

The Effectiveness of a Musical Stories Program to Develop Awareness of Climate Change among Pre-School Children

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Abstract

The research aims to determine the dimensions of climate change awareness for pre-school children, and the effectiveness of musical stories to develop their awareness of climate change. A random sample of (20) pre-school children's teachers was selected to survey their views on the extent of children's awareness of climate change. The research used the quasi-experimental approach on a sample of (30) children aged (5-6) years, and the research relied on the following tools: the opinion poll form to determine the dimensions of climate change awareness appropriate for children in preschool age, and the climate change awareness scale for children in preschool age, and a program of musical stories to develop awareness of climate change for preschool children, the results of the research showed the effectiveness of musical stories on developing awareness of climate change for preschool children.

Keywords

Musical story, Pre-school, Climate change, Environment.

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فاعلية برنامج قصص موسيقية لتنمية الوعي بتغير المناخ لدى الأطفال في سن ما قبل المدرسة

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الملخص

يهدف البحث إلى تحديد أبعاد الوعي بتغير المناخ للأطفال في سن ما قبل المدرسة، ومدى فاعلية القصص الموسيقية لتنمية الوعي بتغير المناخ لديهم، وقد تم اختيار عينة عشوائية من معلمات أطفال ما قبل المدرسة وعددهم (20) معلمة لاستطلاع آرائهم في مدى وعي الأطفال بتغير المناخ، واستخدم البحث المنهج شبه التجريبي على عينة من الأطفال وعددهم (30) طفل في سن (5-6) سنوات، واعتمد البحث على الأدوات التالية: استمارة استطلاع الرأي لتحديد أبعاد الوعي بتغير المناخ المناسبة للأطفال في سن ما قبل المدرسة، ومقياس الوعي بتغير المناخ للأطفال في سن ما قبل المدرسة، وبرنامج قصص موسيقي لتنمية الوعي بتغير المناخ للأطفال في سن ما قبل المدرسة، وظهرت نتائج البحث وجود فاعلية للقصص الموسيقية على تنمية الوعي بتغير المناخ للأطفال في سن ما قبل المدرسة.

الكلمات المفتاحية:

قصص موسيقية، مرحلة ما قبل المدرسة، تغير المناخ، البيئة.

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Introduction

The world today is facing a climate change crisis, that affects the ecosystem of life on earth, and piece changes at all levels together in natural conditions, which will affect the living organisms survival, leading to the need to know those changes and how to adapt thereto. In his study, Eze (2020) stressed the importance of spreading awareness of climate change among educated members of society since childhood, as the development of climate-related concepts has a significant impact on their behavior later on, reflecting in turn in the environment.

The musical story is an appropriate medium for developing climate change concepts, for preschool children in an interesting way. During the story telling, children are visually stimulated through illustrations, music and singing, so they relate thereto and become more sensually involved in the presented activity (Niland, 2007), where **the researchers** found that there are deficiencies in addressing the concepts of awareness of climate change within the daily program for pre-school children, and that it focuses on simple scientific concepts such as (sun- moon- rain), without paying attention to the changes occurring as a result of climate change, which children may adapt to, or form positive attitudes towards them.

There is a lot of evidence that pre-school children need to learn about issues related to climate change, as it is not only to identify information about climate or abnormal phenomena, but also how to deal with these phenomena or try to reduce them later so that the problem does not worsen with age. So, the study conducted by Blaise, et al. (2021) emphasized the importance of teaching young children means to adapt to the weather and its various changes through the movement of their bodies and the dancing expression of the meaning of climate difference, as it is very necessary in the early years of age as an innovative approach to environmental learning.

This prompted the researchers to conduct personal interviews with some kindergarten teachers, who confirmed, by up to 80%, that the children were constantly asking about climatic phenomena such as why the weather has become so hot?, etc., or fearing some natural phenomena such as earthquake,

which made **the researchers** to think about the use of musical stories dealing with the scientific concepts of climate change, through which children's awareness of the concepts related to climate change, may be developed.

The researchers also used the musical story as one of the children's favorite educational media, as the different situations of the story arouse the child's attention, making him eager to reach to its end, with the addition of music as a way to teach children the scientific concept of climate in an interesting way and without any misconceptions. The musical story is also used to modify the child's behavior towards a certain thing or a specific event in a simplified and interesting way and instilling habits, values and attitudes to the hearts of children.

Therefore, the researchers suggested creating a program based on the use of musical stories to develop awareness of climate change concepts, in order to answer the following questions:

- What are the dimensions and concepts of climate change awareness appropriate for preschool children?
- What is the effectiveness of a program of musical story activities in developing awareness of climate change for pre-school children?

Research Importance

The research importance is to direct the attention of specialists in preparing the curricula of pre-school children to the interest in spreading awareness of climate changes within the educational programs provided to the child according to the current developments of environmental culture and climatology, as well as simplifying the concepts of climate change to present them to preschool children to raise their awareness of the climate components, its problems, the causes of its change and its effects on the environment imbalance, and their role in adapting to those effects; helping them to understand the issues related to the environment around them and try to exploit their resources and solve their problems.

