DEVELOPMENT OF SOME OF THE SCIENCE CONCEPTS AND VOCABULARIES TO PRESCHOOLERS USING SCIENCE MAGIC ACTIVITIES

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ABSTRACT
This research aimed to develop selected science concepts and vocabulary among preschool children through the use of science magic activities. To achieve this purpose, the researcher began by reviewing the educational literature and previous studies related to science concepts, science vocabulary, science magic activities, and their interrelationships. The study was guided by six research questions and six hypotheses, which were tested at levels of significance of $p \leq 0.01$ and $\alpha \leq 0.05$. A one-group pretest–posttest experimental design was employed. The sample consisted of 23 preschool children randomly selected from Smart Baby Kindergarten in the Kafer El Zayat district. The experimental group was taught targeted science concepts and vocabulary using a program based on science magic activities. Data were collected using three validated instruments: a test of science concepts, a test of science vocabulary, and note cards for science concepts. The findings revealed that science magic activities had a positive impact on developing certain scientific concepts and vocabulary among preschool children. Overall, the results suggest that integrating science magic activities into early childhood education can effectively support young children's understanding and acquisition of basic science concepts and related vocabulary.

Keywords: Science Concepts, Vocabulary, Preschoolers, Science Magic Activities

INTRODUCTION
Teaching through "magic" is an innovative method for early childhood educators, as it provides engaging ideas across various subjects designed to capture children's attention and help them grasp fundamental concepts through magical activities. Research shows that most children aged four to six and even about half of nine-year-olds are naturally drawn to magical practices and often engage in forms of magical thinking. This may include magical pretend play, participation in stories about magical folk characters, and imagining interactions with magical powers (Evgenii Vasilievich, 2010, p. 15). The term "magic" is often used to describe thinking that does not conform to conventional logic. For many preschool educators, particularly those informed by a Piagetian perspective, the development of magical thinking as a form of illogical reasoning is seen as a common and natural feature of early childhood (Rosengran, Miller, Gutierrez, & Schein, in press; as cited in Marjorie Taylor, 2013, p. 43).

Hands-on activities are widely used in early childhood education based on the belief that such practical experiences naturally foster interaction and provide added educational value by promoting thinking skills. French (2004) explains that scientific activities in preschool classrooms often emphasize collecting observable phenomena and using language that supports both intellectual and linguistic development. Such activities give children opportunities to describe and explain scientific processes and to participate in scientific investigations, which enhances their understanding of the nature of science (Metz, 2004). Many teachers believe that hands-on science learning is highly effective, provided that experiments are well-planned and purposeful (Caulton, 1998, p. 20). Worth and Grollman (2003) argue that these activities should go beyond merely delivering information about scientific phenomena; instead, they should provide opportunities for children to expand their thinking and construct new understandings through direct experience.

Children also learn advanced scientific concepts through curiosity, exploration, and learning from trial and error (Naellace, Chairman, Provost, & Rice, 1988). In this context, Lehr (2005) emphasizes that while children are naturally curious, they require guidance to make sense of their observations and to connect new information with what they already know. Recent developments in science education highlight the importance of supporting children's sequential conceptual development in science, alongside building scientific thinking skills necessary to understand foundational concepts such as patterns, order and organization, evidence, models and explanations, change and stability, measurement, and the relationship between form and function (U.S. Department of Education, 2005). Brenneman, Stevenson-Boyd, and Frede (2009) stress that thinking processes developed through early explorations of science help children build a solid foundation for deeper understanding as they progress in their learning.

However, when children learn science through experiments, scientific vocabulary can often present an obstacle. To help children overcome this barrier, teachers must intentionally support children's understanding of science vocabulary and encourage them to connect new concepts with relevant terminology (Kopp, 2011, p. 9). There is substantial evidence indicating that direct teacher input and guidance can enhance preschool children's skills and comprehension. For example, Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, and Poe (2003) found that young children's oral language skills develop primarily through meaningful conversations. Scarborough and Dobrich (1994) further demonstrated that children who engage in rich conversational experiences with adults during their preschool years achieve better academic outcomes later on.

