

## The Reality Of Applying The Five Mathematical Operations Recommended By The National Council Of Teachers Of Mathematics (Nctm) In Saudi Kindergartens

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Article Info	Abstract
<p><b>Article History</b></p> <p>Received: May 14, 2021</p> <p>Accepted: August 27, 2021</p> <hr/> <p><b>Keywords :</b> Mathematical, Educational, Saudi Kindergartens, Teachers</p> <p><b>DOI:</b> 10.5281/zenodo.5297239</p>	<p><i>The purpose of the research was to recognize the reality of the application of the five mathematical operations recommended by the National Council of Teachers of Mathematics (NCTM) in Saudi kindergartens. It aimed at revealing the statistically significant differences for their application according to (geographical area/type of kindergarten/profession / academic qualification/years of experience), following the descriptive approach, as it was applied to a sample of (140) teachers (assistant - basic), supervisors, and principals, by constructing a questionnaire consisting of 13 phrases and suitable for the research subject. The research found that the percentage of approval by educational practitioners to apply these standards fell within a large limit, so the correlations came in the first place with a relative weight (96,3), followed by representation (74,3), then communication (62,3), and finally Problem solving (58,3), but the logical thinking criterion came within the average limit (3.11) and this ratio is considered insufficient as it is important for building mathematical concepts for the child. The research also revealed that there are no significant differences between the sample members about its application due to the research variables. The Research recommended reconsidering the mathematical curricula currently used in self-learning curricula according to Saudi and international development standards While preparing curricula.</i></p>

### Introduction

The specialists in the educational field are keen to enrich the child's learning environment with motives that persuade him to innovate, learn, acquire knowledge and experiences through his discovery of this environment through various experiments and attempts. They made him the basis and focus of the learning process and through his various constructive and purposeful educational activities, his comprehensive growth in various fields was achieved. (Al-Jabri, Al-Musharib, 2018).

The upbringing of the child in all aspects starts from the beginning of his birth and changes its content through the phases of his growth. The most important of these aspects is upbringing and training him to use mathematical thinking in the kindergarten stage by creating educational situations that help him in the formation and learning of elementary mathematical concepts. (Makhlouf, 1986).

Consequently, the child needed to have mathematics in kindergarten curricula to provide him with basic mathematical skills and concepts as long as its content agrees with the objectives of this stage and is appropriate for his abilities and needs, develop modern and appropriate methods for teaching him, and offer him educational activities and means that facilitate his learning. (Al-Rahhala, 2010)

The field of mathematics differs from one country to another at this educational level. The National Council of Teachers of Mathematics in the United States of America (NCTM) has set a set of standards for the skills and knowledge that a kindergarten child must acquire in the fields of mathematics. The aim was to teach him the basics of mathematics because of its positive effects at all stages of later education, in addition, to help him to think positively, face his life problems, and develop his mathematical reaching skills. (Al-Saeedi, 2018)

Because of the importance of learning Mathematics in our lives; especially in early childhood. We could find many studies that have taken care of it and its teachers, including the study of (Al-Juhani, Salem, 2020), which recommended the need to pay attention to training female teachers according to modern educational and instructional movements in the light of development standards in the Kingdom of Saudi Arabia. On the other hand, (Ishaq, 2015) (Badawi, 2003) pointed out the importance of making the best benefit of the international standards issued by the National Council of Teachers of Mathematics (NCTM) in preparing training programs for teachers of mathematics because of the appropriate perception of these standards for teaching mathematics at the kindergarten level. (Abdul Samee , Khalifa, Mahmoud, and Mansour, 2016) also asserts that the most important basic of mathematical skills identified by (NCTM) that learners must study

include (geometric and arithmetic skills - thinking, communication, mathematical reasoning - measurement, statistics, approximation - numerical sense and linking Ideas with educational tools - computer use - mathematical expressions and problem-solving). (Al-Natheer, 2005) emphasizes the need to improve the mathematics curricula in the Kingdom of Saudi Arabia in the fields of measurement and engineering, and that the NCTM standards should be an important basis and contribute to setting quality standards for the development and design of these curricula.