Being the only study in Egypt, to the researchers' knowledge, dealing with awareness of climate change for children, the research aims to determine the dimensions of awareness of climate change and related concepts suitable for children of pre-school age, and the specifications of appropriate musical stories to develop awareness of climate change for those children.

Theoretical Framework

The musical story for children of pre-school age

Music is an important aspect in human development and learning. There is no known human culture without music. It is noted that children develop rapidly through music, whether inside or outside school. Music is one of the most important inventions of mankind (Hogan et al., 2018). Many studies have confirmed the benefits of using music with children as they interact with it in multiple ways such as singing, playing percussion instruments or creating musical songs, as well as the children's reincarnation of the characters and their representation with the accompaniment of music, which is called the musical story (Niland, 2007). The study by Williams (2009) also emphasizes the importance of using musical stories to encourage and improve students' writing skills, while the study of Osama (2019) indicated the impact of the musical story on the development of some positive behavioral patterns in the preschool child. The researchers defined the **concept of the musical story** procedurally as a story that has a beginning, middle and end that depends on the sequence of its events, and it is more than an art at the same time, as it combines story literature, representation and kinetic expression alongside music and singing, and is employed with the aim of developing awareness of climate change for children at the pre-school age.

Importance of Musical Stories with Children

Music helps children in holistic development by improving social, academic and language skills, as well as musical skills. Children's programs have to achieve goals of making education easier through listening, rhythm, singing, dancing, and musical stories (Kocabaş & Özeke, 2012). When presenting stories, music helps children learn and understand without any effort. For example, when playing small scales, the child feels nervous and sad, and when playing large scales, he feels fun and joy, where this helps the child to feel the changes in the rhythm, expressions and pace of the story. The use of musical elements such as rhythm and musical expression during storytelling gives children an opportunity to respond to the musical story, thus understand the information and the text (Niland, 2007).

In this context, the study performed by Williams (2009) confirmed the impact of the musical story on writing story on Basic English language learner, as he used the musical story as a medium to help relieve the pressure resulting from literacy, and increase the chances that students remember vocabulary, as the study of Wolfe and Noguchi (2009) has demonstrated the importance of the musical story for maintaining young children's attention.

Hence, the researchers arrived at the importance of using musical stories with pre-school children in developing awareness of a concept of climate change, because using musical story makes awareness of that concept more easy and simple, and moreover, more interactive, positive and a way to attract the child attention.

Strategies of integrating music with story (Niland, 2007)

There are a lot of different strategies that can be used to add a musical dimension to stories:

- **Song stories:** Some of the pictures in illustrated books can be turned into songs. They encourage children to sing the story, and to think of ways to use musical elements to create a musical story with children, which expands children's musical and literary awareness;

- **Adding a narration to a song:** as an example; “*Old Macdonald*” and “*The Wheels on the bus*”, as these songs can be used to compose musical stories that express their events, and other words can also be introduced on those original melodies creating many musical stories;
- **Adding a song to the story:** A song can become part of the story, sung after reading the story, or used as a prelude to the story scenes.

Here, many previous studies emphasized the importance of using musical stories as one of the elements of musical activities designed in accordance with appropriate standards for the child, such as Ekizoglu and Ekizoglu (2009).

Awareness of climate change by pre-school children

Concept of awareness of climate change

The awareness of climate change and identifying strategies to adapt to it is important and necessary for the members of society today in light of the rapid effects of this change.

Idiomatically climate means “the usual weather in a place during a certain period of time ranging from several months to thousands or millions of years, and the natural period is considered to be 30 years.” As for the term climate change, it means the difference in patterns of temperature, precipitation, humidity, winds, different seasons and sea level in similar time periods (UNICEF, 2013).

In his study, Trott (2020) recommended the need to educate children from a young age about the importance of energy and how to rationalize its consumption to become part of their daily habits by reducing the use of fossil fuels that contribute to increasing climate change.

The study of Grauer (2020) also indicates that it is necessary to include information on the potential catastrophic effects of climate change within the curriculum in early childhood by working with children on climate issues, which reduces anxiety by understanding the risks from such change and avoid it or deal with it properly

Here, Piaget asserted that many of the cosmic and climatic concepts and perceptions that children acquire call for their interpretations at a very young age. It is possible for their early ideas to be affected by false and incorrect information acquired through cartoon films and otherwise, so they need sensory methods, scientific experiments and organized observation to properly absorb them (Piaget, 2013), as shown in the figure (1):

