

**Effectiveness of A Proposed Model in Light of the
Dimensions of Digital Citizenship for teaching
Mathematics on Developing the Attitudes of the
Intermediate Stage Female Students**

By

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Effectiveness of A Proposed Model in Light of the Dimensions of Digital Citizenship for teaching Mathematics on Developing the Attitudes of the Intermediate Stage Female Students

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Abstract:

This study aimed to prepare a proposed model in light of the dimensions of digital citizenship for teaching Mathematics and its impact on attitudes toward mathematics for intermediate school students. To achieve this aim, the research used the quasi-experimental approach, by using two groups, (Experimental and control) groups. The sample of study consisted of (40) female students from Intermediate school students in Asir region. The results showed that there were statistically significant differences at the level of (0.05) between mean scores of the students of the experimental and control groups in the post application of attitudes measure toward mathematics in favor of the experimental group. In two subscales: the attitude towards the nature of mathematics and the attitude towards importance of mathematics. And in light of these results some recommendations and suggestions were made.

Keywords: proposed model, dimensions of digital citizenship, attitudes toward Mathematics.

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فاعلية نموذج مقترح في ضوء أبعاد المواطنة الرقمية لتدريس الرياضيات في تنمية
اتجاهات طالبات المرحلة المتوسطة

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الملخص:

هدفت هذه الدراسة إلى إعداد نموذج مقترح في ضوء أبعاد المواطنة الرقمية لتدريس مادة الرياضيات، وقياس أثره على تنمية الاتجاهات نحو الرياضيات لدى طالبات المرحلة المتوسطة. ولتحقيق هذا الهدف، استخدم البحث المنهج شبه التجريبي من خلال مجموعتين: تجريبية وضابطة. وتكونت عينة الدراسة من (٤٠) طالبة من طالبات المرحلة المتوسطة بمنطقة عسير. وأظهرت النتائج وجود فروق دالة إحصائية عند مستوى (٠.٠٥) بين متوسط درجات طالبات المجموعتين (التجريبية والضابطة) في التطبيق البعدي لمقياس الاتجاه نحو الرياضيات لصالح المجموعة التجريبية، وذلك في بُعدين فرعيين: الاتجاه نحو طبيعة الرياضيات، والاتجاه نحو أهمية الرياضيات. وفي ضوء هذه النتائج، قُدمت بعض التوصيات والمقترحات.

الكلمات المفتاحية: نموذج مقترح، أبعاد المواطنة الرقمية، الاتجاهات نحو الرياضيات.

Introduction:

Mathematics is a foundational science that is inextricably linked to numerous other disciplines. Its applications are pervasive, evident in diverse domains such as finance, fashion design, architecture, and computer programming. Without a grasp of mathematical principles, these fields would be severely limited in their ability to function effectively.

Given the significance of mathematics at all educational levels, scholars have devoted considerable attention to fostering positive attitudes toward it. The development of a positive attitudes towards mathematics is one of the most important learning goals that educational institutions seek to achieve, as it will undoubtedly facilitate more effective learning

Attitude as defined by Al-Ashqar (2022, p. 81) is "a negative or positive feeling or attitude about a physical object, group, type of people, a specific person,an institution, ideas, etc.", Moreover, There is a strong relationship between the way students learn mathematics and their attitude towards it(Khalil ,2018), in addition, The term "attitude" is defined as "an inherent response to a particular topic or situation, accompanied by feelings and emotions, and is an acquired response to a particular stimulus, and is relatively stable" (Mehdi, 2021, p. 85).

On the other hand, The attitude towards mathematics was defined procedurally as follows: the student's negative or positive feelings towards mathematics, after studying the proposed model built in light of the dimensions of digital citizenship, were represented by the score obtained by the student in the mathematics attitude scale used in this research.

Realizing the importance of developing a positive attitude towards mathematics, numerous researchers have endeavored to identify effective strategies to develop positive attitude towards it. In a study conducted by Al-Maliki (2022), aimed at revealing the effectiveness of electronic worksheets in developing visual thinking and attitude towards mathematics for sixth grade students in Jeddah Governorate was investigated, and the sample consisted of 60 students who were randomly selected, and the semi-experimental approach was used, and the study

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resulted in the effectiveness of worksheets in developing the attitude towards mathematics.

