

The Effectiveness of the Geogebra Program and the Psychological Impact on the Orientation towards Digital Technologies among the First Intermediate Grade Students

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Abstract

The current research aims to identify the effectiveness of the GeoGebra program in moving towards digital technologies among middle first graders.

For the objective of verifying the objective of the research, the following null hypothesis was formulated:

There is no statistically significant difference at the level of (0.05) between the average scores of the female students of the experimental group studying using the GeoGebra program and the average scores of the female students of the control group studying in the usual way in the measure of orientations towards digital technology. The researcher used the experimental design with partial control of the two equal groups, which includes two groups. The research sample consisted of (80) female students who were distributed equally between the two groups. The two groups were rewarded in variables (chronological age, IQ, previous achievement). The researcher also adjusted extraneous variables such as the confidentiality of the experiment and processes related to maturity and experimental extinction. The researcher identified the subject of engineering from the mathematics book for the first middle grade (3rd edition of 2018)

The researcher formulated behavioral objectives for the scientific material, which amounted to (116) behavioral objectives. She also prepared teaching plans for the experimental group and teaching plans for the control group. With regard to research tools, the researcher has prepared a measure of orientations towards digital technology, where (28) items were drafted for the measure for middle first grade students, and the apparent validity of it was calculated by presenting it to a group of experienced arbitrators, and the content and validity of the construction were validated. Statistical means were used, such as the Kay box, the T-test for two independent samples, the Kyoder-Richardson equation 20, and the reliability was verified by the method of retesting (external validity) and reliability using the Fakronbach equation. The results showed the performance of the experimental group studied using the GeoGebra program on the control group students who studied in the usual method in the measure of orientations towards digital technology.

Keywords : Geogebra, the psychological impact, the orientation towards digital technologies.

Research problem:

Due to the rapid developments, the tremendous growth in digital educational devices and applications and smart education technologies, as well as the increasing demand of users to buy smart devices such as phones and computers, despite the progress that has been made in the construction and development of curricula, the level of teaching in most schools is below the level of ambition. Through the researcher's survey of the opinion of a number of teachers of mathematics in middle schools, she observed a significant decrease in the level of female students in the first middle grade in most subjects, and the lack of orientations, experiences, skills and sufficient knowledge, as well as demonstrations and explanatory examples that show students how to employ those digital and smart

educational technologies in various educational purposes and stages. There are studies that confirmed the weakness of middle first grade students as a study (Awad,2009:91) , (Al-Obaidi,2010:3), and a study(Al-Kubaisi,2011:689), and this is due to the lack of actual orientations towards these digital technologies. The use of methods of teaching a live presentation based on the provision of information by the teacher only in the form of practical examples focused on indoctrination, memorization and recollection, and the lack of adequate opportunity necessary for the student to be an effective and participatory element in the teaching process.

The Significance of the Research:

The study of orientations occupies an important place in the education process, and the positive orientations among students have become an important and necessary objective in teaching various scientific subjects, as this importance focuses on the fact that orientations contribute to the progress of female students in the first middle grade in terms of knowledge and encourage them to study these subjects and enjoy studying them and enhance their desire to obtain more knowledge related to them and involve them in methodological activities and encourage them to read the external enhanced their cognitive background (Mari, 1983: 430).

The student's orientations towards the subject of the lesson is one of the factors that affect her success or failure. Her orientations towards the subject of the lesson increase the student's desire to learn and his turnout facilitates the process of education and teaching. As for the negative orientation, it hinders the student's growth cognitively (Qatami 344: 2000-345).

Recently, it has become a orientation towards integrating digital technology in the presentation and teaching of the study material so that education in the integrated curriculum is based on thinking, research and investigation, where students learn thinking strategies through self-learning, where their teaching and thinking abilities develop clearly and concretely , so they feel pleasure and excitement in learning , and this is what motivates them to practice self-learning in pursuit of creativity, and when the information obtained by students from the content of the study material is fused with different and multiple types of thinking skills, they can work to employ multiple types of thinking in their working lives "(Tafesh ,2004: 118-119).

The objectives of the Research:

The current research aims to identify the effectiveness of the GeoGebra program in moving towards digital technologies among middle first graders.

Research Hypothesis:

There is no statistically significant difference at the level of (0.05) between the average scores of the female students of the experimental group studying using the GeoGebra program and the average scores of the female students of the control group studying in the usual way in the measure of orientation towards digital technologies.

search limitations

The current research is determined by the following:

- 1) Female students in the first middle grade in public schools in Qadisiyah Governorate/General Directorate of Education of Qadisiyah.
- 2) The second half of the academic year 2022/2023.

