Mathematical distance learning in the Israeli Arab middle schools during COVID teachers' point of view

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Abstract: This study aimed to identify the competencies of distance learning mathematics among mathematics teachers in Arab middle schools in the Israel during the Corona pandemic from the teachers' point of view. The study came to answer the following main question: What are the competencies of distance learning mathematics for mathematics teachers in middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view? In addition, to what extent do intermediate schools in the Arab-Israeli sector use open distance learning? Add to that, what is the significance of the differences at the level of statistical significance (0.05), according to the difference in gender, educational qualifications, years of experience, and place of residence?

The sample study consisted of (100) mathematics teachers in Arab schools in Israel, who were chosen randomly, where (100) questionnaires were distributed to them, and they were retrieved and entered for statistical analysis. The validity of the tool verified by calculating the Person Correlation coefficient.

Statistical processing of the data performed by extracting numbers, percentages, averages, standard deviations, one-way analysis of variance (ANOVA), Pear-son's correlation of the paragraph correlation matrix, and Cronbach's alpha sta-bility equation using the statistical package software (SPSS).

Keywords: Distance learning, Mathematical distance learning, mathematical learning among Israeli Arabs.

INTRODUCTION

In 2020, when the Corona epidemic swept the world, the Israeli government, like many governments in the world, rushed to close the entire education system in the country, according to the policy of social separation. The teachers in the Arab sector in Israel and especially math teachers found themselves faced with emergency remote teaching (ERT), here there were many questions about the ability of the Arab teachers to manage the educational process under these conditions, and about the possibilities available to them and the skills they possess to overcome this crisis.

In the special report published by the Israeli State Comptroller in (2021) on distance teaching and learning during the Corona period, [18], p. 43, written, "It is recommended that teachers familiarize themselves with the new environment and that they must get used to distance teaching and learning. Technology can provide a lot of information about learning and we must use it, and be careful about interactions that create student involvement in chat, voting, polls, speaking, presenting, game, quizzes, etc. The teacher should pay attention to feedback to the students, and should invest in social relations, social activities, give the students a space where they can share their emotional experiences, and integrate individual / group / class video calls". A number of recent literature sheds light first on these emerging practices.

Aldon et al (2021), [2], showed that mathematics teachers in France, Israel, Italy and Germany face challenges in distance teaching in terms of supporting student learning and developing assessment and supporting students who face difficulties and exploiting the potential to feed typical mathematical processes. Hodgen et al. (2020), [11], conducted interviews with heads of department in the United Kingdom and found that interaction between students and teachers in remote mathematics teaching was a source of concern. Clark Wilson et al (2020), [4], argued that mathematics teachers in many countries were not ready for online teaching. The Nesta report (2020), [17], noted that the coronavirus has led to persistent and even widening gaps between students in terms of their engagement with and access to technology. In general, there is concern about the loss of student learning Engzell et al (2020), [8], and policy documents confirm Modern on the need for new teaching structures and working methods and awareness in mathematics education (NCSM & NCTM, 2020), [16].

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Theoretical background

Distance learning has emerged as a paramount facet of contemporary education, playing a pivotal role in addressing the evolving educational landscape. As educational paradigms continue to transform, the significance of distance learning cannot be overstated. Recent research indicates that distance learning facilitates access to education, transcending geographical constraints, and fostering inclusivity, Tashtoush et al (2023). Moreover, it accommodates diverse learning styles and preferences, promoting personalized and adaptive pedagogical approaches, Martin & Oyarzun, (2023). The advent of advanced technologies and innovative instructional designs has further enhanced the efficacy of distance learning, enabling interactive and engaging learning experiences, Moreira et al (2023). As the world grapples with unprecedented challenges, such as global health crises and climate change, the adaptability and resilience inherent in distance learning become invaluable, Guzal, (2023). This underscores the imperative for academia to embrace and continually refine distance learning methodologies to ensure an equitable and robust education system for all.

The theoretical background illustrates the competencies of teachers and distance learning, the Corona pandemic and the resulting disruption of school hours, along with the trend towards distance learning in due to this pandemic.

Long distance learning:

Today the need for distance learning has become essential all over the world due to the conditions of distance education when the corona virus spread. Distance learning received the attention of the countries of the world during the spread of the epidemic, the learning system moved from the traditional style that was common to electronic systems with all its components and tools, and many educational studies recommended implementing its plans in the present and in the future.

The teacher's role in the e-learning process at a distance is important, even empowers it and increases its effectiveness in directing the student in the right direction to benefit from learning efficiently and easily, and enables educational management and supervision. Hence, the importance of quality training for teachers and students in distance learning tools in order to apply it and benefit from it easily and efficiently.