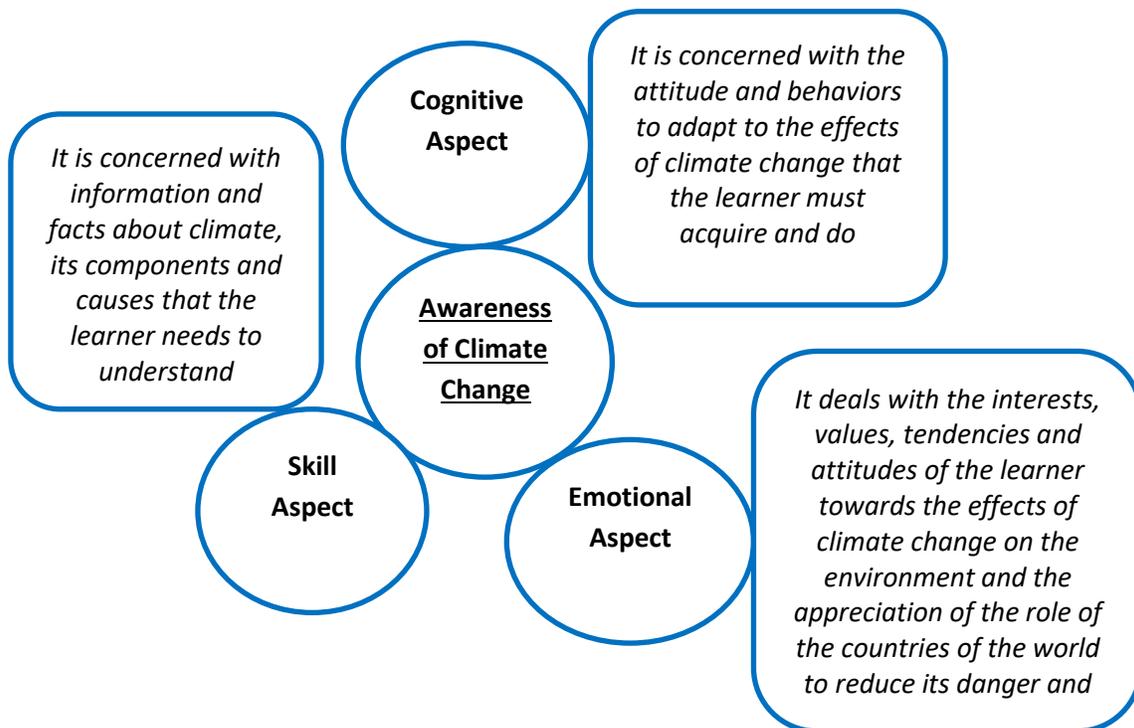


Figure (1) An illustration of the formation of the learner's awareness of climate change (from the researchers' point of view)

From the onset, the researchers define the awareness of climate change by pre-school children procedurally as raising the children's culture with a set of knowledge about the components of climatology and the natural and unnatural causes that led to climate disturbances and their dangerous effects on the ecosystem, as well as the formation of values towards adaptation to the effects of climate change. Climate changes through the necessary behaviors in safe dealing with the natural resources of the environment, which can be measured by them.

The Researchers enumerated the dimensions and concepts of climate change awareness for pre-school children by reviewing some literature, books and references related to the scientific concepts of climate science and benefiting from the opinions of experts and arbitrators, Appendix (4). The dimensions (components of climate science, causes of climate change and adaptation to the effects of climate change) and related concepts were identified as shown in Table No. (1).

Table 1. Explain the dimensions and concepts of climate change

Dimensions and concepts of climate change awareness for preschool children	
Dimension One	Climatology Components
1	Weather; which is concerned with children acquiring information about the meaning of weather, its duration, weather differences between countries and some of them, the role of the Meteorological Authority in forecasting weather conditions.
2	Climate; it is concerned with children's acquiring information about the meaning of climate and its duration and its difference from one country to another, how to measure climate, the importance of scientists identifying the type of climate in each continent on Earth.
3	Atmospheric disturbances; which means that children acquire information about the meaning of climate disturbance and its impact on weather everywhere in the world, and the phenomena of this change, and how the climate changes over time, and its impact on the Earth's atmosphere, the ozone layer and its threat to life on the planet Earth.
Dimension Two	Causes of Climate Change
4	Human activity (pollution); It means that children acquire information about the unnatural and human-caused causes of climate change, knowledge of forms of air pollution and how they affect global warming, and how large amounts of energy affecting the climate.
5	Global warming; It means that children acquire information about the meaning of global warming, how it occurs and its causes, and the dangerous effects of changing the temperature of the four seasons.
6	Nature of the universe; It means that children acquire information about the causes of climate change, including the natural change in the movement of the sun around the earth, as they raise the temperature of the earth for a large period of time.
Dimension Three	Adaptation to the Effects of Climate Change
7	Snow melting; It is concerned with children acquiring information about the dangerous effects of climate change on the ecosystem, and its effects on living organisms on the earth, in addition to the flood and its impact on coastal cities.
8	Drought; It means that children acquire information about drought, its causes and its impact on the environment, agriculture, and the threat of human life and living organisms.
9	Cleanliness and rationalization of consumption; It means that children acquire information about the practices that must be done to maintain the cleanliness of the environment and reduce air pollution, and

how to dispose thereof in a safe and healthy way for humans, in addition to rationalizing the consumption of energy.

The Importance of Developing Climate Change Awareness for Pre-school Children

Forming pre-school children's awareness of climate change is important and necessary to recognize their behaviors affecting the climate and the environment in the long run. as Sundblad et al. (2009) has pointed out to that the child's knowledge of information that raises their level of awareness about climate issues must be formed by them from an early age, whether through the media or through educational institutions, in order to reduce the negative risks of these changes (Professor, 2017).