The quality of conversations between adults and children, where adults respond thoughtfully to children's comments and questions, is vital for supporting children's expressive language development and overall communication skills (French, 2004). Teachers' use of language during interactions plays a crucial role in structuring children's inquiry and shaping their understanding of scientific exploration (French, 2004). By encouraging children to discuss their ideas, think critically, and make observations as part of play and guided activities, teachers help them grow not only in language use but also in communication skills and self-expression (Worth, Moriarty, & Winokur, 2004). Teachers who ask open-ended questions create opportunities for children to participate in meaningful conversations, enabling them to use language in authentic contexts (Bond & Wasik, 2009). While preschool children may not easily learn through formal lectures, the quality of language used by adults around them remains a vital element in their language acquisition and cognitive development (French, 2004).

Statement of the Problem

This research investigated the use of scientific magic activities in developing some scientific concepts and vocabulary among pre-school children. Some studies in recent years have come to view magic performance, especially the use of magic tricks in the magical science program, as not only a form of entertainment, but also a constructive activity. As a tool for teaching science (Hsu, Wang, & Hsu, 2012; Lin et al., 2014) and distinct from traditional magic tricks, scientific magic activities are designed based on scientific principles and knowledge in addition to arousing children's interest as the activities help children develop knowledge and skills. Related scientific studies through observation and processing that occur during scientific magical activities. As a result, this research was designed to design a series of learning activities based on magical sciences.

In this context, (Sarah J. Carrier , 2017) points out the importance of developing children's scientific knowledge, as they need to acquire knowledge of the content of science and practice scientific habits of mind, and this is impossible without knowledge of science vocabulary. In addition, teaching children new terms (vocabulary) expands their world by helping them access a new network of ideas related to concepts (Robert J. Marzano, Katie Rogers, Julia A. Simms, 2015, p. 1).

In addition to the lack of research that aims to use scientific magical activities to develop some scientific concepts and vocabulary among pre-school children, as far as the researcher knows.

Based on the previous background, there was a need to research the use of scientific magical activities in developing some scientific concepts and vocabulary among pre-school children.

Statement of the problem can be formulated in the following main question:

- What is the effectiveness of scientific magic activities in developing some scientific concepts and vocabularies for pre-school children?

Literature review

Teaching through "magic" has emerged as a novel and engaging method for educators, particularly in early childhood education. This approach provides teachers with creative strategies that capture young children's attention and help them grasp fundamental concepts by using magical activities as an instructional tool. Many children between the ages of four and six—and even a significant number of nine-year-olds—naturally gravitate toward magical thinking and practices, which may include pretend play involving magical scenarios, imagining interactions with mythical characters, or envisioning themselves with supernatural abilities (Evgenii Vasilievich, 2010, p. 15). Such magical thinking, often characterized as illogical by adults, is seen by many educators, especially those influenced by Piagetian developmental theory, as a typical and valuable feature of young children's cognitive growth (Rosengran, Miller, Gutierrez, & Schein, in press; cited in Marjorie Taylor, 2013, p. 43).

Hands-on activities have long been a staple of early science education, operating on the principle that direct interaction with materials fosters curiosity, exploration, and deeper understanding. French (2004) emphasizes that scientific activities in preschool classrooms support children's intellectual and language development by encouraging observation, description, and explanation of phenomena. These experiences provide young learners with opportunities to participate in basic scientific investigations and to better understand the nature of science (Metz, 2004). Teachers generally believe that hands-on science learning is highly effective when experiments are well-structured and purposeful (Caulton, 1998, p. 20). Worth and Grollman (2003) highlight that science activities for young children should aim not merely to deliver information but to stimulate thinking, promote questioning, and help children construct new knowledge from their experiences.

Children's natural curiosity drives them to explore the world through experimentation, even when this leads to mistakes or trial-and-error learning (Naellace, Chairman, Provost, & Rice, 1988). According to Lehr (2005), while young children possess innate curiosity, they need guidance to interpret their observations and to relate new knowledge to their existing understanding. Recent research underscores the importance of helping children develop basic scientific thinking skills alongside a foundational understanding of core scientific concepts such as patterns, order and organization, evidence, models and explanations, change, stability and measurement, evolution, balance, and the relationship between form and function (U.S. Department of Education, 2005). Brenneman, Stevenson-Boyd, and Frede (2009) note that early engagement with scientific ideas lays the groundwork for more advanced scientific learning as children grow.