On the other hand, Ibrahim (2020) conducted a study aimed at using manuals in teaching topology and its impact on the development of visual thinking and attitude towards mathematics for primary school students, The research sample consisted of 43 male and female students from the fifth grade of primary school, and it employed a semi-experimental approach, The study concluded that the use of manuals in teaching topology has a significant impact on the development of attitude towards mathematics.

In order to encourage a more positive attitude towards mathematics among students, it is necessary to consider the interests of the current generation.

In the current era, with advent of fourth industrial revolution, it has become increasingly challenging to disassociate from the pervasive influence of technology ,in which has emerged as a pivotal tool for accelerating student learning (Al-Maliki, 2022). As of 2019, the average daily screen time for teens ages 8 to 18—excluding homework or school—was 4:44 hours and 7:22 hours for tweens. By age 11, 53% of kids own their own smartphone, and by age 12, that number rises to 69%(James, Weinstein, & Mendoza ,2021). Moreover, the integration of technology into the educational process often requires access to a many websites, which inevitably involves the use of the Internet.

"Since technology is a way of life, especially for young people who came into this life carrying smart devices in their hands"(Alsuhaymi & Aldossary, 2023, P608). individuals may be influenced by their online interactions, The Pew Research Center released a report titled "Teens, Kindness, and Cruelty on Social Media," indicating that "at least a quarter of survey respondents said their online interactions had a significant impact on their lives" "(Walters, Gee, & Mohammed ,2019, p4) This requires students to acquire some skills that make using the Internet safe, and therefore educational institutions are responsible for educating students about this matter. This concept is referred to as "digital citizenship" in modern terminology.

The concept of "digital citizenship" has also been defined as "the standards and norms of proper and responsible behavior when using technology" (Al-Khalifa, 2019, p. 40). Additionally, it has been defined as following the appropriate methods to safeguard users engaged in online communities by promoting desirable behaviors and avoiding undesirable behaviors in digital interactions (Al-Muntashari & Akili, 2019). Additionally, Digital Citizenship can be defend as the criteria for the appropriate use of technology that prepares students for the optimal use of technology (Mosalem, 2023).

The proposed model based on the dimensions of digital citizenship was procedurally defined as a detailed blueprint built in light of the dimensions of digital citizenship (first: The ethical and behavioral dimension, The technological/knowledge dimension, The social dimension, to teach mathematics; with the goal of measuring its impact on the attitudes of first grade middle school students toward mathematics

The importance of digital citizenship is delineating the appropriate and inappropriate conduct associated with the utilization of technology, This prepares a citizen who is capable of comprehending the cultural, social, and humanitarian implications of technology (Mosalem, 2023). The concept of digital citizenship encompasses a set of dimensions, as outlined in the educational literature by Tolba et al. (2018), Al-Muntashari and Al-Maliki (2019), Al-Khalifa and Al-Obeikan (2019), and Al-Qahtani (2018). These dimensions have been integrated and summarized as follows:

1- The ethical and behavioral dimension, which includes:

- a. Digital Behavior: This section delineates the standards to be observed during digital interactions, including respect, the avoidance of racism, and the use of appropriate words.
- b. Digital Law: This section defines the penalties associated with digital malpractices.

2- The technological and knowledge-dimension, It includes the following:

- a. Information digital culture: This refers to the skills required to deal the Internet, including the use of browsers and search engines.

- b. Digital commerce: Consumer awareness of digital commerce and secure purchasing and selling methods online.

3- The social dimension, encompasses the following:

- a. Digital communication and relationships: This refers to the exchange of information via the Internet, encompassing both asynchronous and synchronous communication.
- b. Security and privacy: This is defined by the non-disclosure of personal data to protect against identity theft and fraud, in addition, it use to learn of ways to protect against viruses.
- c. Digital Safety: The prevention of electronic damage, including the hacking of files, the transmission of data-destroying viruses, in the other hand, the safeguarding of physical safety and the awareness of the dangers associated with excessive Internet usage, particularly in relation to the eyes, neck, and other vulnerable areas.
- d- Bullying and Digital Drama: The term "digital bullying" refers to the deliberate harassment of others via the Internet and cell phones. in contrast, Digital drama encompasses online fights and disagreements that may have racial origins, such as, differences in religion, race, or tribe.
- e- Digital reputation and footprinting: Digital activities that are concerned with tracking individuals' data and information via the Internet and other digital devices.
- f- Identity and personal image: Identity is a person's expression of their individuality, while personal image is the image they take of themselves in the digital world.