The researchers are interested in the necessity of spreading climate awareness among children through the educational programs provided to them, as the study by Boggs et al. (2019) which dealt with integrating the topics and concepts of climate change in the educational curricula, to be rooted in the child's personality from a young age by presenting it in a manner that they like through various books.

The researchers also chose to use the musical story specifically to develop children's awareness of climate change, as the stories provide the child with a set of educational practices through which positive pursuit can be applied to confront climate change, in addition to the fact that music has a favorable effect on children's hearts and linking rhythm to body movement during the embodiment of the characters of the story in the representation of climatic conditions and the disruption that occurred in them, according to the results of the study.

Research Hypotheses

- There are statistically significant differences between the mean scores of the children of the experimental group pre and post application of the musical stories program on the scale of awareness of climate change on preschool children in favor of post-measurement;
- There are statistically significant differences between the mean scores of the children of the experimental and control groups in the post measurement, after applying the musical stories program on the climate change awareness scale for preschool children in favor of the experimental group.

Procedures

Research Sample

The researchers, as faculty members of the Faculty of Early Education for Childhood, Cairo University, have selected the study sample through their supervision of the faculty students in the field training course in schools and kindergartens, organized by the faculty administration, as well as taking the consent of the parents as an essential part of the training that the students practice in the school, therefore the program was implemented by the researchers.

The research sample is represented of kindergarten children at Al-Ahram Modern Language School affiliated to the Al-Haram Educational Department in Giza Governorate. The sample was chosen in a haphazard way, to implement the musical story activities. The number of children in the research sample was 30 boys and girls, enrolled in the second level of kindergarten, ranging in age between 5-6 years, were divided into 15 children for each of the group.

It has been verified that the sample is homogeneous and that there are no statistically significant differences between the average scores of children between the experimental and control groups before applying the *Musical Stories Program* in the pre measurement as shown in Table No. (2) (see figure 2).

Table 2. Mann-Whitney test for differences between the two groups (control - experimental) of the pre-test musical stories program

	Control group			Experimental group			Z Test	Significance
	M.	SD	Rank mean	M.	SD	Rank mean		
Components of climatology	1.13	1.64	16.40	0.80	1.32	14.60	-0.608	0.543
Causes of climate change	1.00	1.60	15.13	0.93	1.28	15.87	-0.249	0.803
Adaptation to the effects of climate change	0.93	1.58	16.53	0.67	1.35	14.47	-0.732	0.464

Pretest

Note. SD: Standard Deviation, M: Mean

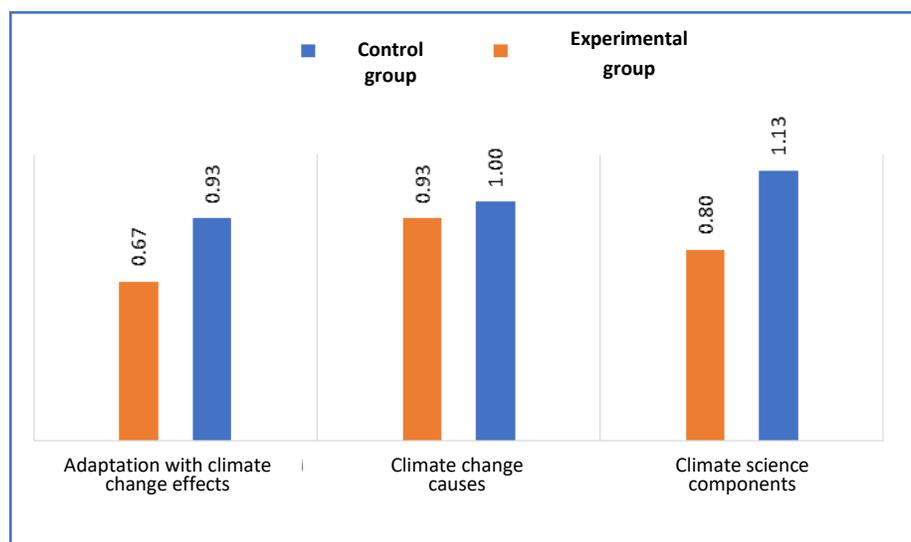


Figure (2) The differences between the mean scores of children between the experimental and control groups before applying the musical stories program in the pre measurement

The illustrated scale was applied to the sample children to determine the children's level of awareness of climate change before starting the program, then the program was applied to the children of the experimental group for a period of six weeks, three days a week, and then the scale was applied again to the children of the experimental group and control group, where its application has taken the duration of a week.

Research Methodology

The researchers used the quasi-experimental approach to provide more accurate as well as documented, in addition to enhance the researchers' ability to detect how the children absorb the changes that may occur gradually, thus, making adjustments to the program.

It is also possible to generalize the results of experimental research to a large extent on Phenomena similar to the one covered in the experiment.

Research Tools

- **An opinion survey form to determine the dimensions of awareness of climate change that are appropriate for pre-school children**

The researchers prepared a list of the dimensions of awareness of climate change and their concepts, where the form was prepared in its initial shape, and it was presented to the 10 arbitrators, who are experts in the field of musical education, early childhood education, and quality education.