However, as young children begin to explore scientific ideas, the language of science can present a significant obstacle. Teachers play a vital role in supporting children's understanding of scientific vocabulary and guiding them to link new terms to concrete experiences (Kopp, 2011, p. 9). Research demonstrates that teacher input and guidance are critical in enhancing children's comprehension and language development. Dickinson et al. (2003) found that preschool children's oral language skills develop primarily through rich conversations with adults, and Scarborough and Dobrich (1994) demonstrated that children who engage in such interactions achieve stronger academic outcomes later in life. Encouraging dialogue between adults and children—where adults respond thoughtfully to children's questions and comments supports expressive language development, communication skills, and conceptual understanding (French, 2004). Open-ended questions and discussions allow children to use language in meaningful ways, promoting deeper thinking and greater confidence in expressing their ideas (Bond & Wasik, 2009; Worth, Moriarty, & Winokur, 2004).

Magical thinking, as a cognitive process, serves multiple developmental functions. Freud (1916/1976) argued that it enables individuals to fulfill wishes that reality often denies. Freed from everyday restrictions, magical thinking creates a mental space where impossible desires can find expression: in dreams, we can fly, converse with loved ones who have passed away, or relive our youth. Freud, Borel (1934), and others have noted that magical thinking fuels fantasy—a capacity fundamental to creativity in both the arts and sciences. Magical thinking also helps people understand the world by projecting human thoughts and emotions onto objects, animals, or natural phenomena, a process psychologists refer to as animism and anthropomorphism (Bullock, 1985; Lévy-Brühl, 1926/1984; Piaget, 1929/1971; Subbotsky, 2000). Everyday language is rich with such constructions for example, "the sun rises" or "the rain is coming" and even scientific language uses animistic metaphors, like "gravitational attraction."

Magical thinking also has a meaning-making function. For those who believe in magic, religion, or an afterlife, these beliefs give life a broader perspective and help people cope with existential questions that scientific reasoning alone cannot answer, such as the fear of death or unexplained misfortune (Lundahl, 1993). There is increasing evidence that magical content in children's activities can benefit cognitive development, enhancing memory, imagination, and creativity. Principe and Smith (2008) found that 5- and 6-year-old American children who strongly believed in the Tooth Fairy told more vivid and detailed stories about losing their first tooth than peers with weaker belief. In another study, Subbotsky, Hysted, and Jones (2010) showed that children exposed to magical scenes from Harry Potter films performed significantly better on creativity tests than those who watched non-magical scenes. Subbotsky and Slater (2011) found that watching magical films helped children better distinguish fantasy from reality, an important skill for moderating the effects of media content on behavior. Research by Boyer and Walker (2000) suggests that counterintuitive magical effects are especially "attention grabbing," making them more memorable than ordinary events.

Additional studies have found that magical themes can aid memory for unrelated content, such as commercial brands embedded in films (Subbotsky & Matthews, 2011). Magical thinking helps children construct alternative imaginary worlds, broadening their perspectives and supporting divergent thinking (Eugene Subbotsky, Claire Hysted, & Nicola Jones, 2012). In light of this evidence, the present study aims to shed light on the role of science magic activities in developing key science concepts and vocabulary among preschool children. By integrating magical elements into hands-on science activities, this research explores how educators can leverage children's natural fascination with magic to promote curiosity, language development, and foundational scientific understanding.

Objectives

The current research aims at:

1- Identifying the effect of using scientific magical activities in developing some scientific concepts and vocabulary among pre-school children.

2- Developing some scientific investigation skills among pre-school children, such as (observation, prediction, planning, conducting investigation, interpreting data, asking more questions).

Source of science concepts

The movie Frozen is one of the best movies to choose from movies because it contains many science activities for ice science, and it contains several ideas related to ice science. All of these activities are known as frozen activities that fall under the heading of sensory science and they provide a lot of fun and are also easy to do at home or school! These awesome activities are not only beautiful but also educational. They help children explore science concepts such as chemical reactions, melting and freezing ice, water science, non-Newtonian fluids, polymers, and crystal growth while improving fine motor skills as well! These activities are also science that enables children to feel great sensory components for hands-on learning.

