Journal of Statistics Applications & Probability
An International Journal

http://dx.doi.org/10.18576/jsap/130132

Early Childhood Mathematics Curriculum in the light of the standards of the National Council of Mathematics Teachers

Rania H. Elwan[1,], Ibtesam A. Y. Hussain[1], Hanan A. A. Ebrahim[2], Norhan A, H. H. Nounou[1], Sabrin A. Labib[1], Raghad F. A. Alqahtani[1] and Sarah M. Altamimi[1]*

[1]Department of Early Childhood, College of Education, Imam Abdulrahman Bin Faisal University, Dammam, Saudi Arabia
[2]Department of Psychological Sciences, College of Education Early Childhood, Cairo University, Cairo, Egypt

Received: 1 Oct. 2022, Revised: 27 Dec. 2022, Accepted: 4 Jun. 2023
Published online: 1 Jan. 2024

Abstract: This study aims at exploring the preschool mathematics curriculum in light of the National Council of Teachers of Mathematics Standards. The study researched a sample of (140) preschool educators. An analysis of the mathematical content of preschool Self-Learning curriculum was conducted, and Saudi preschool educators were surveyed, in terms of their educational practices, and the processes used in teaching mathematics in their classes In accordance with the U.S. national standards for mathematicians, it means the methods in which children interact with sports content or content, namely (problem solving- communication- logical thinking - representation - Connection), where the study showed that the reality of the components of the mathematics curriculum applied in kindergartens within Saudi Arabia achieved these standards at these levels was The application of representation, communication and connectivity are the most achieved in the self-learning curriculum units with ratios of (86.4%, 83%, 82%), respectively, while problem-solving and logical thinking have reached the minimum use in the classroom, indicating that these processes are the least interested in application from the sample point of view, with 80%, respectively, using them (80%, 67.80%), despite the critical importance of these two processes specifically in building mathematical concepts as they focus on the ability of the child to be focused on the ability of the child. To use his accumulated sports skills to meet challenges such as predicting and examining hypotheses in order to find a scientific solution to the sports situation.

Keywords: curriculum-mathematics-preschool-Mathematics-Standards

1 Introduction

Early childhood learning has a major impact on school success and working life in adulthood[1-2]. Therefore, early childhood care and attention is a priority for the advancement of communities. Mathematics processes are the basis for children to learn a lot of science, knowledge and other skills.

Timms 2019 report showed that five Asian countries (Singapore, Hong Kong, Korea, Chinese Taipei and Japan) achieved the highest scores in fourth-grade mathematics, while (Philippines, Pakistan, South Africa, Kuwait and Morocco) scored the lowest and Saudi Arabia ranked 53rd out of 58 participating countries. One of the most prominent revealed in the report is that many students in the Kingdom lack basic knowledge in mathematics where the results of students are low compared to international performance and did not rise to the level hoped for, indicating the low quality of education, the lack of basic knowledge of mathematics and their inability to continue education and participate successfully in societies dominated by the economics of knowledge and techniques [3] lack of basic knowledge of mathematics at an early stage of Education may adversely affect children's acquisition of sports skills in later stages. Hence the interest of Saudi Arabia and even the international educational community in developing the curriculum and developing mechanisms and tests to measure and track development processes to ensure the quality of learning outcomes in general, and in mathematics in particular such as official and informal interviews. This has been demonstrated by numerous studies such as Watts and Duncan (2015), Duncan et al. Dowsett, Claessens, Magnuson, Huston, Klebanov, & Sexton, (2007), which documented that learning lower-level mathematics such as primary and first grade may put children on a high path of school achievement throughout their subsequent studies and long-term success in school. Mulligan J.,Anderson A., Baccaglini-Frank A.,Benz C., (2018). Seeing children entering early childhood learning environments as unable to learn mathematics can harm their subsequent educational opportunities if children are not created to experience mathematics, the development of their skills and understanding in mathematics may be limited and can affect their subsequent development, underscoring the need to review and diagnose kindergarten math curricula as a basis that may affect improving students' results in international tests in the

*Corresponding author e-mail: r.raniaelwan@gmail.com

fourth grade. [4-5-6]