The experts agreed on 3 main dimensions of awareness of climate change that are most appropriate for pre-school children; components of climate science, causes of climate change and adaptation to the effects of climate change. These dimensions were chosen based on 80% achievement or more.

According to experts and arbitrators opinions, the form took its final shape after modification, and dimensions with their concepts were considered appropriate, Appendix (1)

- **Climate change awareness scale for preschool children**

The design of the scale aims to measure the extent to which pre-school children acquire dimensions of awareness of climate change and the role of the musical story in this. The measurement is carried out by presenting

illustrated scale questions to the children, through conducting individual interviews for each child alone, and clarifying the phrases accompanying each question to help the child to the choice by pointing out to the correct picture, where the time of application of the scale was 20 minutes for each child, Appendix (2)

The scale consisted of 18 questions divided into the following dimensions:

- The first dimension/ components of climate science, questions 1-6;
- The second dimension/ the causes of climate change, questions from 7-12;
- The third dimension/ adaptation to the effects of climate change 13-18.

So that each dimension measures the cognitive aspect, the skill aspect, and the emotional aspect of the climate change awareness scale for preschool children.

The scale was also presented to a group of 10 expert professors and arbitrators, Appendix (4) until it reached its final form. The percentage of agreement on the dimensions of the scale as a whole ranged between 80%-100%, as shown in Table No. (3).

Table 3. Shows the percentage of jury agreement on the dimensions of the Climate Change Awareness Scale for preschool children

S.	CCAS Dimensions	Percentage
1	Components of climatology	80%
2	Causes of climate change	100%
3	Adaptation to the effects of climate change	100%

Note. CCAS: Climate Change Awareness Scale. The maximum score on the scale is 18 degrees, and the minimum is 0 according to the child correct and wrong choices.

In-class correlation coefficient (ICC): It is a descriptive statistic that can be used when making quantitative measurements on units that are organized into groups, and describes the strength of similarity of units in the same group to each other, which is done by judging three parameters to

correct students' scores in the illustrated scale test To develop awareness of climate change.

It is clear from Table No. 4 that the stability coefficient among the three arbitrators reached 0.998, which is a very high degree of stability, indicating that the three arbitrators gave the same scores to the students with a stability rate of 99.8%.

Table 4. *In-class Correlation Coefficient (ICC)*

	ICC	95% Level of Reliability	
		Min.	Max.
Single Metrics	.998	0.996	0.999
Metrics average	.999 ^c	0.999	1.000

Note. Min : Minimum level, Max. : Maximum level

Program objective

The Musical Stories program aims to develop some dimensions of climate change awareness and related concepts for preschool children represented in the dimension of climate science components- climate change causes dimension- adaptation to the effects of climate change dimension.

Program content

The current research program consists of 18 musical story activities, and includes scientific information, positive trends, and various behaviors towards understanding and child dealing with the impact of climate changes, where each dimension consists of 3 concepts that include 6 activities, two activities per each concept. An activity contains a story revolving around specific information and verification of a specific objective of climate change awareness presented to the child using children's favorite songs and music.

Program schedule

The researcher implemented a program of musical story activities, which consists of 18 activities divided into 3 main dimensions, with an activity every two days, according to a time of approximately two months, and the time of each activity is an hour.

The researchers have inserted the program content description in appendix (3).

The proposed program was presented to 10 professors and specialized experts, Appendix (4), and they recommended amending the wording of the questions during the discussion period to suit the age of the children.

It is clear from Table No. 5 that the percentages of agreement regarding the program's arbitration axes ranged between 80%-100%, which are high percentages, indicating the possibility of relying on these items in developing awareness of climate change for pre-school children.

Table 5. *Percentage of judges' agreement on the program of musical story activities to develop awareness of climate change for preschool children*

Arbitration clauses	Number of agreeing parties	Agreement percentage
General design of the program	10	100%
Procedural goals	10	100%
Activities of the components of climatology	8	80%
Climate Change Causes Activities	10	100%
Climate change adaptation activities	9	90%
Suggested musical story content	9	90%
Educational applications	8	80%

A sample of one of the activities of the Musical Stories program to develop awareness of climate change among pre-school children

The First Dimension/ Climate Change Phenomenon

The First Concept/ The Weather

Meeting

General Objective

Developing children's knowledge of the weather and meaning, its components, how to measure them; and the role of the Meteorological Authority in forecasting weather conditions, and the sudden change in them.

Activity 1

Activity: weather condition.

Procedural goals: After completing the activity, every child will be able to:

a. Cognitive Domain:

- The child identifies the components from which scientists learn about the weather. [Level: remembering]
- The child predicts the change in weather from one country to another according to the characteristics of each country. [Level: Understanding]

B. The skill Domain:

- The child masters the coloring of various images required for knowing about the weather. [Level: Mastery]
- The child listens to the musical story "**Friends**".
- The child sings the song "**How is the weather**".
- The child claps with the rhythmic unit  accompanying the song.

C. Affective domain:

- The child attentively listens to weather videos. [Level: Observation]
- The child shows interest in knowing the difference between weather conditions in different countries. [Level: interest]
- The child respects the performance of others while singing.