In light of the growing importance of digital citizenship, numerous researchers have endeavored to elucidate its significance and integrate it into educational curricula. To this end, the study of Moslem (2023) examined the role of blended learning on the development of digital citizenship skills among female secondary school students. The study employed a descriptive methodology

with a sample of 2995 female students from the General Administration of Education in Jazan region, The findings indicated that the mean scores for digital citizenship skills ranged between 4.34 and 4.05.

The objective of Capuno et al.(2022) The purpose of this research is utilizing the digital citizenship model of Mike Ribble to measure the awareness of the teachers and students in terms of how to use digital tools, gadget as support to their educational journey it also examines the consistency of this model through the empirical evidence, The results indicate that students are at risk in this digital environment along with the covid-19 pandemic This critical aspect addresses the schools to provide initiative and integrate digital citizenship in the curriculum in order to provide a responsible digital citizen.

As for school curricula, digital citizenship is one of the essential elements in the teaching and learning process, as it helps in development in all aspects of life. Moreover, it plays a positive role in promoting positive behavior and acquiring digital culture. In light of this, the importance of integrating digital citizenship into school curricula has been emphasized by the International Society for Technology in Education, as it provides learners with the knowledge and skills necessary to engage in safe and responsible digital practices, in accordance with the principles of digital citizenship. It also helps in proper interaction with others and limits the spread of inappropriate behaviors(Alsuhaymi & Aldossary, 2023)

The problem of studying can be identified as the low level of students in mathematics, which was proven by Khalil's study (2018), and what Ibrahim's study (2022) revealed that 88% of students suffer from not enjoying learning mathematical subjects, and with what Abu Obaid (2019) pointed out that the response of male and female students to the learning process is at its best when the abilities and tendencies of students towards what they learn are

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taken into account, hence, this research came to try to raise the attitude towards mathematics ,This research aimed to enhance students' attitudes towards mathematics.

Considering the recent trends in the educational process, which included digital transformation, and taking into account the students' poor understanding of the concept of digital citizenship as pointed out by Muslim (2020), it is clear that this deficiency may have negative effects on the individual and society. In addition, “issues of misuse of technology will arise when individuals are not trained on specific laws and policies for the responsible and ethical use of technology”(Walters, Gee, & Mohammed ,2019, p4) This is especially important in light of the increasing use of the Internet, with the percentage of Internet users in Saudi Arabia reaching 98.60% in 2022 (Al-Asmi and Akram, 2023). It is essential to provide learners with the necessary skills to become digital citizens. This can be achieved by integrating digital citizenship into the curricula. Accordingly, this study aims to evaluate the effectiveness of integrating digital citizenship in promoting positive attitudes among students towards mathematics.

Research questions:

1. What is a proposed model in light of the dimensions of digital citizenship for teaching mathematics to first intermediate grade school female students?
2. What is the impact of the proposed model in light of the dimensions of digital citizenship for teaching mathematics for the first intermediate grade on the attitude towards mathematics?

Methodology:

Due to the nature of the current research, the experimental method was used to apply the proposed model using a quasi-experimental design for two groups: One of them is a control group, which teaches a number of study units prescribed in the textbook in the traditional way, and the

other is an experimental group, to which the proposed model based on the dimensions of digital citizenship is applied.

Research community and sample:

The research community included first intermediate grade school female students. The sample was limited to 40 female students in the first grade of intermediate school who studied in Asir Educational District (Namas Education Department) in the Kingdom of Saudi Arabia, which is taught in the third semester of the academic year 2022 semester.

Equivalence between the experimental and control groups in the pre-measurement of attitudes towards mathematics

In order to verify the equivalence between the experimental and control groups in the premeasurement of attitude towards mathematics, the Mann-Whitney U test was used to examine the significance of the differences between the mean scores of the students of the two groups, and the results came as shown in Table (1).