Learning at Preschool in general depends primarily on the senses, as perceptual perception is an entry point for learning at that stage. Mathematics, by its abstract nature, is a challenge for children in Preschool, where children find themselves faced with chains of numbers and concepts that they cannot understand. Active learning and the use of multisensory portal through manual experiences involving vision, sound, smell, and touch have a profound impact on translating these mathematical abstractions into meaningful concrete facts. In addition to providing an interactive learning environment, that boosts children's positivity and participation in mathematics educational attitudes. As educators, we had to provide child-oriented curricula in a developmentally appropriate, effective manner, and ensure that all five basic mathematical processes adopted by the National Council of Teachers of Mathematics These processes are intended for the ways in which children interact with sports content or content and include: problem solving, logical thinking, connectivity, representation, and communication. [7].

To improve the results of our students in international mathematics tests in Saudi Arabia, it was necessary to diagnose the reality of mathematics education in Preschool. Hence, the current study aimed to identify the content of the mathematics curriculum provided by Saudi Preschool, and its effectiveness and conformity to the standards of mathematical processes according to the National Council of Teachers of Mathematics.

Theoretical and conceptual framework

Mathematics in self-learning curriculum in Saudi Arabia:

It is considered as a curriculum based on both teaching, self-learning of mathematics, and based on the activities of the children themselves to meet their needs in all areas of development, taking into account the individual differences between them and enhancing their positivity and motivation towards learning mathematical concepts.

Preschool stage in Saudi Arabia:

Is the stage that takes care of the child between the ages of 3 or 4 until the sixth or seventh in educational social institutions aimed at achieving the integrated and balanced development of children in all physical, mental, psychological and social aspects in addition to strengthening and developing their abilities through play and free activity.

National Council of Teachers of Mathematics (NCTM):

The standards of early learning in general are "a general description of what children should know and be able to do" [8]. Mathematics standards are the general framework set by the National Council of Teachers of Mathematics to ensure fair opportunities to learn mathematics and what math teachers must provide to their students with understanding, knowledge, skills that set common goals and a vision for the future, starting from Preschool to grade 12 [9]. These standards were based on general characteristics: caring for developmentally appropriate learning environments, ensuring that learning is appropriate for all children and their families, preparing teachers with high academic abilities, and formulating effective approaches to support problem-solving [10].

National standards for mathematics teachers include two categories of criteria: content standards, and process standards. The content criteria include five dimensions: 1) number and operations, 2) algebra, 3) geometry, 4) measurement, and 5) data analysis and probability. The criteria for operations include the activities or actions of individuals interested in finding answers to the mathematical concepts with which they live on a daily basis to reach conclusions and verify them, prompting further research and discovery.

With regard to the standards of mathematical processes, NCTM summarized them In five major operations, as I mentioned in Smith, 2013. [7].

1. Problem solving, in which the child uses the mathematical skills that have been formed and accumulated in daily life situations in which he lives and faces some challenges that lead him to think in many ways and methods that are compatible with his developmental characteristics at every age stage.
2. The evidence-backed logical thinking process aims to train the child to explain how he or she has used to solve the mathematical problem and his or her ability to use prediction, and to develop and examine hypotheses with a view to finding a solution.
3. Communication is a process that encourages children to participate in peer discussion and with the teacher about the mathematical concept and to share ideas with a view to understanding, understanding and crystallizing what is learned accurately and effectively using the most accurate vocabulary, allowing questions to be asked, reaching conclusions, and interpreting how they can reach a solution.
4. The binding process, which aims to help the child use previous mathematical discoveries in understanding new sports

attitudes or linking learning mathematics to learning lessons in fields other than mathematics.

5. The process of representation is embodied in the use of various manually felt tools for the visual expression and expression of the mathematical problem before the child arrives to understand it merely. This process includes using drawings, tables, words, drawings, numbers, equations as ways to express the problem The problem-solving process is used when the child uses the mathematical skills that have been formed and accumulated in everyday life situations where s/he faces some challenges that lead him/her to think in ways and methods that fit his/her developmental characteristics at every age stage.