From the last part, It becomes clear the importance of the current research, which comes from its subject, and the results of educational studies and research that point to the necessity of teaching mathematics in kindergarten and paying attention to it. One of them is the study of (Mustafa, 2018), which emphasized that the kindergarten child's study of mathematics made him more accommodating and understanding of it in the later educational stages. (Saber, 1995), (Kashkary, 2012) found through their study in Jeddah that kindergarten children were more successful in learning mathematics when they joined the first grade of primary school, and that those enrolled in two years in kindergarten were better in mathematics achievement than those who joined one year in kindergarten. The results of the study of (Saghir, 1990), after its application in Makkah Al-Mukarramah, emphasized the difference in the achievement of learning mathematics in the first and second grades of the learners enrolled in kindergarten before and those who were not enrolled.

Hence, the current study aims to reveal the reality of the application of the five mathematical operations recommended by the National Council of Teachers of Mathematics (NCTM) in Saudi kindergartens, to find out some results that can be used in developing and designing the mathematics curriculum in Saudi kindergartens, and preparing training courses and workshops for mathematics teachers in the light of (NCTM) standards to raise their efficiency in teaching them, which positively affects the kindergarten child's learning of it, and thus improves his ability to face his life problems.

#### **Theoretical Framework:**

##### **National Council of Teachers of Mathematics (NCTM) standards:**

The International standards are a set of phrases agreed upon by specialized educational experts to be used as guidelines, from which indicators are derived that show the procedural performance required to be achieved by the child in learning mathematics, and from them are branched practices that show the minimum limit that the child must learn to achieve the targeted learning outcomes in mathematics.

The field of mathematics is one of the basic fields of kindergarten programs, which aim at (developing logical thinking - solving problems - applying ideas - communication) in situations of (playing - or real life) in which the child uses his mind and hand and is in the circle of his interests in the kindergarten stage.

The kindergarten stage is the stage in which the child from the age of four to six years enrolls and is educationally qualified in all aspects to qualify him for the later educational stage. (Ismail, 2015)

Therefore, it was necessary to teach the child mathematics according to international standards in light of contemporary developments. The standards of the National Council of Teachers of Mathematics (NCTM) took the lead in this regard at the international and Arabic levels in conferences and scientific research because of the basic rules of mathematical knowledge that they include for each educational stage and setting goals for learning. Mathematics education consists of five goals that the learner achieves, which are:

- Realizing the importance and role of mathematics in various sciences and societies.
- Confidence in his mathematical abilities.
- His ability to mathematical inference 'deduction'.
- Enables him to communicate mathematically "arithmetically".
- Solving mathematical problems.

The standards were set based on these goals to illuminate what the mathematics curriculum should include in each stage of education and not to be linked to a specific culture or society, which increased its importance and the ability to employ it with the content of the mathematical curriculum. (Awda, Al Shakra, 2007)

So, the outcomes of many studies on these standards in the learning and teaching of mathematics revealed their significance and recommended the necessity of reviewing them by the authors of the curricula in the field of mathematics to build and develop these curricula in the light of these standards and according to them as a study (Asqoul, Abu Odeh, 2019), (Al-Shahri, 2015).

#### **STATEMENT OF THE PROBLEM AND QUESTION OF RESEARCH:**

The Kingdom of Saudi Arabia is making great efforts to develop education and improve its quality at all stages, including the kindergarten stage. The Saudi developmental learning standards for kindergartens have been developed across the Kingdom. This document is a set of expectations for the knowledge, behaviors, and skills that children can have that will participate in building the child's personality in the later stages of learning (Developmental Learning Standards for the Age Group 3-6, 2018).

The document of developmental learning standards in the Kingdom of Saudi Arabia, within the standard of cognitive processes and general information in the mathematics track, indicated that this track is concerned with studying relationships (between quantities) and processes, and deals with mathematical and logical thinking skills, by understanding the simple processes and mathematical processes. The children begin to understand mathematical concepts through their experiences with the environment around them (Developmental Learning Standards for the age group 3-6 years, 2018).