During the COVID-19 pandemic, apps developed for distance education are new forms of technology for many educators. Therefore, the study of teachers' opinions and beliefs regarding distance education has become the main topic of many researchers, especially in the last two years Karademir et al (2020),[12]; Klaproth et al (2020), [13]. In these studies, opinions and beliefs are often analyzed in terms of different variables. For example, Kurnaz et al. (2020),[14], conducted a study with 418 teachers who implemented distance education methods in different classes, and examined whether the opinions of the teachers made a significant difference in regards to gender, their educational experience, the type of school, the workplace, the equipment used, and The place where it was held. Online education. They found that the views of female teachers on distance education were more positive than male teachers, but there was no significant difference between them. In addition, there was no significant difference in the opinions of the teachers regarding distance education according to their experience and the level of their taught class. Gorin et al. (2020), [10], investigated the views of stakeholders on the distance education process (teachers, students, administrators and parents) in four sub-dimensions; Access and participation in distance education, the organization of distance education, the quality of distance education and the future of distance education. It is worth noting that all participants agreed that distance education is not as effective as traditional face-to-face education. Second, among the stakeholders in the organization of distance education, teachers had the most negative views, and as the level of grades increased, their satisfaction with the organization of the process decreased. Third, while they had positive views about the quality and future of distance education, the average scores on these dimensions were very low compared to students and parents. In a similar study, Fiden (2020), [9], examined the opinions of elementary school teachers regarding distance education and found that the most beneficial characteristics that teachers considered for distance education were that students did not fall behind in courses, felt comfortable, and had freedom. Regarding the time, they have to take part in the courses. In addition, the teachers indicated that teacher readiness was an important challenge when they talked about the negative aspects of the distance education process. In a case study with 44 primary school teachers, Demir and Ozdaş (2020), [6], revealed that teachers see distance education practices in three different ways: satisfactory, inadequate and limited. Those who were satisfied with the distance education process described distance education as successful, motivating, positive, beautiful, useful, good, effective, sufficient, interesting and useful. On the other hand, those who thought it was limited stated that distance education was useful but incomplete and that they found it useful because it kept the students involved in the learning process, even though it was not efficient enough.

Mathematics and distance learning:

It is clear that after the corona virus, everyone agrees on one thing, and that is that learning and teaching mathematics with and through technology requires rethinking and rearranging traditional forms of teaching. As such, it can be used to define and describe teaching practice. Stein and colleagues

describe organizations that focus on productive mathematical discussions Stein et al (2008),[19], which can be difficult to create in distance education. Bozkurt and Ruthven (2018) refer specifically to activity structures in teaching mathematics using digital technology. Recently, the NCSM and NCTM (2020), [16], provide guidelines for teaching practices for the distance education situation during times of COVID-19.

Through my work as a mathematics lecturer and as head of the mathematics department at Sakhnin College, I circulated some notes to the lecturers during the Corona period (notes that I think are useful for distance education for all mathematics teachers).

"The math teacher must have more skills than other teachers must have in distance learning methods and control a collection of important tools.

1. Knows the general framework of online teaching and the tools to manage learning in this way. (Moodle, Teams).
2. Knows structures for delivering an online math class.
3. Knows writing and drawing techniques:

a. Using a tablet. (OneNote app, Notability, whiteboard...).
b. Using a graphics tablet and Autodesk Sketchbook or OneNote software
c. Using the equations in Ward.

4. Knows tools for illustration such as Geogebra, Dudamath,
5. Knows tools for practicing geometry such as FullProof, Desmos
6. Knows tools for creating questionnaires, exams and test as Moodle, Forms, Class E, Wizer
7. Diagnostic capability allows the teacher to implement differential instruction and individual instruction".

Thurm (2018), [20], examined the relationship between technology-related beliefs and classroom practice in a study of 160 secondary mathematics teachers. It was found that the beliefs of teachers who received that technology supports discovery learning were positive in more frequent use of technology; On the other hand, it seems that teachers, who thought that the technological integration takes too much time, hardly use technology in their courses.

In Drijvers, P., Thurm, D., et al Study (2021), [7], on Distance mathematics teaching in Flanders, Germany, and the Netherlands during the COVID-19 lockdown written, "Results show that even though students preferred regular face-to-face teaching, they were content with the quality of their teachers' distance mathematics teaching. Students reported that they were taught new topics often, but did not experience teachers initiating peer feedback. High student appreciation of mathematics, good home environment, and more synchronous delivery of ERT were related to ERT experiences and more positive beliefs concerning digital mathematics education. These findings have implications for ERT teaching strategies in future, as well as for hybrid teaching practices." p 35.

METHODS

The study came to investigate the competencies of distance learning mathematics teachers in middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view in the presence of the schools' educational role shrinking due to the closure resulting from the Corona pandemic, and the emergence of new tools for teaching, which are the means of communication and modern technology that has become necessary for the accomplishment of distance learning, so the study came to answer the following main question: What are the competencies of distance mathematics learning for teachers in middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view? Which leads to the following set of sub-questions:

1. To what extent do the middle schools in the Arab Israeli sector use open distance learning?
2. What are the competencies of distance learning mathematics for mathematics teachers in the middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view?
3. What is the indication of the differences at the level of statistical significance (≥ 0.05) for distance learning mathematics competencies among mathematics teachers in the middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view according to the difference in gender, educational qualification, years of experience, and place of residence?

Study hypotheses

The study came to verify the following hypotheses:

1. There are no statistically significant differences at the level (≥ 0.05) in the competencies of distance learning mathematics among mathematics teachers in the middle schools in the Arab

Israeli sector during the Corona pandemic from the teachers' point of view, according to the difference in gender.

2. There are no statistically significant differences at the level (≥ 0.05) in the competencies of distance learning mathematics among mathematics teachers in the middle schools in the Israeli Arab sector during the Corona pandemic from the teachers' point of view, according to the difference in educational qualification.
3. There are no statistically significant differences at the level (≥ 0.05) in the competencies of distance learning mathematics among mathematics teachers in the middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view, according to the years of experience.
4. There are no statistically significant differences at the level (≥ 0.05) in the competencies of distance learning mathematics among mathematics teachers in the middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view, according to the place of residence.

