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The Role of the Palestinian Family in Compensating for the Learning Loss of Their Children in Science Subject during the War on Gaza

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Abstract

The study aimed to identify the role of the Palestinian family in compensating for their children's learning loss in the science subject during the war on Gaza, amid the suspension of the educational process and the transformation of schools into shelters since October 2023. The study employed the descriptive analytical method and applied a questionnaire to a sample of (68) Palestinian families, covering four domains: academic, psychological, digital, and obstacles. The results showed that the level of family compensation for learning loss was high across the three domains, with the psychological domain ranking first (73.4%), followed by the academic (69.3%) and digital (66.6%) domains. The main obstacles identified were power and internet outages, lack of resources, household overcrowding, and psychological stress, with no statistically significant differences attributed to the mother's educational level. The study concluded that Palestinian families effectively contributed to simplifying scientific concepts, providing psychological support to their children, and engaging in digital learning, and recommended strengthening coordination with local and international educational initiatives to ensure the continuity of learning during wartime.

Key words

Palestinian family; learning loss; science education; Gaza war; basic education; psychological support; digital learning; educational challenges; family role; wartime education

Introduction and Theoretical Framework

God created human beings and endowed them with reason to distinguish them from other creatures, and He made knowledge their path to understanding life and fulfilling their mission. The word "Read" came as the first revelation to emphasize that knowledge is the foundation of progress and advancement. Today, education is considered the main pillar for the development of individuals and societies, as it opens horizons of awareness for the individual, develops their personality, and provides them with the tools needed to face life's challenges. It also contributes to preparing human resources capable of creativity and is considered the basis of civilizational, economic, and social renaissance, as no nation can rise without building a strong and effective educational system. The world today suffers from complex crises that lead to the suspension, postponement, or failure of education to achieve its objectives, resulting in delayed comprehensive development of society (Al-Zanfali & Al-Shami, 2020). Among these crises was the COVID-19 pandemic, which caused students to lose, on average, two-thirds of the academic year due to school closures, leading to a huge educational loss.

UNESCO Director-General Audrey Azoulay stated that prolonged and repeated school closures increase psychological and social harm to students, which in turn increases learning loss (UNESCO, 2021). These crises led to what is known as the problem of learning loss. Pier et al. (2021) defines it as a term used to describe various aspects of the failure of the educational system to achieve its intended goals, in addition to representing the gap arising among students between what they acquired during crises and what is normally acquired in regular school years. Hebebeci, Bertiz & Alan (2020) define it as the difference between what is supposed to be acquired and what the learner acquired, representing the amount of learning that occurs between normal learning conditions and learning during a pandemic.

Khudair (2021) states that learning loss is an educational problem that hinders the achievement of educational objectives due to the disruption it causes in the functional balance of the learning process, reflecting on educational inputs, which become greater compared to educational outputs, leading to negative impacts on the productivity and efficiency of education. Al-Ramhi (2021) emphasized that the main factors leading to increased learning loss during the COVID-19 pandemic and similar crises are prolonged interruptions in education, resulting from long-term school closures. This leads to halted learning, forgetting previously learned material, loss of skills, inability to improve them, not learning new concepts and skills, and decreased learning levels among students.

One of the long-term effects of continuous educational disruption is learning loss (ESCWA, 2023), as studies indicate that school closures may result in loss and decline of learning among students (Patrinos, 2022), as well as increased dropout rates. The longer schools remain closed, the greater the learning loss, the higher the probability of student dropouts, and the more complex the problem becomes.

Jibran (2021) observes that learning loss appears more clearly and at a higher rate in developing countries compared to developed countries. The Palestinian people are among those most affected by learning loss over the past years. Specifically, Gaza suffers from a dual crisis due to the COVID-19 pandemic on one hand and the genocide war it is facing on the other (ACLED, 2024). Since October 7, 2023, the war on Gaza has profoundly and multifacetedly affected all sectors, including education. The war radically impacted the quality and accessibility of education, leading to a complete suspension of the educational process during the first six months of the war (Abu Jammeh, 2024).

More than 600,000 children were deprived of their right to education, and over 70 public schools were converted into shelters, along with 145 schools under UNRWA (Ministry of Education, 2023). The deterioration of Gaza's educational infrastructure extends beyond buildings and schools to include a lack of essential educational resources such as books, tools, and modern technologies necessary for children's learning (World Bank, 2019).

In this context, the Palestinian Ministry of Education indicated that learning loss became a significant risk following the start of the genocide war in Gaza, with most students being disconnected from regular education for more than 18 months until May 2025.

One of the most important institutions responsible for child welfare is the family, which provides the essential environment for child upbringing and serves as a means for society to preserve and transmit its heritage across generations. It is also a source of psychological safety and emotional warmth for every individual (Abdel-Halim, 2024).