Mathematics education is considered one of the basic areas of education in the kindergarten stage. Children at this stage need to learn the steps of scientific and logical thinking, by defining the problem, examining data, formulating hypotheses, and experimenting. They also show an understanding of the basic processes of science; Such as observation, classification, measurement, estimation, and forecasting. These skills and processes prepare children to be decision-makers and citizens who are able to solve their problems in a better way. Knowledge also provides them with power and responsibility for its use (Martin et al., 1998, 17-21). The results of research and studies revealed the significance of providing the kindergarten child with mathematical and logical thinking skills through giving him opportunities for observation, exploration, and training in the use and understanding of mathematical concepts (Al-Rahhala, 2010; Al-Shafi'i, 2014).

The global standards movement, which appeared in the eighties of the twentieth century, is considered one of the paths of developing mathematics education and learning (Obeid, 2010). The report of the American National Council of Teachers of Mathematics (NCTM) was issued in (1989 AD) on school mathematics standards, which clearly indicated what the picture of Mathematics education should be in the current era. The NCTM document calls for a general basis in mathematics that all students learn while recognizing the existence of differences between them, as they show different talents and abilities, and their achievements, needs, and interests in mathematics vary. However, all students must be able to from receiving educational programs in mathematics at a high level (Abbas and Al-Absi, 2007).

The standards of the National Council of Teachers of Mathematics (NCTM, 2000) also highlight the significance of developing mathematical thinking, critical thinking, mathematical proof, inductive and deductive thinking, presenting mathematics as a tool for thinking and communication, and building a mathematical Thinker by informing the child of the importance of his role in learning mathematics, encouraging him to form Meaning of what he learns, and presenting mathematics topics interestingly and enjoyably for the child (Najm, 2012, 495).

The researchers believe that the experience of the National Council of Teachers of Mathematics in creating specific standards for mathematics is a pioneering scientific experience. Therefore, it was important to compare those standards with the practices and standards applied in kindergartens in the Kingdom of Saudi Arabia, where they are global with international educational orientations. Based on the previous, the problem of the current research is determined in the following main question: What is the reality of the application of the operational standards of the National Council of Teachers of Mathematics (NCTM) in kindergartens in the Kingdom of Saudi Arabia from the point of view of educational practitioners (teacher/supervisor/principal)?

The following sub-questions are derived from the main question:

1. To what extent are the operational standards of the National Council of Mathematics Teachers applied in kindergartens in the Kingdom of Saudi Arabia from the point of view of educational practitioners (teacher/supervisor/principal)?
2. .Are there statistically significant differences for applying the standards of mathematical operations according to (geographical area/type of kindergarten/profession / academic qualification/years of experience)?

## METHODOLOGY:

### Research Sample:

The sample included (140) educational practices (teacher/supervisor/principal) in Saudi kindergartens, as shown in Table (1).

Variables	Details	(N)	percentage
Geographical area	Eastern area	06	42.8
	Middle area	31	22.1
	Western area	13	9.2
	Other areas	36	25.7
Kindergarten type	Governmental	75	6.53
	Private	60	42.8
	International	5	3.5
Profession	Assistant teacher	6	4.2
	Main Teacher	70	3.5
	Supervisor	24	17.1
	Director	40	28.5

Academic Qualification	Diploma	30	21.4
	Non-educational bachelor's degree	13	9.2
	Educational bachelor's degree	24	17.1
Questionnaire Axis		Correlation Coefficient	
<b>The nature of the mathematics curriculum applied in kindergarten</b>		0.654	
<b>NCTM Mathematical Operations</b>		0.772	
Years of Experience	Early childhood bachelor's degree	62	44.2
	Diploma after bachelor	3	2.1
	Master degree	8	5.7
	1-2 years	37	26.4
	3-5 years	24	17.1
	6-10 years	40	28.5
	More than 10 years	39	27.8

Table 1

### Methodology of the Research:

This study used the descriptive approach to describe the phenomenon and to reach conclusions that could explain this phenomenon in an impartial and objective manner.

#### research tools:

- A questionnaire about the reality of the application of the five mathematical operations recommended by the National Council for Teachers of Mathematics (NCTM) in kindergartens in Saudi Arabia, prepared by the researcher. The questionnaire consisted of three axes, the first: personal data, contain two main parts consisting of 13 phrases distributed as follows:  
The second axis is the mathematics curriculum applied in kindergarten (8 phrases), and the third axis is mathematical operations (5 phrases).