METHODOLOGY

This study employed a simple repeated measures research design to investigate the effect of science magic activities on the development of science concepts and vocabulary among preschoolers. The repeated measures design involves using a single group of participants who are exposed to multiple test occasions both before and after the intervention (Jones & Kenward, 2003). In this design, the pretest serves as a baseline control for the posttest results, allowing for a clear measurement of changes attributable to the intervention. Similar research designs have been effectively used in recent studies (Onyishi et al., 2021; Ugwuanyi, Ede, et al., 2020; Ugwuanyi, Gana, et al., 2020). In this research, a one-group pretest–posttest experimental design was used to gather empirical data. This design is supported by a descriptive method to provide detailed insights into the context and implementation process. A random sampling approach was adopted to select participants. The final sample consisted of 23 preschool children 9 boys and 14 girls randomly selected from Smart Baby Kindergarten in the Kafer El Zayat District, Egypt.

The experimental group received instruction specifically designed to teach basic science concepts and vocabulary through a structured program that incorporated science magic activities. The treatment phase of the study lasted for three months. Following the intervention, a posttest was administered to measure any changes in the children's understanding of the targeted science concepts and vocabulary.

Measures

To collect the necessary data, the researcher developed the Science Concept Test (ScT). The ScT covers foundational science topics including chemical reactions, ice melting and freezing, water science, non-Newtonian fluids, polymers, and crystal formation. The ScT is a 12-item multiple-choice test, with each item offering three options (A, B, and C). Children were expected to select the correct answer for each item. Correct responses were awarded two marks each, while incorrect responses received zero, yielding a total possible score ranging from 0 to 24. Additionally, the Science Vocabulary Test (SvT) was developed to assess children's understanding of key scientific vocabulary. The SvT focuses on terms such as crystal, solution, snowflakes, sink, float, changes in matter, mixture, frozen fractals, clouds, water cycle, rainbows, hurricanes, and snowstorms. The SvT consists of 13 multiple-choice questions, each with three options (A, B, and C). Similar to the ScT, each correct response was awarded two marks, with a total maximum score of 26 and a minimum score of 0. In addition to the ScT and SvT, the study used a Note Card Assessment to evaluate selected science concepts connected to magical thinking skills. This note card included six skill dimensions rated on a four-point scale: 4 = performs the skill with great skill, 3 = performs the skill brilliantly, 2 = performs the skill fairly proficiently, and 1 = does not perform the skill. Together, these measurement tools provided a comprehensive evaluation of the children's development of scientific understanding and vocabulary as influenced by the science magic activities.

FINDINGS

Data Analysis of Research Question One

Table 1. Shows Averages, standard deviations, and "t" values for the scores of the children in the experimental group in the pre- and post-measurements of the scientific concepts test "scientific concepts and sub-dimensions."

Significance level	T value	Degree of freedom	Standard deviation	Average	number	group	Dimensions	Series
0.01	3.80	22	1.37 0.97	2.08 3.30	23 23	Pre - post	Chemical reactions	1
0.01	5.47	22	1.72 1.45	2.39 4.86	23 23	Pre-post	Ice melting and freezing	2
0.01	9.95	22	1.20 1.24	2.00 5.00	23 23	Pre-post	Water Sciences	3
0.01	4.77	22	0.89 1.23	1.47 2.91	23 23	Pre-post	Non-Newtonian fluids	4
0.13	1.55	22	0.99 0.96	0.78 1.26	23 23	Pre-post	Polymer	5
0.08	1.80	22	1.02 0.89	0.95 1.43	23 23	Pre-post	Crystal growth (crystals)	6
0.01	8.94	22	4.23 4.92	9.69 18.78	23 23	Pre-post	Total score	7

Table 2. Shows Averages, standard deviations, and "t" values for the scores of the children in the experimental group in the pre- and post-measurements of the scientific vocabulary test "scientific concepts and sub-dimensions."