Abdel-Wadoud (2020) believes that learning loss can be mitigated by raising the awareness of students and parents about the importance of education and its role in improving individuals' quality of life, encouraging families to prioritize education and exert greater efforts to provide it to their children even at basic levels. Al-Rashidi (2023) emphasizes the importance of cooperation between schools and parents to compensate for learning loss.

The 2023 Arab States learning loss document cited Australia as an example of parental involvement in supporting home education to address learning loss during the COVID-19 pandemic. Rousoulioti, Tsagari & Giannikas (2022, p.432) noted that during COVID-19 lockdowns, parents suddenly had to take on a new role as home teachers, assisting their children in understanding lessons, completing homework, and supporting the learning process, especially in early primary grades.

Al-Qaisi (2023) indicated that education is a social process in which all stakeholders, including parents, must actively participate to address learning loss by developing lost concepts and skills to raise learners' academic levels. Science is considered one of the most important subjects, introducing learners to scientific concepts, encouraging experiments, interpreting data, and linking it with available information (Zaitoun, 2015).

The researcher, with over 15 years of experience in teaching science, observes that the educational process in Gaza faces unprecedented pressures, especially in science. Science has been among the most affected subjects due to its practical and experimental nature, which requires laboratories, tools, and equipment that are unavailable due to destruction and siege. Denying students the opportunity to conduct practical experiments weakened their deep understanding of scientific concepts and deprived them of scientific thinking and inquiry skills, which are core to studying science. This has significantly increased learning loss, extending beyond absenteeism to include decreased understanding of scientific concepts, weakened practical skills, and absence of interactive learning opportunities.

Problem of the Study

Gaza today is facing a genocide war unprecedented in its contemporary history, which has cast its shadow over all aspects of life, destroying economic, educational, environmental, psychological, and health infrastructures. Regarding the educational process, it can be said that it has completely devastated education: schools were bombed, others were turned into shelters, teachers were killed, and thousands of students lost their lives.

This situation has put the role of the Palestinian family to the test, as its responsibilities no longer simply involve providing food, clothing, and shelter like other families in different societies or leaving education to schools. Instead, the main and fundamental burden now rests on the family to educate their children, inherently embracing the challenge, resilience, crisis management, and a philosophy of self-sacrifice to ensure their children's education.

Despite all the bombardment, killings, destruction, starvation, and displacement, Palestinian families today continue to educate their children, attempting to fill educational gaps and compensate for the learning loss in various subjects, including science. Based on the above, the current study seeks to answer the following main question:

What is the role of the Palestinian family in compensating for learning loss in science at the basic education level during the war on Gaza?

From the main question, the following sub-questions arise:

1. What is the degree of the Palestinian family's compensation for learning loss of their children in science at the basic education level during the war on Gaza?
2. What are the obstacles that hinder the Palestinian family's role in compensating for learning loss of their children in science at the basic education level during the war on Gaza?
3. Are there statistically significant differences in the degree of the Palestinian family's compensation for learning loss of their children in science at the basic education level during the war on Gaza due to the educational level of the parents (mother)?
4. What are the suggestions to improve the role of the Palestinian family in compensating for learning loss of their children in science during the war on Gaza?

Study Objectives

The current study aims to identify:

1. The degree to which the Palestinian family compensates for the learning loss of their children in the science subject at the basic education level during the war on Gaza.
2. The obstacles that hinder the Palestinian family's role in compensating for the learning loss of their children in the science subject at the basic education level during the war on Gaza.
3. The statistical differences in the degree of the Palestinian family's compensation for learning loss of their children in the science subject at the basic education level during the war on Gaza based on the educational level of the parents (mother).
4. Suggestions to improve the role of the Palestinian family in compensating for the learning loss of their children in the science subject during the war on Gaza.

Significance of the Study

The importance of this study stems from the following:

1. It highlights the reality of the ongoing war in Gaza and its consequences, including repeated displacement of families, loss of safety, persistent fear, and psychological and social effects on children.
2. It sheds light on learning loss resulting from these circumstances, especially in scientific subjects that require practical engagement and analytical understanding.
3. It aims to understand the strategies of the Palestinian family in confronting educational crises.
4. It contributes to filling the research gap regarding the role of the family in education during wars.
5. It raises awareness among parents and the Palestinian community in general about the importance of their participation and fulfilling their responsibilities and roles in compensating for learning loss in science despite the war and difficult circumstances.

Study Terms

Palestinian Family:

An individual or a group of individuals connected by kinship, usually residing in the same dwelling, sharing meals or other aspects of daily living arrangements (Palestinian Central Bureau of

Statistics, 2017). The researcher will focus on the mother due to the fathers' involvement in other life responsibilities imposed by the war.

Learning Loss:

The educational gap in knowledge and skills that Palestinian students in the basic education stage should have acquired in science but were unable to fully gain due to the 2023 war on Gaza.

Basic Education Stage:

An educational stage extending from the beginning of Grade 1 to the end of Grade 9, including students from 68 Palestinian families, both male and female.