Study Methodology

In this study, we used the analytical descriptive approach, which was concerned with studying phenomena and events as they are, in terms of their characteristics and forms, and the factors that affect them. It also studies the phenomena and events by describing them from all aspects and dimensions, and aims to derive solutions and identify the causes and obstacles that led to these phenomena and events, as well as identify the relationships with each other. In addition to the external factors affecting them to benefit from them in predicting the future of these events and phenomena, which is the appropriate and best approach for such studies.

Study population

The study population consisted the mathematics teachers in Arab schools in Israel.

Study sample

The sample consisted of (100) mathematics teachers in Arab schools in Israel, who were chosen randomly, where (100) questionnaires were distributed to them, and they were retrieved and entered for statistical analysis.

Table 1. (Characteristics of the demographic sample)

Variable	Category	Number of teacher	Percentage
Gender	Male	60	60.0
	Female	40	40.0
	Total	100	100.0
Scientific qualification	First degree	30	30.0
	Second degree	58	58.0
	Third degree	12	12.0
	Total	100	100.0
Scientific experience	Less than 5 years 5-10 years	20 48	20.0 48.0
	More than 10 years	32	32.0
	Total	100	100.0
Place of resident	City	36	36.0
	Village	38	38.0
	Unrecognized village	26	26.0
	Total	100	100.0

Study tool

The research tool was done in the form of a questionnaire using previous theoretical background, and the necessary adjustments were made in order to answer the questions of the study, its objectives, and some previous studies. The questionnaire consisted of two parts, the first contains primary data about the sample, and the second contains a set of paragraphs that measure the aim of the study, and it consists of (33) paragraphs, divided into four axes, which are (planning competencies, implementation competencies, evaluation competencies, and technological competencies).

Validity of the study tool

The validity of the tool was verified by calculating the Person Correlation coefficient between each paragraph of the study with its total score in each of the study axes.

Table 2. (Pearson correlation coefficient between each paragraph of the study with its total score in each of the study axes).

Axis	Paragraph numbers	Paragraph	Pearson correlation coefficient	Scientific significance
Planning competencies	1	I am planning a program based on distance learning in collaboration with my fellow teachers.	0.946**	0.000
	2	I arrange the book's lessons in a manner commensurate with the nature of distance learning.	0.896**	0.000
	3	I design an educational situation in a distance mathematics lesson.	0.935**	0.000
	4	In planning, I take into account the individual differences among the students.	0.950**	0.000
	5	I check the quality standards for distance learning applications from an official body.	0.956**	0.000
	6	I set educational goals according to the learning requirements.	0.959**	0.000
	7	Design distance-learning activities to achieve the educational goals.	0.150	0.137
Implementation competencies	8	I provide students with specific lessons that focus on key skills and knowledge.	0.298**	0.003
	9	I have the necessary skills to implement a remote mathematics lesson.	0.853**	0.000
	10	I vary of distance learning mathematics lesson strategies with students.	0.665**	0.000
	11	I take into account the gradation and continuity in teaching mathematics subjects from a distance.	0.885**	0.000
	12	I Develop students' self-learning skills in mathematics.	0.497**	0.000
	13	I communicate with students who do not participate in meetings.	0.851**	0.000
	14	I vary in the stimuli that make students want to learn mathematics from a distance.	0.359**	0.000
Evaluation competencies	15	I set clear standards for remote evaluation.	0.838**	0.000
	16	I use formative assessment methods for each objective of distance learning mathematics.	0.282**	0.005
	17	I offer a variety of assessment tasks suitable for distance learning.	0.009	0.930

	18	I follow up the calendar assignments in terms of students' commitment to submitting them on time.	0.871**	0.000
	19	In the evaluation, I focus on the quality of the outputs of the evaluation tasks carried out by the students.	0.192	0.056
	20	I use electronic tests to measure student achievement.	0.865**	0.000
	21	I employ electronic tests that require analysis and deduction.	0.737**	0.000
	22	I employ the guided questions in student assessment.	0.258**	0.010
	23	I allocate a part of the evaluation based on the students' achievement files.	0.831**	0.000
	24	I hold simultaneous meetings to answer questions related to the lesson and to explain the evaluation tasks.	0.860**	0.000
	25	I provide students with effective feedback when they hand in assessment assignments.	0.832**	0.000
	26	I vary teaching methods for mathematics for distance learning according to the results of the evaluation.	0.838**	0.000
Technological competencies	27	I use digital applications to learn mathematics from a distance.	0.443**	0.000
	28	I can deal with technical problems while using the computer.	0.883**	0.000
	29	I use dialogue and discussion forums in online learning in distance learning mathematics.	0.771**	0.000
	30	I have sufficient knowledge of the e-learning standards.	0.821**	0.000
	31	I record simultaneous meetings for students to watch whenever they want.	-0.055	0.586
	32	I have enough experience in educational programs.	0.884**	0.000
	33	I use electronic platforms that achieve effective communication with students.	0.866**	0.000

* means that the correlation is statistically significant at the level (0.05)
** means that the correlation is statistically significant at the level (0.01)

It is clear to us from the previous schedule that the majority of the study items are of statistically significant degrees of association with the total degree of it in each of its axes, which indicates that the study items have a very large degree of honesty and that they are valid fort, which they are made to measure.