Table 1:

Equivalence between the experimental and control groups in the pre-measurement of attitudes towards mathematics

Dimension	Group	Number	Rank sum	Rank mean	U value	Z value	sig
attitude towards the nature of mathematics	Experimental	20	٤٣١.٥٠	٢١.٥٨	١٧٨.٥٠	٠.٥٩-	٠.٥٦
	Control	20	٣٨٨.٥٠	١٩.٤٣			
attitude towards mathematics teacher,	Experimental	20	٤٢٨.٠٠	٢١.٤٠	١٨٢.٠٠	٠.٤٩-	٠.٦٢
	Control	20	٣٩٢.٠٠	١٩.٦٠			
attitude towards the importance of mathematics	Experimental	20	٣٩٥.٠٠	١٩.٧٥	١٨٥.٠٠	٠.٤١-	٠.٦٨
	Control	20	٤٢٥.٠٠	٢١.٢٥			
attitude towards the enjoyment of mathematics	Experimental	20	٣٨٦.٠٠	١٩.٣٠	١٧٦.٠٠	٠.٦٦-	٠.٥١
	Control	20	٤٣٤.٠٠	٢١.٧٠			
Total score of the mathematics attitude scale	Experimental	20	٤٢٣.٠٠	٢١.١٥	١٨٧.٠٠	٠.٣٥-	٠.٧٢
	control	20	٣٩٧.٠٠	١٩.٨٥			

It is clear from table (1) that, the value of Z reached 0.35 with a statistical significance of 0.72, indicating that there are no statistically significant differences at the 0.05 level between the average scores of the

experimental group and the control group. The average scores of the control students in the premeasurement of the attitude towards mathematics were (21.15), while the average ranks of the experimental group were (19.85). This reflects the convergence of the levels of attitude towards mathematics between the two groups. in contrast, As the sub-dimensions of the scale, the value of Z was statistically insignificant at the level of significance (0.05) for all sub-dimensions. These results indicate equivalence between the experimental group and the control group in the pre-measurement of the attitude towards mathematics.

Research tools:

To achieve the aim of the current research, which is to determine the effectiveness of a proposed model in light of the dimensions of digital citizenship on the attitude of female middle school students, the Mathematics Attitude Scale was used. The following is a detailed explanation of how it was constructed:

In light of the existing literature on the subject, including the studies by Jarad (2017) and Al-Maliki (2022), a questionnaire comprising 24 point was constructed to assess four dimensions: attitude towards the nature of mathematics, attitude towards mathematics teacher, attitude towards the importance of mathematics, and attitude towards the enjoyment of mathematics. A five-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree) was employed for each statement.

The validity of the tool was ascertained through the arbitrators and internal consistency. To this end, the scale was presented to a group of arbitrators in the field of mathematics curricula and teaching methods. The arbitrators were asked to provide their opinions about the representation of the points of the dimensions, their linguistic and scientific validity, and their suitability for the level of students. Based on their feedback, the scale was modified. The psychometric properties were verified on the exploratory sample of the current research through the following:

The internal consistency of the mathematics attitude scale was determined through the calculation of correlation coefficients between the scores of each point and the score of the dimension to which it

belongs, as well as between the scores of each dimension and the total score of the scale. The results of this calculation are presented in Table 2.

Table 2:

The internal consistency of the mathematics attitude scale

attitude towards the importance of mathematics			attitude towards the mathematics teacher,			attitude towards the enjoyment of mathematics			attitude towards the nature of mathematics		
correlation of total score	correlation of dimension	Point number	correlation of total score	correlation of dimension	Point number	correlation of total score	correlation of dimension	Point number	correlation of total score	correlation of dimension	Point number
٠.٦١	**٠.٨١	١٩	**٠.٥٠	**٠.٥٦	١٣	**٠.٧٦	**٠.٥٨	7	0.71	0.73**	1
٠.٦٨	**٠.٨٣	٢٠	**٠.٦٥	**٠.٥٨	١٤	**٠.٤٩	**٠.٦٤	8	0.49	0.58**	2
*٠.٣٨	*٠.٤٠	٢١	**٠.٥٨	**٠.٦٩	١٥	*٠.٤١	**٠.٧١	9	0.46**	0.67**	3
*٠.٣٩	**٠.٤٦	٢٢	**٠.٦٧	**٠.٥٩	١٦	**٠.٦٧	**٠.٦٠	10	0.53**	0.47**	4
٠.٦٤	**٠.٨٥	٢٣	*٠.٤٢	**٠.٦٢	١٧	*٠.٤٣	**٠.٦٢	11	0.62	0.65**	5
٠.٦١	**٠.٧٨	٢٤	**٠.٥٨	**٠.٧١	١٨	**٠.٦٧	**٠.٦٥	12	0.83	0.77**	6
٠.٨٠	Correlation of total score		**٠.٩٠	correlation of total score		0.85	correlation of total score		0.83**	correlation of total score	