The Strategies used: Brainstorming - Cooperative Learning - Singing - Role-playing.

Tools: papers - colors - a computer.

Implementation procedures

Initialization: [15 minutes]

The teacher asks the children with music how to know the weather in each country as follows:

**Oh Sweet Come we Answer
Where Know from the Weather?
from the sun**



- Through singing, the teacher repeats the question with the children, and they give different answers.
- The teacher shows the children a video about the weather and its basic components.
- The teacher asks the children: "Through the video (animation), how do we know the weather condition in each country?"

Content: [30 minutes]

- The teacher introduces the children to the weather through the musical story as follows:
 - * There were two friends called Zozo and Mizo, who lived together in Egypt, go to school together, and play with ball every day.
 - * One day, the Mizo family decided to go on a trip to USA.
 - * The two friends kept in contact, talking together, and the following conversation occurred:
 - * Mizo asked about the weather condition by singing the following song in rondo:

How is Weather Today?

Is it sunny, Is it rainy

How is Weather Today?

Is it snowy, is it windy

How is Weather Today?



- Zozo: The weather in Egypt is sunny and fine; and how is the weather in the USA.
- Mizo: Snow is falling everywhere, and there are strong winds and rain.
- Mizo: What are you doing today?
- Zozo: I am playing with ball in the park because the sun is shining, and what are you doing?
- The teacher displays images from the video that expresses the sunny weather as in Egypt, and the activity of children while playing with the ball.
- * Mizo: I make beautiful shapes with snow.
- The teacher shows images of Mizo's activity during snowfall in the USA, and others displaying forming beautiful shapes with snow.
- * Mizo and Zozo kept in contact until Mizo got back from traveling and they gathered again.
- The teacher tells the children that the weather differs from one country to another, so it may be sunny in Egypt, while snow falls in the USA. And the weather may differ from one place to another in the same country, so the weather on coasts may be windy and rainy, while it is hot in Upper Egypt.
- **Educational application: [15 minutes]**
 - The teacher distributes an image to the children with the weather components, as well as other images.
 - The teacher asks each child to color only the images from which we can know the weather.
 - The teacher advises the children to color at least 3 images from the images in front of them.
 - The teacher asks the children to sing the song more than once so that they can memorize it.
 - The teacher asks the children to sing the song with clapping to the song with rhythmic unity 

Statistical Processing

Table No. 6 shows the test of the normal distribution of the study variables, and the results showed that all the variables do not follow the normal distribution, as the significance of the test is all less than the significance level of 5%, and then the researchers used the statistical methods represented in the nonparametric tests to study the differences between two independent groups. Represented by the Mann-Whitney test and the differences between two related groups the pre-test - the post-test represented by the Wilcoxon test.

Table 6. The normal distribution test for the study variables

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	Df	Sig.	Statistic	Df	Sig.
Components of climatology	0.291	30	0.000	0.680	30	0.000
Causes of climate change	0.357	30	0.000	0.643	30	0.000
Adaptation to the effects of climate change	0.310	30	0.000	0.604	30	0.000

Note. Df = Difference, Sig. = Significance

First hypothesis: There are statistically significant differences between the mean scores of the children of the experimental group before the application of the musical stories program and after the application on the scale of awareness of climate change on preschool children in favor of the post-measurement.

Table No. 7 shows the Wilcoxon test as one of the nonparametric tests to study the differences between two related groups before - after. The results showed that there were statistically significant differences (see Figure 3), as the test was significant for the components of climate science axis 0.001, the axis of causes of climate change 0.001, and the axis of adaptation to the effects of climate change. Climate 0.001 and all of them were less than the 1% error level, and these differences were in favor of the post test, where the average positive signs in the post test were 8.46, 8.46, 8.50, respectively, while the average negative signs in the pretest were 1.50, 1.50, 1.50, respectively, and then The first hypothesis was validated.

Table 7. Wilcoxon test for differences between the two tests (pre- and post-test) of the musical story program for the experimental group

	Pretest			Posttest			Z Test	Sig.
	M.	SD	Negative parameters	M.	SD	Positive parameters		
Components of climatology	0.80	1.32	1.50	5.33	0.90	8.46	-3.395	0.001
Causes of climate change	0.93	1.28	1.50	5.20	0.86	8.46	-3.386	0.001
Adaptation to the effects of climate change	0.67	1.35	1.00	5.53	0.74	8.50	-3.471	0.001