In calculating the validity of the questionnaire, the researchers relied on the following:

#### 1. The validity of the internal consistency of the Items:

The researchers verified the consistency of the questionnaire internally, by calculating the correlation coefficients between the degree of each item of the questionnaire and the degree of the axis under which the item falls as in Table (2) and Table (3), and also calculating the correlation coefficients between each axis and the total score of the questionnaire (Table 4), This is after applying the questionnaire in its initial form (31 items) to the exploratory study sample consisting of (31) educational practitioners.

Axis I (the nature of the mathematics curriculum applied in kindergarten)							
(N)	correlation coefficient	(N)	correlation coefficient	(N)	correlation coefficient	(N)	correlation coefficient
1	0.764	2	0.653	3	0.504	4	0.598
5	0.487	6	0.545	7	0.551	8	0.512

Table 2: Correlation coefficients between the score of each item and the score of the first axis (n = 31)

Axis II (NCTM Mathematical Operations)							
(N)	correlation coefficient	(N)	correlation coefficient	(N)	correlation coefficient	(N)	correlation coefficient
9	0.804	10	0.848	11	0.849	12	0.902
13	0.862						

Table 3 Correlation coefficients between the degree of each item and the degree of the second axis (n = 31)

#### Table 4 Correlation coefficients between the score of each axis and the total score of the questionnaire (n = 31)

\* Statistically significant at 0.01

#### B. Discriminatory Validity:

The total scores of the survey sample members who were subjected to the application of the questionnaire were calculated, which numbered 31 educational practitioners. After that, the total scores of the survey sample members were arranged in descending order, and those who obtained the highest 25% of the total score were determined, and the individuals who obtained these degrees were considered The highest category, while the individuals who obtained the lowest 25% of the scores were considered members of the lower category. Then, the Mann-Whitney test for independent samples was applied to examine the differences

between the average ranks of the two groups on the total score as an indicator of the degree to which the discriminatory validity of the questionnaire was achieved, as shown in Table (5).

	N	Ranks average	Ranks total	"Z" value	Statical Significance
Upper category	8	11.50	92.00	-3.246	Statically significant at 0.001.
Lower category	7	4.00	28.00		

Table 5 (Mann Whitney) test for the average ranks of the upper and lower categories of educational practitioners for the exploratory sample on the total score of the questionnaire.

It is clear from the previous table that the value of ( $Z = -3.246$ ) is statically significant at 0.001, which indicates that there is a difference between the average ranks of the upper and lower groups on the total score of the questionnaire in favor of the higher category. this indicates the verification of the discriminatory validity of the questionnaire.

## 2.Stability:

In calculating stability, the researchers relied on the following:

### A. Split-half Method:

The researchers applied the questionnaire to the exploratory sample, and the correlation coefficient between the two halves of the questionnaire was calculated, and the Spearman-Brown equation was used to correct the impact of split-half, as shown in the following table (6):

The Questionnaire and its Axes	stability coefficient
the mathematics curriculum applied in kindergarten	0.851
Mathematical Operations	0.960
The Questionnaire	0.883

**Table 6 The stability coefficients of the questionnaire and its axes by the split-half method**

\* Statistically significant at 0.01

### B. Alpha Cronbach Method:

The researchers used the Alpha Cronbach Method, which is an equation used to clarify the general logic of the test reliability, and Table (7) shows the stability coefficients of the questionnaire and its axis:

The Questionnaire and its Axes	stability coefficient
the mathematics curriculum applied in kindergarten	0.774
Mathematical Operations	0.845
The Questionnaire	0.811

**Table 7 The stability coefficients of the questionnaire and its axes by Alpha Cronbach Method**

## FINDINGS and DISCUSSION:

**First: The extent to which the Operational Standards of the National Council of Mathematics Teachers are applied in kindergartens in the Kingdom of Saudi Arabia:**