Chapter Five and Chapter Six of the Textbook of Mathematics for the First Intermediate Grade, Third Edition, 2018 , Ministry of Education / Iraq.

Identifying Terminology

First: - GeoGebra program is identified by :

1- (Anbousi,2005): An interactive program aimed at providing assistance to students from 10 to 18 years old and their teachers in mathematics class and it can certainly be used before and after this age, and the possibility of integrating algebra and geometry together (Anbousi,2005: 44)

2- (Al-Rujaibi,2007): A program that was built according to international rules and standards for mathematics supported the approved curriculum and is not a substitute for it. It was designed in a way that the student can develop a precise and deep understanding of mathematical theories and facts during practical application and discover the concepts himself (Al-Rujaibi,2007:27).

The researcher adopted the definition (Anbousi ,2005) as it suits the current research.

The researcher defines it procedurally: a digital technology within the educational multimedia, which is a set of steps and procedures performed by both parties to the educational process, which contribute to providing students with engineering skills for the subject under research and help them discover the relationship between its elements and is suitable for the school and not a substitute for it, and is used with the experimental group in teaching mathematics to the students of the research sample.

Second: - Orientation : Defined by: -

1- (Khalifa, 1990): A cognitive psychological state of the student that is formed because of his perceptions related to a particular subject, leading him to carry out a number of reactions or behaviors, and it is determined by these responses the extent of the student's acceptance or rejection of this subject. (Khalifa,1990: 130)

2- (Ahmed,2009): "Psychological preparation and readiness that has been acquired in advance , is somewhat stable, gives the student his opinion and belief towards a specific topic or idea (Ahmed,2009: 35).

The researcher agrees with the definition (Ahmed,2009) theoretically; because it fits the definition (orientation) theoretically.

The researcher defines it procedurally: - The opinion of the students of the first average to accept or reject modern educational technologies, and is measured by the degree they receive in the measure of orientation towards digital technologies prepared for research purposes.

Third: - Digital Technologies : Defined by :

1) (Al-Jundi, 2000): Digital technologies are the methods in which devices and tools are managed by numbers(Alia Al-Jundi , 2000 :12).

2) (Amal Swaidan and Manal Mubarez, 2008): It is the technique that uses the pulses represented by bits in a digital way, that is, without attention to the physical medium, where they can be transferred and dealt with without the need to put them on paper, and the bit is the smallest unit to represent digital data, and takes the value of one or zero, and information, images and sounds can be represented by a large number of bits, which can be stored on multiple media such as computer magnetic discs or CDs...Techniques that convert texts, shapes, and sounds into single-zero strings so that they become mechanically processable and fusionable in a multimedia alloy. (Amal Suwaidan and Manal Mubarez, 2008 :191)

The researcher agrees with the definition of (Al Jundy , 2000)theoretically, because it fits the definition of (digital technologies) theoretically.

The researcher defines digital technologies procedurally : a feature of the modern era and the attention of the generation accompanying it and help to design, organize and implement the educational process according to the objectives previously identified is the dealing of the students of the first medium with modern technology and modern programs and Internet connectivity.

Theoretical background

The first Subject : The electronic world (electronic culture)

Currently, homes, offices and other places are not free of the presence of electronic devices, but rather the case that a person does not move from one place to another without having an electronic device, until the emergence of the so-called (computer culture) : It is that the individual is able to deal with the computer, and familiarity with knowledge and information related to the computer in order to make an adaptation to the electronic environment that depends on the use of the computer, and awareness of using the computer correctly, sound and legal and awareness of the risks that occur as a result of using the computer correctly , electronic culture consists of: (knowledge , borders, direction, application , enjoyment). (Al-Ashiri , 2011 : 188)

GeoGebra

GeoGebra is a program designed and built on international standards of mathematics that supports the curriculum adopted by the Ministry of Education and not a substitute for it. It is designed and built in a way that helps the student to develop a deep understanding of mathematical theories and facts through practical application, and discover the concepts himself. The program is a set of tools that help the student acquire mathematical skills. The program includes all the necessary aids to make the learning process more flexible and enjoyable, as the student constantly relies on his previous learning, and this is fully consistent with the structural approach to learning(Al-Jasser , 2011 : 73).