Experimental group

Note. M: Means, SD: Standard Deviation, Sig: Significance

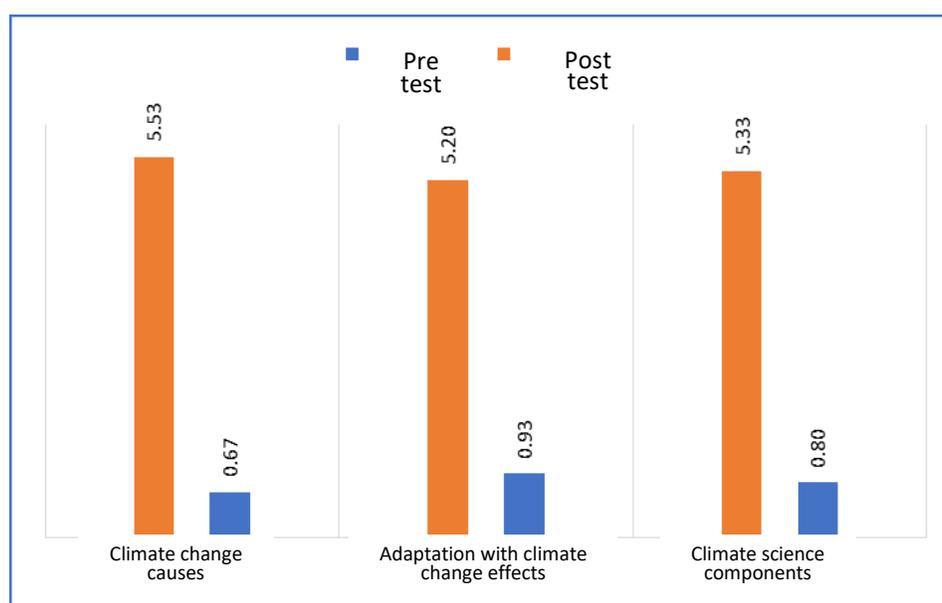


Figure (3) The differences between the mean scores of the children of the experimental group before applying the musical stories program and after applying the climate change awareness scale on preschool children

Second hypothesis: There are statistically significant differences between the mean scores of the children of the experimental and control group in the dimensional measurement after applying the musical stories program on the scale of awareness of climate change on preschool children in favor of the experimental group.

Table No. 8 shows the Mann-Whitney test as one of the nonparametric tests to study the differences between two independent groups control - experimental. The results showed that there were statistically significant differences at a confidence level of 99% (see Figure 4), where the test significance was 0.000 for the climatology components axis, and for the causes of change axis. Climate 0.000, and for the axis of adaptation to the effects of climate change 0.000, all of which were less than the 1% error level, and these differences were in favor of the experimental group, where the average ranks were 22.80, 22.13, 22.77, respectively, while the average ranks in the control group for the post-test were 8.20, 8.87, 8.23, respectively, and then the second hypothesis was validated.

Table 8. Mann-Whitney test for differences between the two groups (control - experimental) of the musical stories program by post-test

	Control group			Experimental group			Z Test	Sig.
	M.	SD	Rank mean	M.	SD	Rank mean		
Components of climatology	1.07	1.39	8.20	5.33	0.90	22.80	-4.633	0.000
Causes of climate change	1.13	1.68	8.87	5.20	0.86	22.13	-4.218	0.000
Adaptation to the effects of climate change	1.00	1.36	8.23	5.53	0.74	22.77	-4.650	0.000
Posttest								

Note. M.: Means, SD: Standard Deviation, Sig: Significance

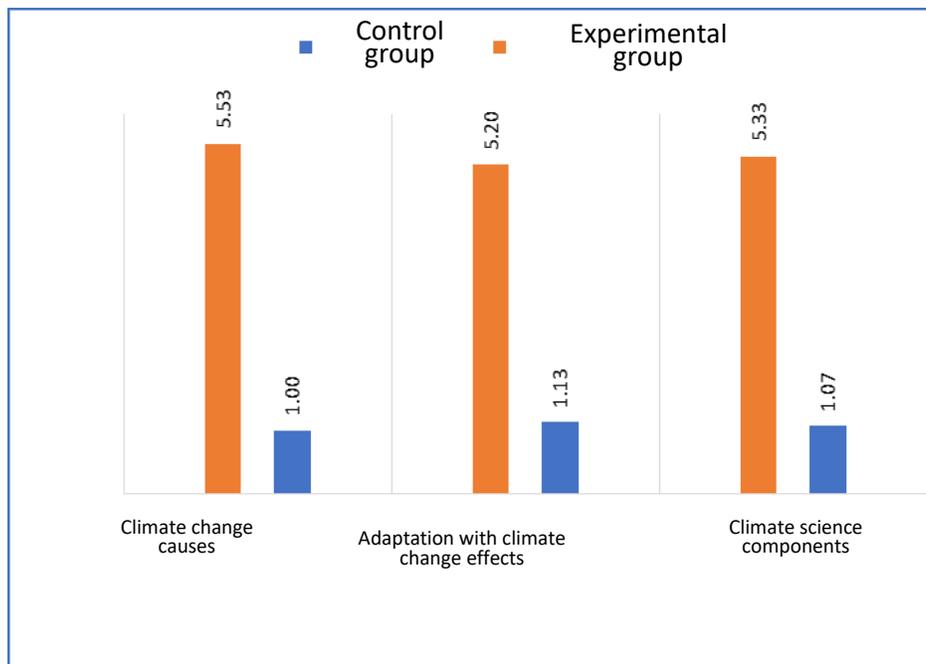


Figure (4) The differences between the mean scores of the children of the experimental and control group in the post-measurement after applying the musical stories program on the climate change awareness scale for pre-school children

Results and Discussion

First hypothesis discussion

The researchers explain the reasons for the superiority of the children of the experimental group in the post-measurement on the climate change awareness scale for pre-school children as follows:

Where a program has been prepared that introduces the concepts of climate change in a gradual way through the musical story by presenting the information familiar to the preschool children and grading from the easiest to the most difficult, which contributes to better assimilation and commensurate with their abilities. The child followed the accompanying story by singing, playing and re-performing the characters again using the accompanying music, which made the children share with each other in understanding and assimilation of the concept easily, in addition to providing each activity with a set of various educational applications such as

coloring pictures that express the Weather condition or singing the song more than once with the rhythm and representation of the story and this agrees with the results of Trott's (2020) study.