Phrases	very much	good	moderate	little	Very Little	I don't Know	relative weight	Response
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	T	%	T	%	T	%	T	%	T	%	T	%		
Communi-cation	28	20.0%	80	57.1%	-	-	21	15.0%	5	3.6%	6	4.3%	3.62	Very M
problem-solving	27	19.3%	77	55.0%	-	-	28	20.0%	2	1.4%	6	4.3%	3.58	Very M
logical thinking	20	14.3%	62	44.3%	-	-	40	28.6%	7	5.0%	11	7.9%	3.11	Very M
Repres-entation	37	26.4%	74	52.9%	-	-	18	12.9%	6	4.3%	5	3.6%	3.74	Very M
mathematical correlations	41	29.3%	79	56.4%	-	-	14	10.0% <sup>2</sup>	6	43%	-	-	3.96	Very M

To answer the first question of the research questions, the researchers monitored the responses of the study sample about the extent to which the five mathematical operations recommended by the National Council of Teachers of Mathematics (NCTM) are applied: communication, problem-solving, logical thinking, representation, mathematical correlations, and then calculating the relative weight, as explained by the following table:

Table 8; The responses of the study sample about the extent to which the five mathematical operations recommended by the National Council of Teachers of Mathematics are applied, and the relative weight (n = 140)

It is clear from Table No. (8) that there is great agreement among educational practitioners to apply the standards of the National Council for Teachers of Mathematics in the Kingdom of Saudi Arabia. The mathematical correlation criterion ranked first with relative weight (96,3), followed by the mathematical representation with relative weight (74, 3) And in the third place comes the standard of mathematical communication with relative weight (62.3), and in the last comes problem-solving with relative weight (58,3). In general, the percentage of approval for the application of the standards of operations in kindergartens, which are the processes of Correlations, representation, communication, and problem-solving occurred within the large limit, but the logical thinking criterion came within the average limit with a relative weight of (3.11). This ratio is considered insufficient as it is important for building mathematical concepts because it focuses on the child's ability to use his accumulated mathematical skills to face challenges, predict and examine hypotheses to reach Problems solutions. This is an important foundation in learning mathematics.

These results can be explained in light of the following:

1. The Mathematical Correlations Standard: It came in the first place with a relative weight of (96,3) which is a fairly high percentage. The reason for this result is that the activities provided in kindergartens to teach mathematics focus on developing the child's ability to link the concept in equal representative ways and to form clear connections between mathematical knowledge and its applications in daily life, such as the use of drama, children's literature, and various arts in learning mathematics topics. That totally agrees with Erdoğan & Baran (2009); Mink & Fraser (2005) who indicate the importance of using drama in developing mathematical concepts in the early grades. Also, it became clear from the results that the teachers used reading stories about numbers and geometric drawings and linking them with the child's reality. Mathematics education in kindergartens includes the application of the mathematical subject in children's real-life situations, too as; designing furniture carpentry for geometric shapes, calculating the unit price of food for numbers..., and this is what was confirmed by many researchers that the correlations in their nature emphasize what is called Realistic Mathematics and this was confirmed by Hasbi et al., (2020) and Al-Sawa'i. (2004) that the learning of mathematics takes place in cultural and social contexts and not in a separate form. The criterion of correlation represents a qualitative shift in looking at the nature of school mathematics from just scattered and isolated pieces of knowledge to a tightly coherent and coordinated whole, emphasizing the need to link it closely with other topics and the real world.
2. The Mathematical Representation Standard: It came in second place with a relative weight of (74,3) which is somewhat high. The reason for this result is that the activities provided in kindergartens for teaching mathematics focus on developing the child's ability to build diverse representations of mathematical concepts. Since The source of the mathematical representations for the kindergarten, the child is the surrounding reality, and this was evident in the activities presented in the kindergarten through the various sensory models of geometric shapes and numbers through the mathematics corner. It also provided representations in pictures, language, form, or image Which helps the child to convert one concept from one image to another, and this, in turn, helps him to understand because representing the concept with a realistic example from the environment, then through pictures, shapes and language helps the child to master the concept, and this was explained by Tirosh, et al., (2018) who show the importance of using representation with pictures and drawings. One of the advantages of this

representation is that it helps the student in Memorizing the data, the ease of studying it, and the ease of discovering the relationships between the variables through it, as well as enabling the student to discover his mistakes.