Subject 2 : Engineering

Engineering occupies the largest part of realistic (tangible) mathematics, where everyone sees it, and the student can feel it unlike some other mathematical topics, which are completely abstract, and it is not easy for the student to deal with it, especially algebraic ones , while it is easy to deal with most engineering concepts and teach them easily if the teacher mastered the use of educational means necessary to understand them , as one of the distinctive qualities of engineering is its use of specific educational means, which clarify different engineering concepts and rules at all levels of these means (Abu Lom , 2005 : 25).

The third Subject : -orientations

The orientation was originally an English word translated into Arabic, and the English philosopher (Herbert Spenco) was the first to use the term orientation, and those who wrote in the directions were previously in (1862AD) in his book (First Principles), where he stated (that our access to correct judgments in matters characterized by excitement for a lot of controversy depends on a large degree of our mental orientation as we listen to this controversy and participate in it(Abu Jadu 2002:189) .

Orientations may be formed through contact with the topic of orientation or direct contact with experience and reality, and orientations (negative or positive) may arise as a result of a coincidental situation or painful experience (Ahmed,2008: 1999).

Orientation Characteristics

(Al-Anani,2008) believes that the most prominent characteristics of theorientations can be clarified by the following points: -

1- Latent psychological components that can be deduced by observing the student's response to different stimuli or through his verbal response to the topics of orientation .

2- It is characterized by its relative reliability and reliability and resists change.

3- Orientations are acquired and not inherited, and therefore they develop in the student through his interaction with his physical and social environment in which he is present.

4- Can be measured and evaluated and need appropriate tools and expertise to measure and evaluate verbally or behaviorally

5 – with a certain emotional content, varying in the degree of severity or comprehensiveness . (Al-Anani, 2008: 35)

LITERATURE REVIEW

First, there are studies on GeoGebra application.

1- Darwish (2013): This study was conducted in Jordan and aimed to find out the impact of using the GeoGebra program in understanding splint concepts and mathematical representations.

The sample number was 50 students and research was conducted in the subject of algebra and two tools were used (mathematical concepts comprehension test, mathematical representation test) and statistical means were used (one-variance analysis)

The research concluded : There are statistically significant differences to absorb the splint concepts and mathematical representation due to the teaching method that depends on the Geogbera software .

2- Al-Balawi (2012): This study was conducted in Saudi Arabia and aimed to find out the impact of an educational program based on the GeoGebra software in solving mathematical problems and motivation towards learning mathematics.

The sample number was 64 students and the research was carried out in the subject of engineering and two tools were used, namely (test solving mathematical problems and a scale of motivation towards learning mathematics) and statistical means were used (analysis of single variance) .The research concluded : There are differences in favor of the experimental group that was taught through the GeoGebra software in achievement and motivation in mathematics.

Studies on the orientation towards digital technologies:

1- Study (2018Bolliger, D. U. & Shepherd, C. E.)

This study aimed to research the university students' orientations towards employing digital and smart devices to study outside the classrooms and classrooms (in the gardens, for example) and to establish this in the light of the theories of natural scientists and psychology. The tools of this study were a number of questionnaires and opinion polls on learning using technical devices outside the classrooms. The number of the study sample was (95) students enrolled in eight study programs at the University of Wyoming in the United States. The results of the study reported the high positiveorientations among the participants in the study sample towards engaging in learning through technical and smart devices connected to the Internet outside the classrooms, and employing them to communicate with others of different ages as well.

2- Al-Sharif (2018) : This study was conducted in Saudi Arabia and aimed at knowing the extent of awareness of digital and smart educational technologies for faculty members in Saudi universities and their orientations towards them .

The number of members of the research sample reached (15) faculty members in three Saudi universities.

He used two research tools, namely, to determine the awareness of faculty members in Saudi universities about digital and smart educational technologies and to measureorientations towards the use of digital and smart

educational technologies in education , and used statistical means such as T-testing . Alpha Cronbach equation, Pearson correlation coefficient. The current research has reached several results, the most important of which is the absence of statistically significant differences in the degree of awareness of faculty members in Saudi universities about digital and smart educational techniques due to the basic effect of the degree, or gender. The results also reached statistically significant differences in the orientations of faculty members in Saudi universities due to the basic effect of the degree, while there were no statistically significant differences in the orientations also due to the basic effect of the gender factor of the individuals in the research sample.

Chapter Three

The research community and its procedures :

This chapter includes a presentation of the research procedures: research methodology, experimental design, identification of its population, sample selection and equivalence of the two experimental groups, identification of scientific material, formulation of behavioral objectives, preparation of teaching plans, preparation of the research tool (orientation scale of digital technologies), and appropriate statistical means for data analysis.