Significance level	T value	Degree of freedom	Standard deviation	Average	Number	group	Dimensions	Series
0.13	1.55	22	1.02 0.94	0.95 1.39	23 23	Pre-post	crystal	1
0.01	2.85	22	0.94 0.94	0.60 1.39	23 23	Pre-post	solution	2
0.01	3.14	22	0.97 0.84	0.69 1.56	23 23	Pre- post	snowflakes	3
0.01	3.14	22	0.97 0.84	0.69 1.56	23 23	Pre-post	Sink	4
0.01	5.01	22	0.84 0.77	0.43 1.65	23 23	Pre- post	Float	5
0.01	5.46	22	0.94 0.41	0.61 1.91	23 23	Pre- post	change in matters	6
0.01	3.44	22	0.97 0.77	0.69 1.65	23 23	Pre- post	mixture	7
0.01	3.76	22	0.94 0.77	0.60 1.66	23 23	Pre- post	frozen fractals	8
0.01	2.57	22	1.02 0.77	0.95 1.65	23 23	Pre-post	Clouds	9
0.01	4.59	22	0.97 0.57	0.69 1.82	23 23	Pre-post	hydrologic cycle or water cycle	10
0.01	4.09	22	0.97 0.57	0.69 1.83	23 23	Pre- post	Rainbows	11
0.01	6.55	22	0.84 0.41	0.43 1.91	23 23	Pre-post	Hurricane	12
0.01	4.21	22	0.99	0.78	23	Pre-post	Snowstorm	13

			0.57	1.82	23			
0.01	14.98	22	2.75 3.12	8.86 23.12	23 23	Pre-post	Total vocabulary score	14

Table 3. Shows average, standard deviations and t-values for the scores of the children in the experimental group in the post-test and follow-up measurements of the scientific concepts test (scientific concepts and sub-dimensions).

Significance level	T value	Degree of freedom	Standard deviation	Average	number	group	Dimensions	Series
0.49	0.69	22	0.97 0.89	3.30 3.47	23 23	Post-follow up	Chemical reactions	1
0.25	1.16	22	1.45 0.99	4.86 5.21	23 23	Post-follow up	Ice melting and freezing	2
0.05	2.07	22	1.24 0.84	5.00 5.56	23 23	Post-follow up	Water Sciences	3
0.05	2.33	22	1.23 0.89	2.91 3.47	23 23	Post-follow up	Newtonian fluids	4
0.01	3.34	22	0.96 0.41	1.26 1.91	23 23	Post-follow up	Polymer	5
0.01	3.02	22	0.89 0.00	1.43 2.00	23 23	Post-follow up	Crystal growth (crystals)	6
0.01	3.76	22	4.92 2.93	18.78 21.85	23 23	Post-follow up	Total score	7

Table 4. İllustrates Average scores of the children of the experimental group in the post-test and follow-up measurements, to test the scientific vocabulary as a whole and the sub-dimensions. The researcher used the Paired-Samples T Test to detect the significance of the difference between the averages (using SPSS. V21). The following table (4) show s these results:

Significance level	T value	Degree of freedom	Standard deviation	average	number	Group	Dimensions	Series
0.06	2.01	22	0.94 0.57	1.39 1.82	23 23	Post-follow up	crystal	1
0.10	1.69	22	0.94 0.68	1.39 1.73	23 23	Post-follow up	Solution	2
0.08	1.81	22	0.84 0.57	1.56 1.82	23 23	Post-follow up	snowflakes	3
0.18	1.36	22	0.84 0.57	1.56 1.82	23 23	Post-follow up	Sink	4
0.42	0.81	22	0.77 0.57	1.65 1.82	23 23	Post-follow up	Float	5
0.32	1.00	22	0.41 0.68	1.91 1.73	23 23	Post-follow up	change in matters	6
0.42	0.81	22	0.77 0.57	1.65 1.82	23 23	Post-follow up	Mixture	7
0.42	0.81	22	0.77 0.57	1.65 1.82	23 23	Post-follow up	frozen fractals	8
0.08	1.81	22	0.77 0.41	1.65 1.91	23 23	Post-follow up	Clouds	9
0.57	0.56	22	0.57 0.41	1.82 1.91	23 23	Post-follow up	hydrologic cycle or water cycle	10
0.32	1.00	22	0.57 0.41	1.82 1.91	23 23	Post-follow up	Rainbows	11