Table 2 clearly demonstrates that all items on the mathematical attitude scale are statistically significantly correlated with their respective dimensions at the (0.01) or (0.05) level. The correlation coefficients ranged from (0.40) to (0.85), and the correlation coefficients of the items with the total score of the test ranged from 0.38 to 0.83, indicating a moderate to strong correlation. Furthermore, all sub-dimensions demonstrated a statistically significant correlation with the total score of the scale at the 0.01 level, with coefficients ranging from 0.80 to 0.90. This supports the internal consistency of the mathematical attitude scale. The stability of the Mathematics Attitude Scale was evaluated using Cronbach's alpha coefficient and the Split-Half method. This was based

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on data obtained from the application of the scale to a sample of 35 students involved in exploratory research sample . The results are presented in Table 3.

Table 3: The stability of the Mathematics Attitude Scale

Dimension	Number of points	Split-half stability		Cronbach's alpha
		Guttman coefficient	Spearman's-Brown coefficient	
attitude towards the nature of mathematics	6	٠.٧٧	٠.٨٥	٠.٧٤
attitude towards the enjoyment of mathematics	6	٠.٧٧	٠.٨٢	٠.٧٠
attitude towards mathematics teacher,	6	٠.٧٣	٠.٧١	٠.٧٠
attitude towards the importance of mathematics	6	٠.٨٤	٠.٩٣	٠.٧٨
The total of attitude	24	٠.٩١	٠.٨٤	٠.٩٠

As evidenced in Table 4, the Cronbach's alpha coefficient for the stability of the attitude towards mathematics scale reached 0.90. Furthermore, the Cronbach's alpha stability coefficients for the sub-scale dimensions demonstrated high reliability, the values ranging from 0.70 to 0.78. The calculation of stability by the semi-division method demonstrated that the values of the Spearman-Brown and Guttman coefficients for the stability of the attitude were 0.84 and 0.91, respectively. Additionally, the stability coefficients for the sub-scale dimensions ranged from 0.71 to 0.93. The Spearman-Brown coefficient exhibited a range of values between 0.71 and 0.93, while the Guttman coefficient demonstrated a range between 0.73 and 0.84. The stability analysis indicated a high level of stability for the total scale and all its sub-dimensions, thereby providing confidence in the results of applying the attitude towards mathematics scale and the validity of building on them.

The First Question's Result:

To answer the first question that states :What is a proposed model in light of the dimensions of digital citizenship for teaching mathematics to first intermediate grade school female students?

By referring to the literature, the model was built, which is as follows:

Teacher's Guide:

The teacher's guide serves as a reference for the educator throughout the educational process, facilitating the transition from theoretical content to practical teaching in the classroom. To prepare the guide for the teacher to translate the objectives of the current research, the following steps **were followed**:

1. The general objectives of teaching the measurement unit were determined by a review of the lessons and the objectives of teaching mathematics for the first intermediate grade as stated in the teacher's book.

The guide included the following:

- Objectives of the Teacher's Guide.
 - General instructions.
 - Distribution of dimensions according to the unit lessons.
 - A brief introduction to digital citizenship and its dimensions.
 - The role of the teacher during teaching the unit.
 - Time distribution of the unit topics.
 - List of lessons included in the unit of study.
 - Lesson planning tables.
 - Concepts/learning and behavioral objectives of the lessons.
 - Explanation of lesson content.
 - Procedures for each lesson.
 - Teaching tools and activities.
 - Teaching strategies and evaluation tools.
2. The guide was constructed in accordance with the following methodology:
 - A comprehensive review of the existing literature on digital citizenship and its dimensions was conducted to ensure the guide's alignment with the identified requirements.