The reasoning and proof process aims at training the child to explain how s/he has used mathematical problems and his/her ability to use prediction, and to develop hypotheses and examine them with a view to finding a solution. Communication is a process that encourages children to engage in discussion with peers and teachers about the mathematical concept and share ideas in order to understand and develop what is learned accurately and effectively using the most accurate vocabulary, allow questions to be asked, draw conclusions, and explain how they come to the solution. The connection process, which aims at helping the child to use previous mathematical discoveries to understand new mathematical attitudes, or link math learning to other subject areas. The representation process is embodied in the use of a variety of kinesthetic tools for visual expression of the mathematical problem before the child arrives to understand it. This process includes the use of drawings, tables, words, numbers, and equations as ways to express the problem, as well as helping the teacher see what is happening inside the child's mind and how he/she thinks about the mathematical problem concretely. [11]

In view of previous studies, Studies have indicated the space available for the study of the analysis of mathematics methods to improve their quality in the Arab world is significant due to the lack of the research field in this area. Although, most studies agree that learning mathematics at the lower levels such as preliminary and first grade primary may put children on a high path in school achievement throughout their subsequent study as in Duncan et al (2007) which yielded a set of results, as the evidence in the field of cognitive ability indicates a strong link between the level of achievement in mathematics in the early and subsequent grades repeatedly in longitudinal studies. [5]. Dearing, McCarthy & Taylor (2009) selected a sample of (1,364) children who received high-quality care within (6-54) months to study the impact of this care on their math and reading achievement scores at age (4.5-11). They found that high-quality care increases the rate of academic achievement indirectly as school preparation skills are learned[12]. Jordan et al., (2009) found that the change in the numerical abilities of children tracked several times in Preschool and first grade primary was a predictive factor in the child's mathematical abilities in the third grade of primary school. [13]

Al-Sheikhi, (2016) recommended that the Ministry of Education takes the necessary measures to increase the number of government and private Preschool in the Kingdom, provide sensory science and pay attention to prepare math teachers to be more distinctive. She also stressed the need to pay attention to appropriate teaching strategies, particularly when teaching first-grade students who had not had the opportunity to attend Preschool in advance. [14]

Some studies such as Sobha, (2011) have confirmed that the Self-Learning Curriculum still lacks some skills that help children progress their development, lack of books to conform to international standards and almost the absence of some dimensions of creative thinking from the curriculum. [15]

Jackson & Leffingwell study, (1999); Al-Jabri, (2018); agreed on the extent to which teachers need many training programs based on mathematics operations and effective strategies developmentally appropriate for children and that the teacher's ability to teach mathematics may affect the orientation of her students towards her learning. In addition, it is necessary to provide specialized workers with many professional development activities that may be considered a strong indicator of better interaction between teachers and children. [16-17]

The current study of the field of child mathematics education will therefore add to the curriculum improvement provided in terms of ensuring that they observe the global standards of content and mathematical processes on which it is based in the process of preparing international tests for mathematics (TIMMS).

Statement of the problem and question of research

Mathematical concepts are of an abstract nature. Children in early childhood may therefore find it difficult to understand them or form a misconception of these concepts. This may be due to poor curricula and methods of education that are not applied properly to the development of the age group. Since the National Council of Teachers of Mathematics has developed a set of adopted criteria that determine the understanding, knowledge and skills that children should acquire in Preschool, the current study has sought to diagnose the reality of the mathematics curriculum introduced within Preschool in Saudi Arabia to ascertain the extent to which the mathematical standards set by the National Council of Teachers of Mathematics are adhered to.

From this point of view, the researchers adopt the hypothesis that the diagnosis and identification of strengths and weaknesses

in the mathematics curriculum in Preschool will provide specialists with a general framework to help them develop the content of a mathematics curriculum that establishes children to master mathematical skills at an early age. Therefore, we may see its results on their future assumptions in international tests.

The current study problem aims at answering the following three questions:

1. To what extent is the content of the units included in the mathematics Self-Learning Curriculum in accordance with the content standards of the National Council of Teachers of Mathematics (NCTM)?
2. What are the components of the mathematics curriculum provided by Preschool within Saudi Arabia?
3. How long is the time devoted for teaching the child mathematics operations in the classroom during his/her day in Preschool?