0.32	1.00	22	0.41 0.00	1.91 2.00	23 23	Post- follow up	Hurricane	12
0.66	0.43	22	0.57 0.68	1.82 1.73	23 23	Post- follow up	Snowstorm	13
0.38	0.89	22	3.12 2.37	23.13 23.91	23 23	Post- follow up	Total vocabulary score	14

DISCUSSION

In this research, The results of the scientific concepts variable in this research are consistent with the results of previous studies, which are as follows: -

(Van Hook, Huziak, and Nowak ,2005) conducted a study to determine whether practical lessons and inquiry-based science magic activities would help kindergarten students develop mental models of the concept of air. One of the difficulties of teaching science to kindergarten students is how abstract many concepts are. They often ask children to infer information that cannot be directly observed. To make science concepts more concrete, teachers often need to help children create mental models. The study was conducted in a Midwestern city with 39 kindergarten children in half-day programs. A scientist taught seven 30-minute lessons using science magic activities and songs. The scientist's goal was to create a mental model for children to understand the concept of air. In the first lesson, children had to come up with evidence for the existence of air. The next six lessons included investigations in which children developed the "air balls" mental model and used it to understand air in different contexts. The investigations included (a) hitting and moving objects with ping pong balls, (b) comparing how fast flat paper and crumpled paper fall, (c) learning about surface area using parachutes, (d) experimenting with a “mouse bowling game” with weight and air resistance, (e) investigating air pressure using straws, and (f) learning about Newton’s third law using propeller cars. The researchers analyzed pre- and post-interview responses and videotapes of the subjects’ body language and behavior. The results showed that in the pre-interview, most of the kindergarteners used their previous experiences to answer questions about air and justify their explanations. For example, the majority of the children said that air is wind and explained that it is real because they feel it. Twenty-five percent of the children said they did not know what air is made of. Air . Post-interview data showed that more children were able to explain what air is and what it is made of, and they used the model to explain their thinking. After the investigations, more children used deeper explanations that included new mechanisms and language. At the pre-interview, only a quarter of the children knew that air was in an empty bottle, compared to two-thirds who knew it at the post-interview. The authors noted that the inquiry-based science lessons and activities were not enough for all children to use a mental model to transform their thinking, and that some children relied heavily on science to confirm their thinking. The researchers concluded that the inquiry-based science lessons and activities helped most preschoolers learn not only about air but also how to apply knowledge about air in different contexts. This study suggests that young children can explain and justify an idea scientifically, and that this research can help them create mental models to understand air. Further research is needed to see if young children can create mental models to help them understand abstract concepts in different science disciplines. (Van Hook & Huziak-Clark ,2008) conducted a half-day study with 49 preschoolers to determine whether inquiry-based science lessons and activities could increase children’s understanding of energy. The kindergarteners received five 30-minute lessons centered around the five-step learning cycle model: engage, explore, explain, extend, and evaluate. The lessons included: (a) hands-on exploration, (b) whole-group discussions, (c) demonstrations of how toys use energy, and (d) songs and key phrases about energy. After analyzing the pre- and post-interviews for symbols and patterns, the researchers found that most children could distinguish between where energy comes from and how it is used. The kindergarteners were also able to provide examples of living and inanimate objects that use energy. In the post-interview, the children used more vocabulary from the discussions and incorporated more reflection into their thinking. One question from the interview was about how to pump energy into a plastic rabbit and an inflatable toy. In the pre-interview, very few children were able to pump energy into the plastic rabbit, but in the post-interview, all students were able to give the rabbit energy by squeezing it, causing it to jump. The authors concluded that “preschoolers are capable of developing a basic understanding of energy if they are provided with practical experiences that relate to their own lives” (Van Hook Huziak-Clark, 2008, p. 12). One limitation of this study is the limited number of participants; more replications would be needed. Another limitation was that the scientist taught the lessons to the preschoolers. The classroom teacher may not have the background knowledge or confidence to create or facilitate some of the experiments.

