additionally, another key recommendation emphasizes developing faculty capacity, such as organizing training courses and workshops for faculty members in colleges of education, particularly those specializing in social studies curricula and teaching methods, on how to employ digital mapping applications in teaching. The training includes a technical aspect, "how to use basic software and produce interactive materials," and a pedagogical aspect, "designing classroom activities and student assignments based on these tools". It would be beneficial to involve experts from the Royal Jordanian Geographic Center or GIS specialists in these workshops, as well as to utilize the freely available Google Earth Education resources. The research also recommends improving the technical infrastructure at universities and their affiliated schools, and working to provide up-to-date computer labs equipped with the necessary software and fast, stable internet connections, particularly in colleges of education. This enables student teachers to practice using these technologies during their undergraduate studies.

Moreover, it is recommended that these labs include GPS devices and tablets for students to practice using in the field. In the longer term, plans should be made to incorporate these tools into the technical infrastructure of the schools where graduates will work in the future, enabling them to apply what they have learned in their work environment. A key recommendation is reflected in encouraging graduation projects and student research in this field, as well as motivating social studies students to choose research topics related to the use of technology in social studies education. For example, academic departments can suggest titles such as "The Effectiveness of Using Google Maps in Teaching Geography to Tenth-Grade Students" or "Designing Educational Software Using GIS to Enhance Students' Environmental Concepts."

Further, engaging students themselves in such research during their final year will contribute to graduating a cadre aware of the importance of technology and experienced in its use for both research and instruction. This study also suggests developing local digital educational materials and encouraging collaboration between the Jordanian Ministry of Education and universities to produce local digital content that supports curricula using geographic technologies. For example, creating interactive maps or Google Earth files that illustrate Jordan's geographical and historical landmarks and making them available to teachers and students can help overcome language barriers and adapt the content to the local culture. These materials can be placed in a central digital repository for all social studies teachers to benefit from. Additionally, this study recommends gradual implementation and continuous evaluation, starting with a pilot program in some courses or with a group of enthusiastic teachers to gather best practices and address challenges before generalization. Meanwhile, the impact should be continuously evaluated through achievement tests or student and teacher satisfaction surveys to ensure that technology integration achieves its educational goals and is not deviated by mere superficial preoccupation with technology.

Besides, this work recommends addressing technical and financial challenges by providing appropriate financial and technical support to ensure that resource constraints do not become obstacles to achieving equal opportunities in the use of technology. If some students do not have personal computers, sufficient lab time should be provided for them, or devices should be loaned when needed. Also, coordinating with telecommunications companies to improve internet services on campus or provide discounted educational packages for students can be a supportive step. An important recommendation is to raise awareness of the importance of technology across educational curricula and to introduce concepts that highlight the relationship between geography, technology, and society into the Foundations of Education or Educational Technology courses taught to all education students. The student “future teacher” understands not only how to use the tool but also why it is important in achieving better learning outcomes and creating a more interactive and life-affirming learning environment.

Likewise, this research recommends expanding research to include other stages and areas, such as conducting more experimental studies in the Jordanian university context to verify direct causality and accurately measure the magnitude of the effect. One of the main recommendations is conducting qualitative studies that delve deeper into the experiences of students and teachers with these tools, alongside encouraging applied studies at school levels, “primary/secondary,” to utilize technologies early in the educational process.

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