Validity of the study tool

The stability of the study tool has been verified using Cronbach's Alpha for internal arrest, as the value of the alpha was calculated between the study items in each axis of its axes and its axes and all the items combined.

Table 3. (Cronbach's Alpha between the study parts in each of its axes and between all the items combined)

Axis	Internal coefficient value (Cronbach's alpha)	Paragraphs number
Planning competencies	0.908	7
Implementing competencies	0.742	7
Evaluation competencies	0.804	12
Technological competencies	0.768	7
Total degree	0.942	33

It is clear to us from the previous table that:

The alpha value calculated between the items of the study about (planning competencies) was (90.8%).The alpha value calculated between the study items on (implementation competencies) was (74.2%).The alpha value calculated between the items of the study on (evaluation competencies) was (80.4%). The alpha value calculated between the study items on (technological competencies) was (76.8%). In addition, that the alpha value calculated among all the items combined was (94.2%).As illustrated previously, all alpha values were high, which indicates that there is a very large degree of internal consistency between the study items, and accordingly, the study tool has a high degree of stability.

Since the scale used is a five-point Likert scale for collecting responses and measuring responses that indicate the degree of approval or disapproval of the arithmetic mean, this scale is corrected to be able to estimate the arithmetic averages of the response scores in three levels, and the estimation of scores and arithmetic averages are as in the following table:

Table 4. (Keys to arithmetic averages)

Average	Degree
1 to 2.33	Low
2.34 to 3.67	Moderate
3.68 to 5	High

RESULTS

Results related to the answer to the first question:

What is the degree of possessing the competencies of distance learning mathematics among mathematics teachers in middle schools at Arab Israeli sector in light of the Corona pandemic from the teachers point of view? To answer the previous question, the average and standard deviation of the total degree extracted in table 5.

Table 5. (Average and standard deviation of the total degree)

criterion	average	Standard deviation	Degree
The degree of possessing the competencies of distance learning mathematics among mathematics teachers in the preparatory stage in the Negev region in light of the Corona pandemic from the teachers' point of view.	3.40	0.578	Moderate

It is clear from the previous table that the overall score on the extent to which mathematics

teachers possess learning from distance competencies in the middle schools at Arab Israeli sector in light of the Corona pandemic, from the teachers' point of view, was medium. With an average (3.40), with a standard deviation (0.578).

Results related to the answer to the second question.

What are the most prominent competencies of distance learning mathematics among mathematics teachers in middle schools at Arab Israeli sector in light of the Corona pandemic from the teachers point of view?

Table 6 presents the averages and standard deviations of the study items arranged in order of importance.

Table 6. (Averages and standard deviation of the study items)

Axis	Order	number in resolution	Paragraphs	Average	Standard deviation	Degree
Planning competencies	1	2	I arrange the book's lessons in a manner commensurate with the nature of distance learning.	3.41	0.900	Moderate
	2	6	I set educational goals according to the learning requirements.	3.09	1.036	Moderate
	3	3	I design an educational situation in a distance mathematics lesson.	3.07	1.023	Moderate
	4	4	In planning, I take into account the individual differences among the students.	3.02	1.124	Moderate
	5	7	I design distance-learning activities to achieve the educational goals.	2.98	1.180	Moderate
	6	1	I plan a program based on distance learning in collaboration with my fellow teachers.	2.92	1.002	Moderate
	7	5	I check the quality standards for distance learning applications from an official body.	2.91	1.200	Moderate
	Total degree			3.08	0.879	Moderate
Implementation competencies	8	12	I Develop students' self-learning skills in mathematics.	3.94	0.489	Moderate
	9	10	A vary distance learning mathematics lesson strategies with students.	3.84	0.647	Moderate
	10	8	I provide students with specific lessons that focus on basic skills and knowledge.	3.38	0.993	Moderate
	11	9	I have the necessary skills to implement a remote mathematics lesson.	3.28	1.026	Moderate
	12	14	I vary the stimuli that make students want to learn mathematics from a distance.	3.24	1.065	Moderate
	13	11	I take into account the gradation and continuity in teaching mathematics subjects from a distance.	3.08	1.088	Moderate
	14	13	I communicate with students	2.98	1.092	Moderate

			who do not participate in meetings.			
	Total degree			3.40	0.589	Moderate
Evaluation competencies	15	25	I provide students with effective feedback when they hand in assessment assignments.	3.92	0.506	High
	16	15	I set clear standards for remote evaluation.	3.84	0.647	High
	17	26	I vary teaching methods for mathematics for distance learning according to the results of the evaluation.	3.84	0.647	High
	18	24	I hold simultaneous meetings to answer questions related to the lesson and to explain the evaluation tasks.	3.76	0.744	High
	19	22	I employ the guided questions in student assessment.	3.68	0.851	High
	20	18	I follow up the calendar assignments in terms of students' commitment to submitting them on time.	3.67	0.863	Moderate
	21	20	I use electronic tests to measure student achievement.	3.37	1.012	Moderate
	22	23	I allocate a part of the calendar based on the students' achievement files.	3.28	1.026	Moderate
	23	17	I offer a variety of assessment tasks suitable for distance learning.	3.15	1.053	Moderate
	24	16	I use formative assessment methods for each objective of distance learning mathematics.	3.10	1.129	Moderate
	25	19	In the evaluation, I focus on the quality of the outputs of the evaluation tasks carried out by the students.	3.04	1.082	Moderate
	26	21	I employ electronic tests that require analysis and deduction.	2.65	1.066	Moderate
	Total degree			3.45	0.515	Moderate
	27	29	I use dialogue and discussion forums in online learning in distance learning mathematics.	3.97	0.437	High
	28	31	I record simultaneous meetings for students to watch whenever they want.	3.96	0.425	High
	29	30	I have sufficient knowledge of the e-learning standards.	3.96	0.425	High