Role of the Palestinian Family in Compensating for Learning Loss:

What the Palestinian family (mother) does in three domains — academic, psychological, and digital — to compensate their children for knowledge and skills in science at the basic education stage that they were unable to acquire due to the 2023 war on Gaza, to preserve their well-being and build a better future for them.

Study Delimitations

Topic: The study focuses on the role of the Palestinian family in compensating for the learning loss of their children in science at the basic education stage during the war on Gaza.

Methodology:

The researcher used the descriptive-analytical method, considering it the most suitable approach for the current study.

Study Instrument:

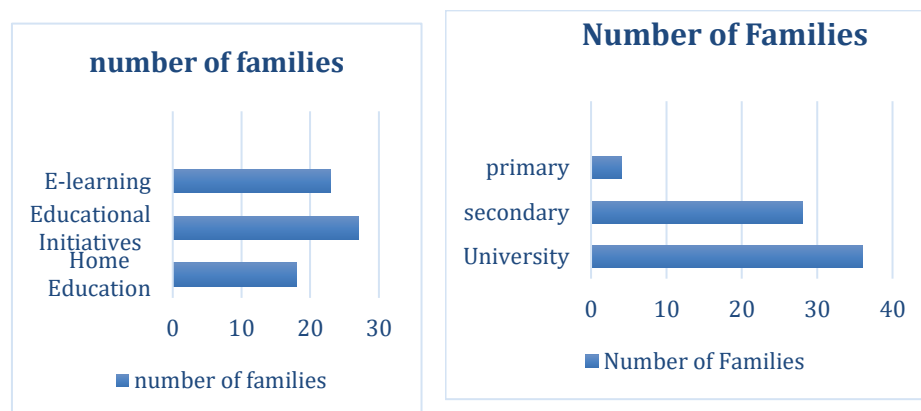
The instrument consists of a questionnaire prepared by the researcher, composed of four domains distributed as follows:

1. First domain: Academic domain, items (1–7)
2. Second domain: Psychological domain, items (8–11)
3. Third domain: Digital domain, items (12–15)
4. Fourth domain: Obstacles domain, items (16–20)

The researcher personally designed the questionnaire and selected these domains after reviewing relevant previous studies to ensure comprehensiveness and accuracy of information, contributing to achieving the study's objectives.

Study Sample:

The study sample consisted of 68 Palestinian families selected using simple random sampling in the western Gaza area. The researcher aimed for a larger sample; however, the circumstances in Gaza imposed restrictions on the available sample size. The sample included diversity in the parents' educational levels, ranging from basic to secondary and some university levels. The questionnaire also included items identifying the type of education students received during the war.



Statistical Methods Used:

The researcher used arithmetic means, standard deviations, Cronbach's alpha coefficient, and one-way ANOVA.

Temporal Delimitation: August 2025.

Spatial Delimitation: Palestinian families in the western Gaza area.

Human Delimitation: Students from the Palestinian families in the western Gaza area, both male and female.

Literature Review

Brahimah (2025): A Proposed Framework to Reduce Learning Loss among School Students in Palestine

The study aimed to present a proposed framework to reduce learning loss among school students in Palestine. The researcher used the analytical-synthetic method and then presented the proposal as an integrated process involving all parties of the educational process, starting from higher authorities such as the Ministry, as well as teachers, students, and families.

The study highlighted the role of the family in addressing learning loss by providing a supportive home learning environment, offering emotional and cognitive support to students, encouraging them to continue learning, and enhancing children's academic skills.

Alwan (2022): The Role of the Palestinian Family in Advancing the Educational Process During the COVID-19 Pandemic

This study aimed to identify the role of the Palestinian family in enhancing the educational process during the COVID-19 pandemic. The researcher used the descriptive-analytical method and selected a simple random sample of 75 families. A questionnaire was used to measure the role of the Palestinian family in advancing the educational process during the pandemic.

The study found that the role of the Palestinian family reached 82.4%, which is considered high. It also emphasized the family's effective role in providing a suitable physical and psychological environment for their children during study, as well as developing and training them on certain educational skills.

Rousoulioti et al. (2022): Parents' New Role and Needs During the COVID-19 Educational Emergency

The study aimed to investigate the new roles and needs of parents during the educational emergency caused by the COVID-19 pandemic, focusing on parents' engagement with unfamiliar roles in teaching their children. The researchers used a qualitative (case study) method and semi-structured interviews as a data collection tool. The sample included parents of first-grade students from various social backgrounds (disadvantaged and non-disadvantaged) in Greece and Cyprus.

The results showed that parents faced challenges in supporting distance learning and providing a supportive environment. They also had needs for technological, educational, and psychological support. Vulnerable families were more likely to face difficulties, highlighting the need for family-targeted support programs and educational policies to ensure continuity of learning during crises.