Experimental Design

The basis of the work of the experimental design is to estimate the relative importance of the impact of various factors on the change of measurements. We call the measurement that we experiment on the subject of the study the dependent variable, and we call the supposed reasons for the change of the incident in the measurement with independent variables. Therefore, the basis of the work of the experimental plan is to organize the set of measurements that we want to do on the subject of the study so that this helps us determine the amount of change in the measurement and its return to the independent variable " (Bakdash , 2011 : 26) .

The researcher adopted the experimental design with partial control in two groups (experimental study using the GeoGebra program , an officer studying in the usual traditional way) and the following table shows this .

Table (1) Experimental design of research

The dependent variable	The independent variable	Valence	Group
Digitalorientations Scale	GeoGebra Program	Chronological age 2. Mid-year grade 3.IQ	Experimental group
	The usual method		Control group

Third : The research community and its sample

Research community

The research community consists of all 17,991 female students in the middle first grade in the schools of the Directorate of Education of Qadisiyah.

Research sample

The research sample is chosen in a random manner, as the school includes (5) people for the first middle grade, two of which were chosen at random, which are (A, B) to represent the experimental group, and the control group, and the students were excluded statistically and the following table shows that

Table (2)

Number of female Students		Group
After Exclusion	Before Exclusion	
40	44	Experimental
40	46	Officer (B)
80	90	Total

Equivalence of the two research groups

The two groups were equated in variables (age in months , IQ , and previous information in mathematics) and a t-test was calculated where the results were not statistically significant, as in the following table:

Table 3 Equivalence of the two research groups results

Valence	Group	Number of sample students	Arithmetic mean	Standard Deviation	Degree of freedom	t.. Value		Statistical significance at (0.05)
						Calculated	tabular	
Age in months	Experimental group	40	151.461	6.488	78	0.440	1.99	Not significant
	Control group	40	150.858	5.756				
IQ .	Experimental group	40	29.125	7.757	78	0.308	1,98	Not significant
	Control group	40	28.600	7.483				
Prior information	Experimental group	40	63.750	25.091	78	0.145	1,98	Not significant
	Control group	40	62.950	24.379				

4. Research tool

Through the current research objective, the research tool was orientations scale towards digital technologies. (28) items were drafted to measure the orientation towards digital technologies for middle first graders. The answer to the scale was according to a triple gradation. The statistical program SPSS and Excel were used to calculate the t-test for two independent samples, the K-square, the characteristic strength, and the internal consistency.

5. Preparation of teaching plans:

Through the content of the scientific material represented in chapters 5 and 6 of the mathematics textbook for the first middle grade, teaching plans were prepared for each of the research groups (experimental and control), for the students of the first middle grade for the academic year (2022/2023). A model of it was presented to a group of arbitrators to benefit from their experiences and views on its validity, and it was modified according to what they approved and proposed.

6- Application of the experiment: -

The students of the experimental group studied chapters (fifth,sixth) of the mathematics textbook for the first intermediate grade for forty days at a rate of one class per day,using the GeoGebra program, and the students of the control group studied the same subject with the same school, place and duration, but in the usual way.

Scale exploratory experiment:

Indicates the need to ensure that the sample members understand each item of the scale (Faraj, 1980 :160) .The scale was applied to a first survey sample. The number of the sample was (40) female students in the first middle grade, and it became clear through this that the instructions of the scale are clear and its items are understandable .

The researcher then applied theorientations cale towards digital technologies to a second exploratory sample, and the number of the sample was (150) female students in the first middle grade. For statistical analysis and extraction of psychometric properties of the scale.

Psychometric characteristics of the measure of orientation towards digital technologies:

Test validity

The validity of the test was found in two ways: -

Face validity : Presenting the test to a group of arbitrators and specialists in the field of education and psychology.

Construct validity

This type of validity is defined as an analysis of the meaning of test scores in the light of behavioral concepts and is one of the most acceptable types of validity from the point of view of a large number of psychometric specialists, as it is consistent with the essence of the concept of validity in terms of the saturation of the scale in the general sense (Imam et al., 1990, p. 131) .