Technological competencies	30	32	I have enough experience in educational programs.	3.84	0.647	High
	31	28	I can deal with technical problems while using the computer.	3.41	0.900	Moderate
	3	33	I use electronic platforms that achieve effective communication with students.	3.38	1.023	Moderate
	33	27	I use digital applications to learn mathematics from a distance.	3.28	1.026	Moderate
	Total degree			3.69	0.481	Moderate

The previous schedule results indicated that technological competencies ranked first among the competencies of learning mathematics from a distance of mathematics teachers in middle schools at Arab Israeli sector in light of the Corona's pandemic.

It has been shown that the most prominent technological competencies were represented in paragraph number. (29) Stipulated (I use dialogue and discussion forums in online learning to learn about mathematics.), with an average account (3.97) and a standard deviation (0.437). Followed up by paragraph number. (31), which is stipulated (I record the simultaneous meetings for students to see whenever they want. Followed up by paragraph number (30) stipulated (I have enough knowledge of the e -lesson standards.), With an average account (3.95) and a standard deviation (0.305). The lowest levels of response to paragraph Number (33) stipulated (I use electronic platforms that achieve effective communication with students.), with an average account (3.38) and a standard deviation (1.023).

The calendar competencies came second from among the competencies in a moderate degree, as the average arithmetic reached (3.45) with a standard deviation (0.515).

It was found that the most prominent assessment competencies of mathematics teachers in the preparatory stage in Israel were represented in Paragraph No. (25), which reads (I provide students with effective feedback when they hand over assessment tasks.), with an arithmetic mean (3.92) and a standard deviation (0.506). Followed by Paragraph No. (15), which reads (I set clear standards for distance assessment.), with an arithmetic mean (3.84) and a standard deviation (0.647). Followed by Paragraph No. (26), which reads (Types of educational methods for mathematics for distance learning according to the evaluation results.), with an arithmetic mean (3.84) and a standard deviation (0.647). Followed by Paragraph No. (24), which reads (I hold simultaneous meetings to answer questions related to the lesson and to explain the evaluation tasks.), with an arithmetic mean (3.76) and a standard deviation (0.744). Followed by Paragraph No. (22), which reads (I use the questions asked in the evaluation of students.), with an arithmetic mean (3.68) and a standard deviation (0.851). The lowest response scores were on Paragraph No. (21), which reads (I employ electronic tests that require analysis and deduction.), with an arithmetic mean (2.65) and a standard deviation (1.066).

The implementation competencies ranked third to a moderate degree, as the arithmetic mean for them was (3.40) with a standard deviation of (0.589).

It was found that the most prominent implementation competencies of mathematics teachers in the preparatory stage in Israel were represented in Paragraph No. (12), which reads (I develop self-learning skills in mathematics among students.), with an arithmetic mean (3.94) and a standard deviation (0.489). Followed by Paragraph No. (10), which reads (various strategies for studying mathematics remotely with students.), with an arithmetic mean (3.84) and a standard deviation (0.647). Followed by Paragraph No. (8), which reads (I provide students with specific lessons that focus on basic skills and knowledge.), with an arithmetic mean (3.38) and a standard deviation (0.993). The lowest response scores were on Paragraph No. (13), which reads (I communicate with students who do not participate in meetings.), with a mean (2.98) and a standard deviation (1.092).

As for the planning competencies, they ranked last to a moderate degree, as the arithmetic mean for them reached (3.08) with a standard deviation of (0.879).

It was found that the most prominent planning competencies were represented in Paragraph No. (2), which reads (I arrange the lessons of the book in a manner commensurate with the nature of distance learning.), with an arithmetic mean (3.41) and a standard deviation (0.900). Followed by Paragraph No. (6), which reads (I define the educational goals according to the learning requirements after.), with an arithmetic mean (3.09) and a standard deviation (1.036). Followed by Paragraph No. (3), which reads (I design an educational situation in a distance mathematics lesson.), with an arithmetic mean (3.07) and a

standard deviation (1.023). The lowest response score was on Paragraph No. (5), which reads (I check the quality standards for distance learning applications from an official agency), with an arithmetic mean (2.91) and a standard deviation (1.200).

Results related to the answer to the third question

Do distance learning mathematics competencies differ among middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view, according to the difference in demographic variables (sex, educational qualification, work experience, and place of residence)? To answer the question, the researcher formulated and verified the following hypotheses:

The first premise

There are no statistically significant differences at the level ($\alpha \leq 0.05$) in the competencies from the teachers' point of view, due to the gender variable.