Al-Hafashi (2022): Learning Loss among Elementary School Students in Science Resulting from Distance Education During the COVID-19 Pandemic

This study aimed to identify the level of learning loss among elementary school students in science resulting from distance education during the COVID-19 pandemic, as well as the most important educational practices to address learning loss and the main obstacles to their implementation from teachers' perspectives.

To achieve this goal, the study used the descriptive method for reviewing and analyzing relevant literature and research. The researcher analyzed diagnostic test records for elementary students from grades four to six and developed a questionnaire to identify the most important educational practices to address learning loss and the obstacles to their implementation from the perspective of teachers in Mecca.

The sample included 204 teachers selected randomly from the city's educational staff. The results showed that students' academic achievement in science in northern and southern Mecca was low (34.8%), medium (30.3%), and high (34.8%), meaning that 65.1% of students did not achieve high-level performance, confirming the existence of learning loss among upper elementary students (grades four, five, and six). Regarding educational practices, the top three practices to address learning loss as perceived by teachers were:

providing continuous worksheets to students, offering continuous feedback, and using technology to simplify and accelerate information delivery. The lowest three practices were: using activity periods to compensate for learning loss, utilizing waiting periods, and dedicating one school

day per month to address learning loss. The study also revealed several obstacles preventing effective intervention, including a heavy teaching load and excessive administrative and extracurricular duties for teachers.

The study shares with previous studies the emphasis on the pivotal role of the family in supporting the educational process during crises, whether in addressing learning loss or providing a supportive learning environment. However, the current study uniquely focuses on the role of the Palestinian family under the war in Gaza, which imposes difficult conditions beyond the pandemic, and specifically on compensating for learning loss in science, which presents special challenges related to the practical and applied aspects of the subject.

Procedures and Study Tools

The researcher used the descriptive-analytical method, which involves collecting data, analyzing it, and deriving meaningful results related to the research problem.

Study Population:

The study population consisted of all parents in Palestinian families.

Study Sample:

The study sample was selected randomly to represent a portion of the study population

Study Tools:

The researcher reviewed previous studies related to the research topic and developed a questionnaire on the role of the Palestinian family in compensating for learning loss among their children in science at the elementary level under the war in Gaza. The questionnaire was structured around four dimensions.

Validity

Internal Consistency Reliability:

Table (1): The correlation coefficients between the domains and the total domain score were calculated

No	Domain	Correlation Coefficient	Sig
1	Academic Domain	725.	0.000
2	Psychological Domain	800.	0.000
3	Digital Domain	803.	0.000
4	Obstacles	704.	0.000

It is evident from Table (1) that all domains are statistically significant at the 0.001 level, indicating the suitability of the domain dimensions.

Second: Reliability

The researcher calculated the reliability coefficient:

A: Reliability coefficient (Cronbach's Alpha method)

Using the reliability coefficient (Cronbach's Alpha method), it was found that the reliability coefficients are as follows:

Table (2) Correlation Coefficients between the Study Domains

No	Domain	Correlation Coefficient
1	Academic Domain	851.
	Psychological Domain	810.
3	Digital Domain	813.
4	Obstacles	718.

It is evident from Table (2) that the reliability coefficient values are high across all domains.

B: Split-Half Reliability:

The reliability for each domain of the questionnaire was calculated using the split-half method, which is based on comparing the odd-numbered items with the even-numbered items to estimate the consistency of responses.

Table (3): Correlation coefficients for each domain of the questionnaire using the split-half method

No	Domain	Correlation Coefficient
1	Academic Domain	874.
2	Psychological Domain	824.
3	Digital Domain	813.
4	Obstacles	729.

It is evident from Table (3) that the reliability coefficients for the domains are high.

Questionnaire Scoring:

The values for the five-point Likert scale categories were determined as shown in the following table:

Table (3): Questionnaire Scoring Levels According to the Five-Point Likert Scale

Level	Average Range (From-To)
Very Low	1.00 – 1.80
Low	1.81 – 2.60
Medium	2.61 – 3.40
High	3.41 – 4.20
Very High	4.21 – 5.00

1. Cronbach's Alpha coefficient.
2. Mean, standard deviation, percentages, and ranks.

3. T-test.

Presentation and Discussion of Results

This chapter deals with the interpretation and analysis of the results, where the researcher used the mean, standard deviation, percentages, and ranks to answer the associated questions.

To answer the first question, which states:

What is the degree to which Palestinian families compensate for the learning loss of their children in the subject of science at the basic education level during the war in Gaza?