(Vanna's , 2013) pointed out in the study of 64 students from two first-grade and two third-grade classrooms at a private elementary school investigated the effects of inquiry-based science learning on young children's understanding of thermodynamics. First- and third-grade teachers volunteered to participate in the study. One class from each grade was randomly assigned to either an experimental or a control class. Children in the experimental group participated in guided experiments in the school assembly hall and during recess or free-choice time. In pairs, the experimental children participated in three investigations in which they made observations, collected and recorded data, made predictions, and attempted to solve problems. In the first investigation, they explored heat, equilibrium, and heat flow using a bowl of room-temperature water, a warm bottle of water, a cold bottle of water, and a laptop computer. During the last two investigations, the children learned about insulation and heat flow. In one investigation, they had to use different materials to keep juice cold, and in the other, they had to choose from the same material and keep hot chocolate hot. An experimenter was in the conference room with the children to facilitate the investigations by prompting the children to make predictions and helping collect data. The experimenter also explained thermodynamics and heat flow to the children and prompted them to make contact with it during the investigations between February and April. The children in the intervention participated in three lessons. The control classes received no instruction on this topic and never saw the experimental room. Varma used an open-ended clinical interview before and after the test to measure the children's learning. The interviews were transcribed for coding and data analysis. The results showed that over time, the guided experiences allowed the first and third graders to learn about the concept of thermal equilibrium. She also found that the children in the experimental group had more complete mental models of thermodynamics than the children in the control group. Posttest scores showed that 63 percent of the intervention group's third-graders increased their understanding of heat flow compared to 36 percent of the control group's third-graders. Similarly, 57 percent of the intervention group's first-graders increased their understanding of heat flow compared to 10 percent of the control group's first-graders. The results also showed that the children in the experimental group gave more answers than the control group that did not contain any misinformation when identifying and explaining good insulators, but they were not statistically significant. The authors concluded that the educational content was accessible to younger students because the thermodynamic and heat flow investigations built on pre-existing experiences of keeping things hot and cold and that inquiry-based learning motivates children to become active learners (Varma, 2014). Varma noted that further research is needed to determine which aspect of the intervention increased children's learning: (a) the experimentation, (b) the investigations, (c) the materials, or (d) the combination. One limitation of this study was that the control group did not receive any instruction on the topic; this may have skewed the results. It is thought that it would be important to replicate the study but with the control group receiving direct instruction on the topic for comparison and the size of the study also limits the results.

Furthermore, The results of the vocabulary variable in this research are consistent with the results of previously conducted studies, which are as follows: - (Block ,2020) states that children who are unable to learn science through pure scientific vocabulary need practical field scientific activities to help them understand concepts. These practical or inquiry-based activities are not limited to traditional scientific experiments. Children are encouraged to ask questions, solve problems, and be creative (Ed, 2015). Inquiry-based learning is accomplished through crafts, songs, dances, and stories (Donohue & Buck, 2017). When these activities are completed in meaningful ways, children can make meaningful connections between their work and their learning (Marzano, 2010; Suárez et al., 2020). By taking advantage of a wide range of hands-on learning activities, children have a better opportunity to become familiar with science vocabulary and concepts, allowing for better understanding and transfer between contexts (Brown & Concannon, 2019; Rice & Deshler, 2018). Science vocabulary can be complex for children, and it can feel as if students are learning a whole new language before they can begin to understand the concepts (Block, 2020; Brown & Concannon, 2019; Rice & Deshler, 2018). However, when teachers recognize this barrier and address this difference during science lessons and activities, children tend to understand words and concepts better. (Nelson & Allen, 2020; Rice & Deshler, 2018). A review of the literature found that vocabulary instruction has value not only in literacy classrooms but across all subject areas. By incorporating effective vocabulary strategies into activities in science instruction, teachers can help children identify what type of vocabulary words they are trying to decode and help decode the word in a science context. Many different strategies can be used in inquiry-based and vocabulary-based activities in the classroom to help teach science vocabulary, such as adapting to children's needs and learning resources, using peer discussion, visual displays for learning such as interactive word walls, and incorporating inquiry-based, hands-on activities. These strategies will help children develop academic speaking skills, which will help them throughout their educational careers (Block, 2020; Carrier, 2011; Nelson & Allen, 2020; Suárez et al., 2020).