To verify the validity of the previous hypothesis, we used the T-test for the differences, due to the gender variable, as shown in the following table:

Table 7. (T-test due to the gender variable)

Axis	Gender	Number	$\bar{x}$	σ	T value	D_f	α
Planning competencies	Male	60	2.970	0.888	-1.496	98	0.138
	Female	40	3.236	0.851			
Implementation competencies	Male	60	3.337	0.631	-1.303	98	0.196
	Female	40	3.493	0.513			
Evaluation competencies	Male	60	3.424	0.540	-0.568	98	0.572
	Female	40	3.483	0.478			
Technological competencies	Male	60	3.655	0.484	-0.786	98	0.434
	Female	40	3.732	0.479			
Total degree	Male	60	3.346	0.599	-1.190	98	0.237
	Female	40	3.486	0.541			

It is clear from the previous table that the value of the statistical significance corresponding to the study scale on the competencies of distance learning mathematics among mathematics teachers in the middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view with its axes and the total score for it reached (0.138), (0.196), (0.572). (0.434), (0.237), respectively, which is greater than (0.05), and this result means that the hypothesis is accepted. There are no statistically significant differences at the level ($\alpha \leq 0.05$) in the distance learning mathematics competencies, that is attributed to the gender variable. This indicates that male teachers do not differ from female teachers in their views.

The second hypothesis

There are no statistically significant differences at the level ($\alpha \leq 0.05$) in the competencies, due to the educational qualification variable.

To test the previous hypothesis, we extracted the averages, numbers, and standard deviations of the response scores of the sample, according to the change in academic qualification, as in the following table:

Table 8. (The response scores of the sample, according to the change in academic qualification).

Dimension	Scientific qualification	Number	Average	Standard deviation
Planning competencies	First degree	30	3.086	0.961
	Second degree	58	3.073	0.892
	Third degree	12	3.071	0.623
	Total	100	3.076	0.879
Implementation competencies	First degree	30	3.359	0.585
	Second degree	58	3.417	0.617
	Third degree	12	3.417	0.493

	Total	100	3.400	0.589
Evaluation competencies	First degree	30	3.454	0.554
	Second degree	58	3.449	0.529
	Third degree	12	3.424	0.349
	Total	100	3.448	0.515
Technological competencies	First degree	30	3.676	0.509
	Second degree	58	3.677	0.502
	Third degree	12	3.750	0.299
	Total	100	3.686	0.481
Total degrees	First degree	30	3.394	0.625
	Second degree	58	3.404	0.594
	Third degree	12	3.415	0.379
	Total	100	3.402	0.578

In order to verify the validity of the previous hypothesis, we used one-way analysis of variance (ANOVA) to test the differences in the competencies, according to the change in academic qualification, as shown in the following table.

Table 9. (The results of ANOVA for differences due to the educational qualification variable)

Dimension	Source of contrast	Sum of squares	Degrees of freedom	Average of squares	F value	Statistical significance
Planning competencies	Between groups	0.004	2	0.002	0.002	0.998
	Inside groups	76.468	97	0.788		
	Total	76.472	99			
Implementation competencies	Between groups	0.072	2	0.036	0.102	0.903
	Inside groups	34.275	97	0.353		
	Total	34.347	99			
Evaluation competencies	Between groups	0.008	2	0.004	0.015	0.985
	Inside groups	26.215	97	0.270		
	Total	26.224	99			
Technological competencies	Between groups	0.056	2	0.028	0.120	0.887
	Inside groups	22.882	97	0.236		
	Total	22.939	99			
Total degree	Between groups	0.005	2	0.002	0.007	0.993
	Inside groups	33.032	97	0.341		
	Total	33.037	99			

It is clear from the previous table that the value of the statistical significance corresponding to the study scale on the competencies of distance learning mathematics with its axes and the total score for it reached (0.998), (0.903), (0.985). (0.887), (0.993), respectively, which is greater than (0.05), this result means that the hypothesis is accepted, there are no statistically significant differences at the level ($\alpha \leq 0.05$) in the distance learning mathematics competencies that is attributed to the educational qualification variable. This indicates that mathematics teachers in middle schools at Arab Israeli sector, despite the difference in their academic qualifications, do not differ in their views on the competencies of distance learning mathematics among mathematics teachers in the middle schools at Arab Israeli sector.

Third hypothesis

There are no statistically significant differences at the level ($\alpha \leq 0.05$) in the competencies, due to the practical experience variable.

To test the previous hypothesis, we extracted the averages, numbers, and standard deviations of the response scores of the sample according to the change in practical experience, as in the following table:

Table 10. (The averages, numbers, and standard deviations of the response scores of the sample due to the practical experience variable)

Dimension	Scientific experience	Number	Average	Standard deviation
Planning competencies	Less than 5 years	20	2.850	0.882
	5-10 years	48	3.156	0.895
	Mora than 10 years	32	3.099	0.856
	Total	100	3.076	0.879
Implementation competencies	Less than 5 years	20	3.214	0.672
	5-10 years	48	3.429	0.546
	Mora than 10 years	32	3.472	0.592
	Total	100	3.400	0.589
Evaluation competencies	Less than 5 years	20	3.288	0.560
	5-10 years	48	3.521	0.500
	Mora than 10 years	32	3.438	0.499
	Total	100	3.448	0.515
Technological competencies	Less than 5 years	20	3.536	0.442
	5-10 years	48	3.741	0.495
	Mora than 10 years	32	3.696	0.480
	Total	100	3.686	0.481
Total degree	Less than 5 years	20	3.222	0.598
	5-10 years	48	3.461	0.571
	Mora than 10 years	32	3.426	0.570
	Total	100	3.402	0.578

Table 11. (The results of ANOVA for differences due to the variable of practical experience)