To verify this, percentages and ranks were used, as shown in the following tables. Table (4) shows the percentages for the dimensions of the degree to which Palestinian families compensate for the learning loss of their children in the subject

of science at the basic education level during the war in Gaza

Table (4) Descriptive Statistics of the Study Domains (Mean, Standard Deviation, Percentage, and Rank)

No	Domain	Mean	standard deviation	percentage	Rank
1	Academic Domain	24.466	5.260	69.31	1
2	Psychological Domain	14.68	3.089	73.4	4
3	Digital Domain	13.33	3.367	66.65	2
4	Obstacles	18.36	3.285	73.444	3

The study results indicated that the degree to which Palestinian families compensate for the learning loss of their children in the subject of science at the basic education level during the war in Gaza reached a high level across the three domains (academic, psychological, and digital). Palestinian families showed significant concern in compensating for learning loss in science during the war. The psychological domain ranked first in compensating for learning loss in science, with a percentage of (73.4%).

The researcher attributes this to the harsh and oppressive conditions faced by students, who are exposed to bombing, fear, and displacement at different times. Thus, the Palestinian family acted as a haven and a source of affection, providing children with all possible support to calm them and create a peaceful psychological environment to bridge the psychological gap and prepare them to continue learning and compensate for learning loss in various subjects, including Science. This aligns with the findings of (Rousoulioti et al. 2022).

The academic domain ranked second, with a percentage of (69.3%), confirming the effective role of Palestinian families in compensating for learning loss in science despite the challenges they face. Their view of education as a protective shield for their children and a means of resistance and

asserting presence through the multiple wars since the Nakba is emphasized. This is also noted in the UNRWA (2020) report, which stated that Palestinian families "consider education the most important investment."

The digital domain ranked third, with a percentage of (66.6%), reflecting the remarkable achievement of Palestinian families despite all the obstacles related to providing mobile devices and electricity outages. They faced these challenges to continue their children's education. The study results also indicate that the obstacles faced by Palestinian families in compensating for learning loss in science reached a high level, reflecting the extent of the efforts made by families despite poverty, displacement, and destroyed infrastructure.

Table (5): Shows the mean, standard deviation, percentage, and ranks for the academic domain.

No	Item	Mean	standard deviation	percentage	Rank
1	I review with my child the Science lessons that they missed during the war period.	3.48	.944	69.6	3
2	I set a daily organized time to study Science with my child in a safe place.	3.46	.852	69.2	5
3	I simplify Science concepts for my child by linking them to our daily reality and difficult needs.	3.67	1.073	73.4	1
4	I help my child conduct simple Science experiments using available materials such as plastic and sand.	3.10	1.145	62	7
5	I guide my child to watch educational Science videos.	3.45	1.052	69	6
6	I help my child follow virtual Science classes through various platforms.	3.48	1.099	69.6	4
7	I provide my child with science learning kits in printed form.	3.62	5.260	72.4	2

The digital domain ranked third, with a percentage of (66.6%), reflecting the remarkable achievement of Palestinian families despite all the obstacles related to providing mobile devices and the study results indicated that the degree to which Palestinian families compensated for learning loss in science at the elementary level in the academic domain reached 69.31%.

Referring to Table (5), the highest-rated item is item (3), which states: "*I simplify Science concepts for my child by linking them to our daily reality and difficult needs*", with a percentage of 73.4%. The researcher attributes the high score of items (3) to the fact that Palestinian families exert maximum effort to compensate for the learning loss in science by simplifying concepts and connecting them to reality. Acquiring theoretical knowledge alone is of little use, but when it stems from the student's daily life and problems, it becomes more understandable and lasting.

Palestinian families, for example, teach energy transformations through solar cells, which are the only energy source in Gaza after the electricity network was destroyed, and which they rely on in various aspects of life. Here, the researcher also notes the effective role of educational initiatives in Gaza, whether supervised by UNICEF or other organizations, in supporting families in this regard, as

well as families' follow-up of e-learning through its various platforms. On the other hand, item (4), which states: *"I help my child conduct simple Science experiments using available materials such as plastic and sand"*, occupied the lowest rank, with a percentage of 62%.

The researcher explains the low score of items (4) by noting that the Israeli occupation destroyed Gaza's infrastructure, including schools, which led to the destruction of science laboratories and the elimination of key tools for interactive learning and the development of students' thinking.

Palestinian families were forced to seek alternative educational methods, using whatever materials were available, such as cardboard, plastic, and sand. Some families succeeded in doing so through cooperation with existing educational initiatives that provided these materials and supported experiments. However, the percentage remains low due to the difficult circumstances, lack of psychological safety, repeated displacement, and psychological pressures on families and children. Some Palestinian families even used these materials as fuel for cooking to keep their children alive. This was confirmed by the study of Save the Children (2021).

Table (6) shows the mean, standard deviation, percentage, and ranks for the psychological domain.

No	Item	Mean	standard deviation	percentage	Rank
8	I encourage my child and praise their efforts in learning science during the war	3.51	0.775	79.2	1
9	I provide a calm environment for my child to learn with reassurance and psychological safety	3.33	1.080	70.2	3
10	I use learning through play with my child in studying science	3.88	1.066	66.6	4
11	I listen to my child's problems in learning science and try to help them solve them	3.96	0.916	77.6	2

The results indicate that the degree of the Palestinian families' compensation for learning loss in the psychological domain reached 73.4%, which is a high level, reflecting the families' awareness of the importance of psychological support in maintaining the continuity of their children's learning, especially in science, which requires mental effort, concentration, and intrinsic motivation.