The final version of theorientations cale towards digital technologies:

The scale is damaged in its final form of (28) items, and since the psychological concepts are distributed in a moderate distribution and to ensure that the scores of the members of the statistical analysis sample are distributed in a moderate distribution, the researcher calculated the statistical indicators such as the mean, mean, mode, standard deviation and variation, as well as the twisting and skewing, as well as the highest and lowest scores for all students on the scale of orientation towards digital technologies, as shown in the following table:

Table (4) shows the statistical indicators for the engineering material test

Statistical Attribute	Engineering test
Arithmetic Mean	55.313
Standard error of the mean	2,547
Mean	56
- Mode.	56
Standard Deviation	3.120
Variance	9.733
Torsion!	238
Torsion standard error .	0.198

Kurtosis	-0.029
Standard error of Kurtosis.	0.394
Range	58
Lowest score	47
Highest score	63
Hypothetical mean (Maths.)	56
Number of items	28
Number of alternatives	3

Chapter Four

Presentation and interpretation of results

Research Findings:

Results related to the orientation towards digital technologies

The zero hypothesis stated that (there is no statistically significant difference at the level of significance (0.05)between the average of the experimental group students who studied using the GeoGebra program and the average of the control group students who studied in the usual way in testingorientations towards digital technology.

To verify the validity of the hypothesis, the researcher calculated the arithmetic mean, standard deviation and T-value, as in the following table

Table (5) Results of the T-test of the two research groups in the measure of orientation towards digital technologies

Groups	Sample size	Arithmetic mean	Standard Deviation	T value		Significance
				Calculated	tabular	
Experimental group	40	66.225	2.475	9.349	1,99	significant
Control group	40	56.800	5.876			

It is clear from the above table that the arithmetic average of the scores of the students of the experimental group is equal to (66.225), while the arithmetic average of the scores of the students of the control group is equal to (56.800) and the calculated T-value is (9.349), which is greater than the table value of (1,99) at the degree of freedom (78) and the level of significance (0.05). This means that there is a statistically significant difference in favor of the students of the experimental group in the measure of orientation towards digital technologies, so it rejects the zero hypothesis and accepts the alternative . The trace size has been calculated through the ETA box for the T-test as in Table(6)

Table (6) The Effect Size of the independent variable in the variable of the orientation towards digital technologies

The independent variable	The dependent variable	Calculated T-value	ETA Box	The value of (d) the effect size	Effect Size
GeoGebra	Moving towards digital technologies	9.349	0.528	2,117	Large ¹

We note from the table above that the value of the Effect Size (d) of the independent variable (Geo-Gabra) in the second dependent variable (measure of orientation towards digital technologies) is equal to (1.179) and is greater (than the level of 0.8), which means that the Effect Size is large (Miles & Shevlin, 2001 p:117)

Second : Conclusions: In light of the results of the research, we can reach the following conclusions:

- 1- The effectiveness of the GeoGebra program in increasing the orientation towards digital technologies among the students of the experimental group compared to the students of the control group, which studied in the usual way in mathematics.
- 2- The process of employing the GeoGebra program in teaching has a great impact in raising the level of flexibility of thinking and mutual thinking among the students of the experimental group compared to the students of the control group .
- 3- When employing the Geo-compulsion program, it is necessary to make an additional effort from the mathematics teacher.

The magnitude of the impact of the GeoGebra program on the orientation towards digital technologies is high .

Third : Recommendations: In light of the results of the study and its determinants , the following recommendations were made:

- 1- It is necessary to employ the GeoGebra program through the preparation of a training program for in-service math teachers to train on how to use it in teaching mathematics to develop their required mathematical knowledge and develop the orientation towards digital techniques required to be used in teaching mathematics.
- 2 - The necessary flexibility in the process of teaching, learning and organization in the thinking method, through an educational environment that prevails freedom and suspense during the course of the learning process and works to develop orientations towards digital technologies.
- 3- It is necessary to develop the teacher's skills to teach mathematics to be based on the development of thinking in general and the scale of orientation towards digital technologies in particular.

Fourth : Proposals :

- 1- Conducting many similar studies, including larger random samples, selected from other study communities, in different regions and cities of Iraq, to determine the extent to which the results can be generalized.

¹If the value of (d) is between (0.2 - 0.5), the Effect Size is weak, but if its value is (0.5 - 0.8), the Effect Size is average, and if its value exceeds 0.8, the Effect Size is large. (Miles & Shevlin, 2001 p:117)

2- Conducting studies aimed at revealing the effectiveness of the GeoGebra program as a key input in teaching mathematics courses at the stages of general education, on specific dependent variables such as (scientific skills, problem-solving skills, engineering imagination skills).

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