3. The Mathematical Communication Standard: It came in third place with a relative weight of (3.62) which is a rather high percentage. The reason for this result is that the activities provided in kindergartens for teaching mathematics focus on developing the child's ability to express mathematical ideas by speaking, writing, display, visual representation, understanding, and clarifying mathematical ideas presented in written, verbal or visual forms, using vocabulary, terms and mathematical structures to present ideas, describe relationships and model situations, and this is the essence of mathematical communication as pointed out by Cai, et al., 1996; Badawi (2003). The researchers also noticed that kindergarten teachers focus on the sub-skills of mathematical communication to a large extent, which is represented in the skill of representation, where the teacher gives skills that help translate the mathematical idea into another form through illustrative and sensory models, pictures, and mathematical words. Moreover, there was a clear focus on the skills of speaking and writing by helping the child use some vocabulary, terms, and structures to express ideas orally, written, or pictured. In addition to having a clear focus on the skills of reading and listening by giving the child the opportunity to express in a healthy mathematical way the audible ideas such as songs and sports stories presented by teachers or Visuals such as pictures, models, and sensory models. These skills became more clear through the reading, writing, and mathematics corner, where activities are provided for reading some numbers and simple shapes and writing some letters, numbers, and shapes, and it provides white paper for writing, various pens, a small board for writing with pens, pictures, and various shapes.
4. Mathematical Problem-Solving Criterion: It came in fourth place with a relative weight of (58,3) which is a fairly high percentage. The reason for this result is that the activities offered in kindergartens for teaching mathematics focus on developing children's ability and skills to solve mathematical problems, as The manifestations of this are the teacher's identification of the problem clearly and in accurate language, using the same language as the child, in formulating realistic problems, giving the teachers a greater opportunity to propose several diverse solutions, raising the child's enthusiasm and encouraging him to try to solve problems and encouraging him to interact and communicate with others to solve problems. Also, From the skills that the teachers focused on is encouraging the child to speak out loud in order to follow the steps of the solution. The teachers also provided the means and tools to help the child reach the best solutions. The teachers also used some strategies such as brainstorming, cooperative learning, games, and computer programs to train children to solve problems in mathematics education because of these strategies Effectiveness in developing the ability to solve mathematical problems (Gur & Kocak, 2018; Bildiren, & Kargin, 2019; Bahar & Aksut, 2020).
5. The logical thinking criterion: It appeared in a medium percentage, where it achieved a percentage of (3.11), and the reason for the emergence of this result may be due to the teachers not using the activities of (justification, stating the reasons for obtaining the result and the reasonableness of the answer) because they believe that teaching logical operations took a long time. Also, some people believe that logical thinking begins at the age of eleven and there is no point to develop it before this age. This trend is adopted by the Swiss scientist Jean Piaget. The truth requires using this field to encourage the student to think about mathematics, and then understand it. This claim may lead to the fact that mathematics education does not include the principle of generalization at this grade. This contradicts what Mackey et al. (2011), Klauer et al., (2002) indicated that early training in logical thinking processes—the quality and Kind of this training, in turn, leads to the quality of children's performance in the following stages where the ability to think logically can be developed in children in the kindergarten stage and that if it is not done Exploiting the early childhood stage correctly in the later stages of education will remain confused and it will be difficult to avoid its shortage in the future.

#### **The results of the second question:**

Are there statistically significant differences for the application of the standards of mathematical operations according to (geographical area/type of kindergarten/profession / academic qualification/years of experience)? To verify the significance of the differences between the sample scores on the mathematics standards questionnaire according to (geographical area, type of kindergarten, profession, teacher's academic qualification, years of experience), the researchers calculated the significance of the differences Using the analysis of variance "P (the percentage) as shown in Table No. ()

Variables	sum of squares	degree of freedom	Square of Averages	Percentage (P)	Indication level
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Geographical area.	Between groups	100.970	2	33.657	1.349	0.261 Not statistically significant
	Within groups	3392.023	136	24.941		
	total	3492.993	139			
Kindergarten type.	Between groups	28.180	2	14.090	0.557	0.574 Not statistically significant
	Within groups	3464.813	137	25.291		
	Total	3492.993	139			
Profession	Between groups	67.016	3	22.339	0.887	0.450 Not statistically significant
	Within groups	3425.977	136	25.191		
	Total	3492.993	139			
Qualification	Between groups	83.047	5	16.609	0.653	0.660 Not statistically significant
	Within groups	3409.946	134	25.447		
	Total	3492.993	139			
Years of Experience.	Between groups	25.455	3	8.485	0.333	0.802 Not statistically significant
	Within groups	9467.538	136	25.497		
	total	3492.993	139			