The study results showed that the degree of Palestinian families' compensation for learning loss in science in the psychological domain reached **73.4%**, a high level. Table (6) shows that **item 8**, which states: *"I encourage my child and praise their efforts in learning science during the war,"* achieved the highest percentage (**79.2%**).

The researcher attributes this to Palestinian families using psychological encouragement and moral support as an alternative means in the absence of material resources and a supportive educational environment. In an environment where security is absent, schools are disrupted, and electricity and internet are cut off, the family's only tool remained the kind word and praise, serving as a psychological shield to protect their children from collapse and encourage them to persist in learning from a moral and faith-based perspective.

This approach reflects the depth of Palestinian belief that education is an act of devotion and resilience, and that encouraging children to learn despite bombing and siege has made moral encouragement a form of educational resistance and a faith-based message that knowledge does not stop regardless of circumstances.

Regarding previous studies, Rousoulioti et al. (2022) indicated that families during the COVID-19 pandemic—despite limited resources—relied on psychological encouragement as a primary tool to compensate for learning loss, as emotional support was crucial in helping children cope with pressures. Al-Ramhi (2021) also confirmed that prolonged school interruptions have negative effects on students' psychological well-being, but families who initiate praise and motivation reduce these effects and maintain learning motivation.

Meanwhile, item 10, which states: “I use learning through play with my child in studying science,” received the lowest percentage (**66.6%**). The researcher attributes this to the fact that educational games require space for movement, materials, and tools, which is very difficult in Gaza due to repeated displacement and lack of wide spaces because of overcrowding in camps while fleeing bombardment. Tools and materials are also unavailable, and educational games require prior preparation and planning, especially in science subjects, and qualified trainers with adequate psychological well-being. This is not available to Palestinian families under war conditions.

Table (7) shows the mean, standard deviation, percentage, and ranks for the digital domain.

No	Item	Mean	standard deviation	Percentage	Rank
12	I provide my child with an electronic device to follow science learning at home	2.88	1.219	57.6	4
13	I participate in educational groups on WhatsApp to follow science lessons	3.58	0.881	71.6	1
14	I make sure to download educational videos to explain science lessons	3.51	1.106	70.2	2
15	I help my child use the educational platforms that were launched during COVID-19	3.36	0.970	67.2	3

The study results indicated that the degree to which Palestinian families compensated for the learning loss in science in the digital domain reached 66.6%, which is considered a high level. Referring to Table (7), the highest-rated item is item (13), which states: “I participate in educational groups on WhatsApp to follow science lessons,” achieving a percentage of 71.6%.

The researcher attributes this to the presence of several educational initiatives in the West Gaza area, as well as initiatives launched by the United Nations Relief and Works Agency for Palestine Refugees (UNRWA), which aimed to provide WhatsApp groups offering explained lessons, work sheets, self-learning papers, and explanatory educational videos. Parents were keen to join these groups and follow their children's learning. Meanwhile, item (12), which states: “I provide my child with an electronic device to follow science learning at home,” received the lowest percentage (57.6%).

The researcher attributes this to the long duration of the war, during which most electronic devices in Palestinian households experienced technical issues due to their multiple uses—they served as communication tools, sources of lighting, and educational devices. Additionally, the deteriorating economic conditions during the war prevented many families from repairing or purchasing new devices, and restrictions by the Israeli occupation on bringing in electronic devices further complicated the situation, placing significant pressure on Palestinian families to maintain their electronic equipment.

To answer the second question, which states:

What are the obstacles that hinder the role of Palestinian families in compensating for the learning loss of their children in basic education in the science subject under the war in Gaza?

Table No. (8) shows the mean, standard deviation, percentage, and ranks for the Obstacles domain.

No	item	mean	standard deviation	Percentage	Rank
16	I find it difficult to teach my child science due to school closures.	3.75	0.864	75	3
17	I Power outages and internet interruptions hinder the use of educational materials.	4.16	0.816	83.2	1
18	I lack the educational experience that enables me to explain science concepts correctly.	2.78	1.270	55.6	5
19	I feel psychologically exhausted, which affects my ability to support science learning at home/in the tent.	3.75	0.930	75	4
20	The crowding of household tasks limits my dedicated time to follow up with my child.	3.91	0.836	78.2	2

The study results indicated that the constraints hindering the role of Palestinian families in compensating for the learning loss of their children in basic science during the war in Gaza reached 73.4%. Referring to Table (8), item number (17), which states: “Power outages and internet interruptions hinder the use of educational materials,” recorded the highest percentage at 83.2%. The researcher attributes this to the fact that electricity cuts and weak internet networks formed the biggest obstacle for Palestinian families in compensating for learning loss, as electricity and internet are scarce and unstable resources due to war conditions, making access to digital educational materials very difficult at many times.