- The dimensions of digital citizenship and their associated branches were incorporated into the lessons of the measurement unit.
- The guide was presented to a group of The experts to ascertain its reliability and validity.

Designing the Proposed Model:

Following a review of the relevant literature on model building, an outline of the proposed model was developed in line with the dimensions of digital citizenship. This consists of:

- The concept of the proposed model
- The overall goal of the proposed model
- Sub-objectives of the proposed model
- The premises of the proposed model
- The foundations on which the proposed model is built
- Requirements for teaching the proposed model
- The importance of teaching according to the proposed model
- Teaching strategies used in The proposed model
- The learning environment, as defined by the proposed model
- The learning content, as outlined in the proposed model
- The learning resources, as delineated in the proposed model
- The assessment methods, as described in the proposed model
- The roles of the teacher and student, as delineated in the proposed model
- The teacher's guide for teaching the measurement unit, as detailed in the proposed model

The Second Research Question's Result:

To answer the second question, which is "What is the impact of the proposed model in light of the dimensions of digital citizenship for teaching mathematics for the first intermediate grade on the attitude towards mathematics"?

This was corroborated through an examination of the discrepancies between the mean grades of female students in both the experimental and control groups with regard to the dimensional assessment of their Attitude towards mathematics. This was conducted through the used of

the Mann-Whitney U test, the outcomes of which are illustrated in Table 4.

Table 4: Distinctions between the averages of the experimental group grades and the control in the dimensional assessment of the attitude towards mathematics

Dimension	Group	Number	Rank sum	Rank mean	U value	Z value	sig
attitude towards the nature of mathematics	Experimental	٢٠	٤٨٨.٥٠	٢٤.٤٣	١٢١.٥٠	٢.١٣-	٠.٠٣
	control	٢٠	٣٣١.٥٠	١٦.٥٨			
attitude towards mathematics teacher,	Experimental	٢٠	٤٢٠.٥٠	٢١.٠٣	١٨٩.٥٠	٠.٢٩-	٠.٧٧
	control	٢٠	٣٩٩.٥٠	١٩.٩٨			
attitude towards the importance of mathematics	Experimental	٢٠	٤١٩.٠٠	٢٠.٩٥	١٩١.٠٠	٠.٢٥-	٠.٨١
	control	٢٠	٤٠١.٠٠	٢٠.٠٥			
attitude towards the enjoyment of mathematics	Experimental	٢٠	٤٧٨.٥٠	٢٣.٩٣	١٣١.٥٠	١.٨٦-	٠.٠٦
	control	٢٠	٣٤١.٥٠	١٧.٠٨			
Total score of the mathematics attitude scale	Experimental	٢٠	٤٨١.٠٠	٢٤.٠٥	١٢٩.٠٠	١.٩٢-	٠.٠٥
	control	٢٠	٣٣٩.٠٠	١٦.٩٥			

Table 4 shows that there are meaningful differences between the averages of the experimental group scores and the control group in the dimensional measurement of the overall degree of direction towards mathematics in the student. The value of the (Z) by (1.92) by a statistical indication of (0.05) which indicates that there are statistically significant differences at an indicative level (0.05). The largest average score was observed in the experimental group, with an average grade of 24.05. In contrast, the average grades for female students in the control group were 16.95. The results of the study of differences at the subdimensional level are presented in the following table, which measures the direction towards mathematics:

The first dimension, which concerns the orientation towards the nature of mathematics, revealed that the value (Z) of 2.13 was statistically significant at the 0.03 level. This indicated that there were statistically significant differences at the 0.05 level between the two groups' average

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scores. The experimental group exhibited the highest average score (24.43), while the average grades for female control group students were the lowest (16.58).