finally, In the case of non-statistically significant results such as crystal growth (crystals), polymers, chemical reaction, melting and freezing of ice, and other concepts and vocabulary addressed in the current research: - The researcher believes that despite the prevalence of these concepts and vocabulary in modern daily life, there are few experiments on the subject in teaching science during primary or secondary education. These concepts and related vocabulary are not found in kindergarten, but primarily in biology or chemistry. Therefore, I prepared experiments related to these topics with the aim of providing children with an understanding of them and in line with science education standards and in a language appropriate for children so that each lesson can be adapted to the vocabulary of the classroom. The important thing is that each lesson contains practical activities for repetition. The concepts taught through scientific magic activities enhance the understanding of research vocabulary, and encourage future teachers to teach science actively and consciously, which has been proven to provide greater retention of lessons in the short and long term among children. This actually provides two motivations for our program: (1) to make these concepts and vocabulary relevant to young children, thus providing a foundation for them before they enter the curriculum, and (2) to teach the next generation of teachers about polymer science, chemical reactions, melting and freezing, crystals, and other concepts and vocabulary associated with the freezing unit and how to communicate effectively with their classes. The Magic Science Activities program has proven successful, and this view is consistent with a study by (Rose K. Cersonsky, Leanna L. Foster, Taeyong Ahn, Ryan J. Hall, Harry L. Van Der Laan, and Timothy F. Scott, 2017) which aimed to introduce children to polymers, crystal growth, chemical reactions, melting and freezing, and other concepts and vocabulary associated with the freezing unit. It is a potential area of study in addition to promoting positivity toward science. To achieve this, each unit is designed to employ active learning techniques that can be applied universally across all age groups. These techniques have been shown to enhance children's interest in a subject for further learning as well as improve long-term retention. Because children's classroom experiences with science have a powerful impact on their attitudes toward science, these lessons use the context of existing classrooms to present science in a new way, either by introducing new topics or by recruiting scientists and engineers as non-traditional scientists and instructors. This exposure to a diverse range of STEM professionals is critical to encouraging interest in and positive attitudes toward STEM careers.

CONCLUSIONS

There are three main conclusions to be made based on these science magic activities. First of all, the results generally indicate that some scientific concepts and vocabularies can be developed in preschool children using scientific magic activities.

Secondly, the teaching method using scientific magic activities helps to improve the conceptual understanding of preschool children in the freezing unit compared to the traditional teaching method.

Thirdly, the teaching method using scientific magic activities is more effective than the traditional teaching method in improving children's achievement in the theoretical and practical freezing science unit.

RECOMMENDATIONS

The researcher recommended that 1-using scientific magic activities as an introduction prepared by the researcher to improve children's vocabulary skills and their academic performance in science.2-seminars and in-service training should be conducted for female teachers regarding the development and implementation of materials for magical scientific activities in the classroom.3-the researcher recommends conducting a similar study covering a larger number of participants elsewhere.4- the researcher recommends that integrating scientific magical activities with the five-year learning cycle model for developing educational materials is effective, useful, and promising. In future studies related to inquiry-based learning, more research should be devoted to developing scientific magic activities related to other science topics, such as light, energy, and heat, which can then be integrated into inquiry learning to improve children's learning performance and attitudes toward science.5- teachers should be introduced to teaching methods and techniques that support inquiry and create an investigative atmosphere for performing inquiry-based science activities in the preschool stage. In attempting to implement inquiry-based science activities, teachers must plan learning experiences related to the children's immediate surroundings, appropriate to their level of development. These activities should be planned and implemented to use basic investigative skills.6-when learning new content vocabulary, children should have the opportunity to do so and communicate with their peers while interacting with the content vocabulary.

7-children should have multiple opportunities to use content vocabulary correctly. This could be through text cards, graphic organizers or interactive activities such as experiments or investigations. This will allow children to build their own understanding of the content vocabulary.

Limitations

The following delimitations were made for this research

"Teaching methods" is too vast and complex field. There are number of teaching methods presently available. It is neither feasible nor desirable to take more than two teaching methods in one research study. Therefore, the present research is restricted to using science magic activities. Sample was taken from a smart baby kindergarten – kafer elzayat district – Egypt consisted of (23) preschoolers 9 (boys) and 14 (girls). The research was confined to the subject of snow science for preschoolers classes , as it is a typical fundamental science.

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