This constraint was not only technical; some families with batteries or alternative subscriptions could continue learning, while the majority were deprived of this right. Consequently, education was trapped between parents’ desire to help and the lack of resources, resulting in a real gap between capabilities and needs.

This result aligns with reports from UNRWA (2021) and UNICEF (2022), which confirmed that “the main challenges facing education in Gaza during emergencies were chronic power outages

and weak internet,” making remote learning an unequal and unfair option. Meanwhile, item number (18), which states: “I lack the educational experience that enables me to explain science concepts correctly,” recorded the lowest percentage at 55.6%.

The researcher attributes this to the relatively high educational level of most Palestinian families, as the illiteracy rate is very low (2.2% only, according to the Palestinian Central Bureau of Statistics, 2023), which enabled them to effectively teach their children and follow up on compensating for learning loss in science.

To answer the third question, which states:

Is there a statistically significant difference in the degree to which Palestinian families compensate for the learning loss of their children in basic science during the war in Gaza attributable to the educational level of the parents (mother)?

To verify this, a one-way ANOVA was used to measure the significance of differences between groups.

To address this question, the following null hypothesis was formulated: There is no statistically significant difference at the significance level ($\alpha \leq 0.05$) in the estimation of the study sample regarding the role of Palestinian families in compensating for learning loss in science during the Gaza war attributable to the educational level of the Palestinian family (mother) (primary, secondary, university).

To test the validity of this hypothesis, a one-way ANOVA test was used to detect the significance of the difference based on the educational level of the parent. The F-value and significance level were calculated, as shown in Table (9).

Table (9): One-Way ANOVA Results of the Study Domains According to the Parent's Educational Level

No	Domain	Means			"F"	Sig
		primary	Secondary	University		
1	Academic Domain	23.700	0.949	0.393	0.949	0.393
2	Psychological Domain	15.000	0.913	0.406	0.913	0.406
3	Digital Domain	13.800	0.149	0.862	0.149	0.862
4	Obstacles	19.900	1.463	0.239	1.463	0.239
Total score		2.400	3.916	9.425	.086	.343

It is evident from the previous table that:

There are no statistically significant differences at the significance level ($\alpha \leq 0.05$) in the estimates of the study sample regarding the role of the Palestinian family in compensating for the learning loss in science during the war on Gaza, attributed to the variable of the family's (mother's) educational level (primary, secondary, or university).

The researcher attributes this result to the fact that it reflects a unique social and educational reality of Palestinian families in Gaza. These families are going through exceptional circumstances that have made all households, regardless of their educational level, face similar challenges in compensating for their children's learning—such as power outages, lack of internet access, displacement, and limited resources. Consequently, the differences that might normally appear under normal conditions between more and less educated families have diminished in the face of this shared suffering resulting in relatively similar family roles in educational compensation.

To answer the fourth question, which states:

What are the suggestions for improving the role of the Palestinian family in compensating for the learning loss of their children in the science subject during the war on Gaza?

The researcher believes that the role of the Palestinian family in compensating for the learning loss in science can be improved through:

- Cooperation with institutions supporting education in Gaza by organizing seminars for Palestinian families to explain the negative effects of learning loss and how to address it during the war, as well as uniting efforts to rebuild and restore learning for Palestinian students.
- Coordination among existing educational initiatives in Gaza to develop educational programs specifically designed to compensate for the learning loss in science, in ways that align with the current situation and available tools.
- Cooperation with supporting institutions in Gaza to provide free workspaces equipped with computers and internet access to help compensate for the learning loss in science.
- Raising awareness among Palestinian families about the importance of following up on their children's education and compensating for the learning loss despite the difficult circumstances. Particularly since the war is still ongoing to this day, the emerging Palestinian generation is at great risk of losing education—an issue that must be addressed with full determination.
- Cooperation with institutions supporting education in Gaza to organize psychological relief days for students in displacement areas, providing specialized counselors to monitor students' psychological conditions and offer the necessary psychological support to help them continue their education.
- Coordination among family leaders to preserve children's education and prevent their years from being wasted, by providing teachers for core subjects such as Arabic, mathematics, and science in

every displacement camp, along with calls for parents to follow up on education and ensure their children's participation in educational initiatives.

- Reformulating the educational packages adopted by the Palestinian Ministry of Education to align with the conditions in Gaza and benefiting from global experiences in this regard, with the aim of ensuring the continuity of science education. It is also suggested to teach science in a functional manner that connects it to reality and Palestinian needs.

Conclusions

In conclusion, the researcher found that the degree of Palestinian families' compensation for learning loss in science at the basic stage during the war on Gaza was high. Palestinian families demonstrated great flexibility and creativity in addressing learning loss by focusing on simplifying scientific concepts, providing psychological support to their children, and using the limited resources available despite the ongoing war and blockade.