The second dimension, which pertains to the enjoyment of mathematics, yielded a value (Z) of 0.29. This value was statistically significant (0.77), indicating that there were no statistically significant differences at an indicative level (0.05) between the two groups' average scores. The experimental group exhibited the highest average score (21.03), while the control group demonstrated the lowest average score where its value (19.98). reflected those of Convergence of the scores of the two groups

Third dimension (Attitude towards mathematics teacher): The value (Z) of 0.25 is statistically significant (0.81), indicating that there are no statistically significant differences at the 0.05 level between the two groups' averages. The experimental group exhibited the largest average, with grades of (20.95), while the control group's average grades (20.05) reflected a convergence between the two groups.

The fourth dimension (attitude towards mathematical importance) The value of 1.86 was statistically significant (0.06), indicating no statistically significant discrepancies at level (0.05) between the two groups' averages. The experimental group exhibited the largest average, with an average grade of 23.93, while the average grade for female students in the control group was 17.08, reflecting Convergence the two groups.

The magnitude of the proposed model's impact on students' attitude toward mathematics was quantified using the ETA and Cohen's d value. The results are presented in Table 5.

Table 5: Magnitude of proposed model's impact on female students' mathematics

Dimension	(η^2)	Cohen's d	Magnitude of impact
attitude towards the nature of mathematics	٠.١١	٠.٧١	Medium
attitude towards the enjoyment of mathematics	٠.٠٠٢	٠.٠٩	Very weak
attitude towards mathematics teacher,	٠.٠٠١	٠.٠٨	Very weak
attitude towards the importance of	٠.٠٩	٠.٦١	Medium

Dimension	(η^2)	Cohen's d	Magnitude of impact
mathematics			
The total of attitude	٠.٠٩	٠.٦٤	Medium

Table 5 shows the average effectiveness of the proposed model on mathematics attitude among middle grade students, with where the value of the ETA square of the overall score of the attitude towards mathematics was (0.09). and a Cohen's value of 0.64. When examining the sub dimensional components of the measurement of the attitude towards mathematics, the model's impact was found to be average in the two dimensions of the attitude towards the nature of mathematics and the attitude towards the importance of mathematics was also considered, with the ETA square valued at 0.11 & 0.9 for the two dimensions in question. Similarly, Cohen's d was valued at 0.71 and 0.61 for these same dimensions. It was found that the impact was very weak or negligible in the attitude of enjoying mathematics and towards the mathematics teacher.

Discussion of results:

A discussion of the results is presented below.

The results demonstrated the partial effectiveness of the independent variable, which was a proposed model built in light of digital citizenship dimensions. With regard to the dependent variable, namely the attitude towards mathematics, this was evidenced by statistical treatments indicating statistically significant differences at the level of 0.05 between the grading averages of female students in the experimental and control groups in the dimensional application of the mathematical attitude measure for female students. In contrast, the results of the research indicated that the attitude towards interest in mathematics and the attitude towards a mathematical teacher is weak and below the desired level. This is supported by the findings of relevant studies (Al-Anazi, 2010; Hassanih and Hassani, 2020). The expected reasons for this are as follows:

- Many students perceive mathematics as an inherently challenging subject that offers little practical value.

Effectiveness of A Proposed Model in Light of the Dimensions of Digital Citizenship for teaching Mathematics on Developing the Attitudes of the Intermediate Stage Female Students

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- There is a dearth of contextualization, with little connection to real-world scenarios and a lack of comprehension regarding the feasibility of studying them.
- The subject requires more time to be fully comprehended and analyzed.
- The mathematics teacher lacks sufficient time to cultivate positive relationships with Their students.

Recommendations & Suggestions:

It is recommended that:

- 1- the dimensions of digital citizenship be included in the measurement module of the first middle grade in the mathematics course.
- 2- It is further recommended that, in light of the weakness of some axes of the attitude towards mathematics, the teacher's relationships with middle-level female students in the math quota be strengthened in order to increase positive attitude towards the mathematics.
- 3- The teacher educates her students on the significance of mathematics in Daily life, for fostering a positive attitude towards the subject and thereby increasing their interest in learning.

In light of the findings, the research suggestions the following:

1. Construction of proposed models in light of digital citizenship dimensions in other units in mathematics and measurement of their effectiveness on different variables.
2. Perform qualitative studies to ascertain the reasons why many female students do not accept mathematics.
- 3- Conduct calendar studies of mathematics courses in light of digital citizenship dimensions.

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