In addition, the study by Williams (2009) used the musical story as a mediator to help relieve the stress resulting from literacy, and the results reached to help the musical stories in the second language writing process, and these results are consistent with the results of the research on the effect of the music story teaches the words and expressions of climate change for preschool children.

The activities program also provides children of pre-school age with a large number of words and texts, both heard and read, through a group of stories accompanying the songs they love, which helps in enriching their linguistic repertoire of the science of climate change, and this is consistent with the results of the study of Iliff (2011). The opportunity for children to be creative, imaginative and scientific thinking by presenting various stories about concepts, it provokes children more to learn, and makes them more aware and understanding (Niland, 2007).

Finally, The researchers emphasize this result on the lack of the traditional program offered to preschool children to discuss and practice the concepts of awareness of climate change and focus on simple scientific concepts such as magnets. Neglecting the aspect of awareness of the effects of climate change and ways to adapt to it, while not applying the musical story activity as a stand-alone activity with only the application of the story activity alone or the music activity alone, despite studies, such as Round and McPhail (2020) and Hu et al. (2021) confirming the effectiveness of story and music in children learning various scientific concepts.

Second hypothesis discussion

The researchers attribute this result to the nature of the program and what was provided to the children of the experimental group and a noticeable development in their awareness and behavior about the concepts of climate change and the change of some of their response to environmental situations, unlike the control group.- skill- emotional according to each of the

dimensions of awareness of climate change, where the child has become aware of the correct information and the modification of their previous information, in addition to the values towards safe dealing with the environment, which are related to the correct behaviors that will reduce the negative effects of climate change in the current era. These results are in agreement with the results of Mcknight's (2010) study.

Also, the study by Wolfe and Noguchi (2009) that used music to maintain young children's attention during cases of auditory aberrations. Kindergarten students were distributed into groups: a spoken story, and a musical story. The participants were asked to listen to the stories and then record the number of correct responses, where these results are consistent with the results of the research in the abilities of preschool-age children that improved in the level of listening, speaking and performance expression a lot.

As the program of musical stories activities contributes to making the kindergarten environment interested in developing children's thinking and their openness to the world, and the environmental risks they face. This is what was addressed by the study of Dynorth (2019) and Kaye (2009) of the need for the learning environment to be fertile for correcting ideas and trends and the awareness of preschool children to become part of the formation of his personality in the future.

Indeed, the children participated in all program activities. For instance, in Activity No. 1, they participated in singing and representing the events of the musical story about the weather, where they benefited of learning about the weather today and how it changes from day to day. As a child noticed that it was quite warm, and air conditioners should be adjusted accordingly, which indicates their realization of that high temperatures may cause higher consumption of electric power, and this indicates that climate change awareness practices have become part of their personal knowledge in contrast to the children of the control group who did not show these practices during the implementation of the musical story activities. The children also participated in Activity 16 by representing the rhythmic melody with their bodies to collectively express the increase in draught all over the planet, and also with the researchers giving the children the

opportunity to improvise the representation that takes place between the characters in dramatic situations, differentiating between a dry plant and a mature plant, where this makes the child in a state of constant recall to show his understanding of the dangers that can occur if they do not pay attention to the negative effects of climate change.

From the ongoing, the effectiveness of musical stories in developing a child's knowledge of the components of climate science, the causes of climate change and how to adapt from the effects of that change, the researchers confirm the role of the musical story program in developing awareness of climate change for preschool children.

Conclusion and recommendations

In light of the previous results, the research concluded that the dimensions of awareness of climate change that are appropriate for children of pre-school age are identified, which are Climatology Components, Causes of Climate Change and Adaptation to the Effects of Climate Change, The related sub-concepts were also identified, It has also been verified that there is an effect of the musical story on developing awareness of climate change for pre-school age children through the presence of statistically significant differences between the mean scores of the children of the experimental group before applying the musical stories program and after applying the climate change awareness scale on children of pre-school age. Pre-school in favor of the post-measurement, and there are statistically significant differences between the mean scores of the children of the experimental group and the children of the control group in the post-measurement, for the application of the musical stories program on the climate change awareness scale for pre-school children in favor of the experimental group. The two researchers present the following recommendations and suggestions:

Including the concepts of awareness of climate change within the curriculum of pre-school children in Egypt and linking them to standards

and indicators to achieve them, in addition to paying attention to musical activities in raising awareness and scientifically educating children.

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