Dimension	Source of contrast	Sum of squares	Degrees of freedom	Average	F value	Statistical significance
Planning competencies	Between groups	1.343	2	0.672	0.867	0.423
	Inside groups	75.128	97	0.775		
	Total	76.472	99			
Implementation competencies	Between groups	0.897	2	0.449	1.301	0.277
	Inside groups	33.450	97	0.345		
	Total	34.347	99			
Evaluation competencies	Between groups	0.772	2	0.386	1.470	0.235
	Inside groups	25.452	97	0.262		
	Total	26.224	99			
Technological competencies	Between groups	0.601	2	0.300	1.304	0.276
	Inside groups	22.338	97	0.230		
	Total	22.939	99			
Total degree	Between groups	0.838	2	0.419	1.262	0.288
	Inside groups	32.199	97	0.332		
	Total	33.037	99			

It is clear from the table 11 that the value of the statistical significance corresponding to the study scale on the competencies and the total score for it reached (0.423), (0.277), (0.235).), (0.276), (0.288), respectively, which is greater than (0.05), the result means that the hypothesis is accepted, that is, there are no statistically significant differences at the level ($\alpha \leq 0.05$) in the distance learning mathematics competencies for the work experience variable. This indicates that the difference in the practical experience of mathematics teachers in middle schools at Arab Israeli sector does not result in a difference in their views on the mentioned competencies

Fourth hypothesis

There are no statistically significant differences at the level ($\alpha \leq 0.05$) in the competencies, due to the variable of place of residence.

To test the previous hypothesis, we extracted the averages, number of teachers, and standard deviations of the response scores of the sample. According to the change in the place of residence, as in the following table:

Table 12 (the averages, number of teachers, and standard deviations due to the change in the place of residence)

Dimension	Place of resident	Number	Average	Standard deviation
Planning competencies	City	36	2.849	0.820
	Village	38	3.274	0.934
	Unrecognized level	26	3.103	0.832
	Total	100	3.076	0.879
Implementation competencies	City	36	3.286	0.610
	Village	38	3.498	0.584
	Unrecognized level	26	3.414	0.561
	Total	100	3.400	0.589
Evaluation competencies	City	36	3.370	0.455
	Village	38	3.551	0.542
	Unrecognized village	26	3.403	0.545
	Total	100	3.448	0.515
Technological competencies	City	36	3.607	0.388
	Village	38	3.782	0.515
	Unrecognized village	26	3.654	0.538
	Total	100	3.686	0.481
Total degree	City	36	3.278	0.525
	Village	38	3.526	0.610
	Unrecognized village	26	3.393	0.582
	Total	100	3.402	0.578

Table 13. (The results of ANOVA for differences due the change in the place of residence)

Dimension	Source of contrast	Sum of squares	Degrees of freedom	Average of squares	F value	Statistical significance
Planning competencies	Between groups	3.355	2	1.678	2.226	0.113
	Inside groups	73.116	97	0.754		
	Total	76.472	99			
Implementation competencies	Between groups	0.841	2	0.421	1.217	0.300
	Inside groups	33.506	97	0.345		
	Total	34.347	99			
Evaluation competencies	Between groups	0.672	2	0.336	1.275	0.284
	Inside groups	25.552	97	0.263		
	Total	26.224	99			
Technological competencies	Between groups	0.601	2	0.300	1.304	0.276
	Inside groups	22.338	97	0.230		
	Total	22.939	99			
Total degrees	Between groups	1.140	2	0.570	1.734	0.182
	Inside groups	31.896	97	0.329		
	Total	33.037	99			

It is clear from the previous table that the value of the statistical significance corresponding to the study scale on the competencies of distance learning mathematics among mathematics teachers in middle schools at Arab Israeli sector during the Corona pandemic from the teachers' point of view with its axes and the total score for it reached (0.113), (0.300), (0.284). (0.276), (0.182), respectively, which is greater than (0.05), the result means that the hypothesis is accepted. There are no statistically significant differences at the level ($\alpha \leq 0.05$) in the distance learning mathematics competencies of mathematics

teachers in middle schools at Arab Israeli sector during the Corona pandemic, from the point of view of teachers, is attributed to the variable of the place of residence. This indicates that no matter how different the place of residence of mathematics teachers in the preparatory stage in the region, they do not differ in their views on the competencies of distance learning mathematics among mathematics teachers in Arab middle schools in Israel.

DISCUSSION

The results of the study indicated that the overall score on the extent to which mathematics teachers possess distance-learning competencies in the middle schools at Arab Israeli sector during the Corona pandemic, from the teachers' point of view, was medium. With an arithmetic mean (3.40), with a standard deviation.(0.578) .

This result can be explained by the fact that mathematics teachers in Arab schools possess technological skills and competencies to a varying degree in the field of using distance learning and related technologies, depending on the training they received in using these technologies, and the matter was reflected that they possess these competencies to a moderate degree, that is, they Not all of them possess these skills, nor do they possess all the relevant competencies.

The results of the study also indicated that the technological competencies ranked first among the distance learning mathematics competencies of mathematics teachers in middle schools at Arab Israeli sector during the Corona pandemic to a moderate degree, as the arithmetic mean for it was (3.69) with a standard deviation of.(0.481)

This result can be explained by the fact that teachers must possess technological competencies for the success of distance learning, which are important competencies for using distance learning tools and through modern technological media, and the more the teacher possesses technological competencies, the more his performance in distance learning.