**Table 9**

It is clear from the earlier table:

- There are no significant differences between the sample members on the identification of the criteria of mathematical operations according to the geographical region (Eastern / Middle / Western), where the value of ( $P = 1.349$ ) is not statistically significant. That indicates the agreement of educational practitioners on the interest of educational policy in the Kingdom of Saudi Arabia. Saudi Arabia is implementing NCTM standards in all regions of the Kingdom of Saudi Arabia, and this was evident in the Kingdom's vision, which aimed at "that every child – wherever he is – has access to quality education opportunities according to various options, and the greatest focus will be on the early stages of education."
- There are no significant differences between the sample members on the identification of the standards of mathematical operations according to the type of kindergarten (governmental/private/international). The value of ( $P = 0.557$ ) is not statically significant, which also indicates the agreement of educational practitioners on the interest of all government kindergartens. The eligibility and universality in the Kingdom of Saudi Arabia by applying the standards of the National Council of Teachers of Mathematics in America NCTM during the teaching of the mathematics curriculum, and this contradicts the study of Shim & Herwig (1997), which confirmed that the kindergarten teacher in public schools is more prepared and better than the rest of the teachers and that the kindergarten teacher in schools In general, their practices and performance were higher than the rest of the teachers.
- There are no significant differences between the sample members on the identification of the standards of mathematical operations according to the profession (assistant teacher, main teacher, supervisor, director), where the value of ( $P = 0.788$ ) is not statically significant, which indicates the agreement of all educational practitioners to apply the standards of The American National Council NCTM in kindergartens in the Kingdom of Saudi Arabia, and this indicates an increase in awareness among educational practitioners in terms of sharing their experiences in the practical application of the standards of the National Council and their professional knowledge. This result is consistent with the findings of Byson (2004) concerning the presence of a high level in the performance of educators in kindergartens in the practical application of occupational standards in India.
- There are no significant differences between the sample members on the identification of the standards of mathematical operations according to the academic qualification (diploma, bachelor's / master's / educational diploma), where the value of ( $P = 0.356$ ) is not statically significant, which indicates the agreement of all educational practitioners to apply the standards of The American National Council NCTM in kindergartens in the Kingdom of Saudi Arabia is not affected by the academic qualification of the teacher. This may be a result of Workshops and pieces of training for kindergarten teachers on how to implement NCTM standards.
- There were no significant differences between the sample members on the identification of the standards of mathematical operations according to the years of experience in the field of kindergarten, where the value of ( $P = 0.333$ ) was not statically significant and this indicates the agreement of all



educational practitioners to apply the standards of the American National Council NCTM in kindergartens in the Kingdom of Saudi Arabia is not affected by the teacher's years of experience, and this result differs with the study of Soulis (2009), which found that educational practitioners with 10 years and more experience were more effective than others in kindergarten, also differed with the study of Lee (2017), which confirmed kindergarten teachers The more experienced have more knowledge of the pedagogical content taught in mathematics.

### RECOMMENDATIONS:

Through this research study and in light of the results, they also recommend the following

- 1- Making a guide for kindergarten teachers that helps them to employ and mathematical concepts and activities within the daily routine as a way of thinking.
- 2- Establishing an integrated mathematical program based on the five standards mentioned in the developmental learning standards for the Saudi child, and the child mental processes standards (NCTM).
- 3- Ensure that early childhood teacher education programs include accurate formulation and are based on the latest international standards in mathematics education for young children (content, processes to be used)
- 4- Reconsidering the mathematical curricula currently used in self-learning curricula according to Saudi and international development standards While preparing curricula.
- 5- Conducting intensive training programs for female teachers in providing the five Mathematical ways stipulated in the early and global developmental learning standards.

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