Among the main challenges faced by these families were the lack of practical equipment, frequent power and internet outages, and the absence of safe spaces for interactive activities. Moreover, the compensatory efforts appeared relatively equal among families of different educational levels, reflecting the resilience of Palestinian society and its awareness of the importance of education as a means of survival and progress even under the most difficult conditions. Despite the significant achievements made by Palestinian families in compensating for their children's learning loss in science during the war, these efforts remain largely individual, stemming from the families' own awareness and sense of responsibility.

They still lack proper organization and continuous follow-up by educational and community institutions. Therefore, transforming these individual initiatives into a coordinated collective effort requires the establishment of a clear institutional framework to ensure the sustainability of these efforts and to expand their impact across Palestinian society.

Recommendations

Considering the above findings, the researcher recommends the following:

- 1. Unifying community initiatives:** Make use of local and international educational programs to support home-based learning during the war.
- 2. Adapting to children's psychological conditions:** Consider the stress and fear caused by the war when organizing educational activities.
- 3. Simplifying scientific concepts and linking them to reality:** Encourage families to use the surrounding environment and available resources to explain scientific ideas, helping to compensate for school interruptions.
- 4. Organizing short and regular learning sessions:** Despite difficult circumstances, it is recommended to set fixed daily times for studying science to ensure continuous learning.
- 5. Conducting training workshops for parents** on home-teaching strategies and innovative ways to teach science.
- 6. Providing psychological support programs** for children and families to enhance their ability to learn under conditions of war and crises.

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دور الأسرة الفلسطينية في تعويض فاقد التعلّم لدى أبنائها في مادة العلوم خلال الحرب على غزة

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الملخص

تبحث هذه الدراسة دور الأسرة الفلسطينية في تعويض فاقد التعلّم لدى أبنائها في مادة العلوم خلال الحرب على غزة. وتنبع أهميتها من الظروف الاستثنائية التي واجهتها غزة منذ اندلاع الحرب في أكتوبر ٢٠٢٣، والتي أدت إلى تعليق التعليم، وتحويل المدارس إلى مراكز إيواء، وحرمان آلاف الأطفال من حقهم في التعلّم، ما أسفر عن فاقد تعلّمي كبير. اعتمدت الباحثة المنهج الوصفي التحليلي، وجمعت البيانات عبر استبانة طُوّرت لأغراض الدراسة وشملت أربع مجالات: الأكاديمي، والنفسي، والرقمي، ومعوّقات التعويض. طُبِّقت الاستبانة على عيّنة مكوّنة من ٦٨ أسرة فلسطينية في المنطقة الغربية من غزة باعتماد العيّنة العشوائية البسيطة. واستُخدمت أدوات إحصائية مثل المتوسطات الحسابية، والانحراف المعياري، ومعامل كرونباخ ألفا، وتحليل التباين الأحادي (ANOVA) لمعالجة البيانات. أظهرت النتائج ارتفاع درجة تعويض الأسرة الفلسطينية لفاقد التعلّم عبر المجالات الثلاثة؛ إذ جاء المجال النفسي أولاً (٧٣,٤٪)، يليه المجال الأكاديمي (٦٩,٣٪)، ثم المجال الرقمي (٦٦,٦٪). كما بيّنت الدراسة أن مستوى المعوّقات التي تواجه الأسر بلغ ٧٣,٤٪، وكان أبرزها انقطاع الكهرباء والإنترنت، ونقص الموارد، والاحتفاظ بالمنزلي، والضغط النفسي. وأظهر اختبار ANOVA عدم وجود فروق دالة إحصائية في درجة تعويض الأسرة تبعاً للمستوى التعليمي للأم، بما يعكس الأثر القسري والموحد للحرب على جميع الأسر بغض النظر عن خلفياتها التعليمية. خلصت الدراسة إلى أن الأسر الفلسطينية أدّت دوراً أساسياً وفعالاً في تعويض فاقد التعلّم عبر تبسيط المفاهيم العلمية وربطها بالحياة اليومية، وتقديم الدعم النفسي والتشجيع للأبناء، والانخراط في التعلّم الرقمي من خلال المجموعات التعليمية ومقاطع الفيديو عبر الإنترنت. وأوصت الباحثة بتعزيز دعم الأسر عبر التنسيق مع المبادرات التعليمية المحلية والدولية لضمان استمرارية تعلّم الأطفال أثناء الحروب.

الكلمات المفتاحية:

الأسرة الفلسطينية؛ فاقد التعلّم؛ تعليم العلوم؛ حرب غزة؛ التعليم الأساسي؛ الدعم النفسي؛ التعلّم الرقمي؛ التحديات التعليمية؛ دور الأسرة؛ التعليم في أوقات الحرب.