The results of the study indicated that there were no statistically significant differences at the level ($\alpha \leq 0.05$) in the competencies in the preparatory stage in Israel in light of the Corona pandemic from the teachers' point of view due to the variable of gender, educational qualification, and years of experience. and place of residence.

This result can be explained by the fact that teachers, regardless of their races, academic qualifications, and places of residence, do not differ in the degree of their possession of distance learning competencies in light of the Corona pandemic. School and education officials at the same level.

RECOMMENDATIONS

In light of the results of the study, the following recommendations are made:

1. The need to develop the preparation of mathematics teachers in the educational field and hold training courses in addition to workshops on the four teaching skills, differentiated teaching skills, conceptual comprehension skills, teaching skills of developed courses, and follow-up teachers in their application.
2. The need to provide teaching aids that help the teacher to apply the skills of teaching the developed courses.
3. The need to develop a guide for mathematics teachers according to the four teaching skills, differentiated teaching skills, conceptual comprehension skills, skills of teaching developed courses and according to modern foundations in teaching, distance teaching skills, and technological teaching skills necessary for that.
4. The need to motivate mathematics teachers to do technological teaching skills and to use technology in education, as well as to master teaching through those technological media in the practice of distance education. These incentives are material and moral that encourage them to do so, when they feel that what they are doing is liked by others and improves their economic level social and educational.
5. The necessity of conducting studies on the competencies of teachers in teaching in all forms of technological teaching, distance learning, flipped learning, etc., and linking its results to the results of the current study to develop education and the educational process, especially in mathematics, given its importance.

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DISCLOSURE STATEMENT

The author reports there are no competing interests to declare.

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APPENDIX

Albano, G., Antonini, S., Coppola, C., Dello Iacono, U., & Pierri, A. (2021). “Tell

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Within the framework of preparing a scientific research entitled Competencies of Distance Learning Mathematics among Mathematics Teachers in the Preparatory Stage in the Israel Region in Light of the Corona Pandemic from the Teachers’ Point of View, we hope that you will help us in answering the questionnaire questions and thank you very much.

First part: general information

1. Gender:
   - o Male
   - o Female
2. Scientific qualification:
   - o First degree
   - o Second degree
4. Place of residence:
   - o City
   - o Village
   - o Unrecognized village

Second part: questionnaire paragraphs

Strongly agree	Agree	Impartial	Disagree	Strongly disagree
1	2	3	4	5

Number	Educational competencies	1	2	3	4	5
	Planning competencies					
1	I plan a program based on distance learning in collaboration with my fellow teachers					
2	I arrange the book's lessons in a manner commensurate with the nature of distance learning					
3	I design an educational situation in a distance mathematics lesson					
4	In planning, I take into account the individual differences among the students					
5	I check the quality standards for distance learning applications from an official body.					
6	I set educational goals according to the learning requirements.					
7	I design distance learning activities to achieve the educational goals					
	Implementation competencies					
8	I provide students with specific lessons that focus on basic skills and knowledge.					
9	I have the necessary skills to implement a remote mathematics lesson.					
10	I vary distance learning mathematics lesson strategies with students.					
11	I take into account the gradation and continuity in teaching mathematics subjects from a distance.					
12	I develop students' self-learning skills in mathematics.					

13	I communicate with students who do not participate in meetings.					
14	I vary the stimuli that make students want to learn mathematics from a distance.					

Evaluation competencies						
15	I set clear standards for remote evaluation.					
16	Use formative assessment methods for each objective of distance learning mathematics.					
17	I present a variety of assessment tasks suitable for distance learning.					
18	I follow up the calendar assignments in terms of students' commitment to submitting them on time.					
19	In the evaluation, I focus on the quality of the outputs of the evaluation tasks carried out by the students.					
20	I use electronic tests to measure student achievement.					
21	I employ electronic tests that require analysis and deduction.					
22	I employ the guided questions in student assessment.					
23	I allocate a part of the calendar based on the students' achievement files.					
24	I hold simultaneous meetings to answer questions related to the lesson and to explain the evaluation tasks.					
25	I provide students with effective feedback when they hand in assessment tasks.					
26	I vary teaching methods for mathematics for distance learning according to the results of the evaluation.					

Technological competencies						
27	I use digital applications to learn mathematics from a distance.					
28	I can deal with technical problems while using the computer.					
29	I use dialogue and discussion forums in online learning in distance learning mathematics.					
30	I have sufficient knowledge of the e-learning standards.					
31	I record simultaneous meetings for students to watch whenever they want.					
32	I have enough experience in educational programs.					
33	I use electronic platforms that achieve effective communication with students.					

* Dr. Wafiq Ali Hibi, a distinguished researcher in pure mathematics. He earned his doctoral degree from the University of Haifa in 2004, resolving a long-standing problem in the topology of metric spaces and graphical theories in isometric spaces. Dr. Hibi has a rich academic background, having served as a lecturer at the University of Haifa, teaching advanced mathematics across multiple departments. Currently, he holds the position of Head of the Department of Mathematics at Sakhnin College. Recognized as a senior lecturer by the Council for Higher Education, Dr. Hibi has authored numerous papers and academic books, showcasing his expertise in mathematics education and teaching methods. Additionally, he contributes to various fields of knowledge, from physics and English to literature and poetry. Dr. Hibi's commitment to research is underscored by his continuous publication of articles on teaching methods in mathematics, particularly in the Arab sector.