Methodology

Research Sample

The sample of the study includes:

1. Documents: The documents included a careful review of all self-learning units approved by the Ministry of Education in (2005-2006) and their number (ten units).
2. Sample: The sample included (140) educational works in the field of Preschool in several areas of the kingdom selected in a random manner activities in the field of Preschool in several different regions of the Kingdom. The sample varies by geographic region, Preschool type, occupation, academic qualification, and years of experience. Table (1) shows accurate description of the sample.

Table 1: Study sample details

Axes	Details	(N)	Percentage
Geographical Area	Eastern Region	60	42,8
	Central Region	31	22.,1
	Western Region	13	9,2
	Other Regions	36	25,7
Preschool Type	Governmental	65	46.5
	Private	60	42.8
	International	5	3.5
	Guest centers	10	7.1
Profession	Assistant Teacher	6	4.2
	Teacher	70	50
	Resident Supervisor	9	6.4
	Non-Resident Supervisor	3	2.4
	Director/Leader	40	28.5
	Others	12	8.5
Academic Qualification	Secondary School	8	5.7
	High-secondary Diploma	20	14.2
	Non-Pedagogical Bachelor's Degree	13	9.2
	Bachelor of Education (non-Preschool)	24	17.1
	Bachelor of Preschool	62	44.2
	Diploma after Bachelor's Degree	3	2.1
	Master	8	5.7
	Other	2	1.4
Axes	Details	(N)	Percentage
Years of Experience	2-1years of experience	37	26.4
	3-5 years of experience	24	17.1
	6-10 years of experience	40	28.5
	More than 10 years of experience	39	27.8

Methodology of the Research

This study has been designed based on the descriptive method to study its variables, in addition to administering research

tools. that describes the phenomenon, collecting the facts and data and observations determining the theoretical framework. [18].

Measurement Tools

The researchers relied on a set of research tools as follows:

1- Analysis form of the content of the Self-Learning Curriculum for mathematics in the Kingdom (prepared by the researchers). The tool was presented to specialists in mathematics and early childhood to ensure the validity of the content and was modified.

2- The survey of educational practices on the processes and content of the mathematics curriculum in Preschool in Saudi Arabia (prepared by the researchers) included (19) items divided into three axes such as "Personal Data (6 Items), the mathematics curriculum applied in Preschool (8 items), and mathematical processes (5 items)."

The Validity and Reliability of the Tools

The Characteristics of the Questionnaire:

First: Validity

The researchers relied on the following:

Validity and the Internal Consistency of Items

The researchers verified the internal validity of the questionnaire by calculating the correlation coefficients between the degree of each item within the questionnaire and the axis in table (2) and table (3), as well as the correlation coefficients between each axis and the total score of the questionnaire in table (4). The questionnaire was applied after in its initial form (31 items) to the pilot study.

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

The first axis (the mathematics curriculum applied to my Preschool)							
No.	Correlation	**No.**	Correlation	**No.**	Correlation	**No.**	Correlation
1	**764,**0**	**2**	**653,**0**	**3**	**504,**0**	**4**	**598,**0**
5	**487,**0**	**6**	**545*0**	**7**	**551,**0**	**8**	**512,**0**

Table 3: Correlation coefficients between each item score and the second axis degree (N = 31)

The second axis (mathematical processes**)**							
No.	Correlation	**No.**	Correlation	**No.**	Correlation	**No.**	Correlation
9	**804,**0**	**10**	**849,**0**	**11**	**849,**0**	**12**	**902,**0**
13	**862,**0**						

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

Correlation	Axis of the questionnaire
654,0**	**mathematics curriculum applied to my Preschool**
772,0**	mathematical processes

Discriminatory Validity:

The researchers used the Mann-Whitney U test for independent pairs to see the statistical differences between the higher and lower quadrants on the questionnaire, as illustrated by table number (5)

Table 5: The statistical differences between higher and lower quadrants

	No.	**Mean rank**	**Total ranks**	**Value "Z"**	**Sig.**
higher quadrants	**8**	**50,11**	**00,92**	-3.246	Significant at **001,0**
lower quadrants	**7**	**00,4**	**00,28**		

The previous table shows that the value of Z = -3.246 is significant at 0.001, indicating differences between the high and low grades, which confirms the ability of the questionnaire to distinguish between highs and lows, indicating the validity of the questionnaire.

Reliability:

The researchers relied on the following:

Split half reliability method:

The researchers applied the questionnaire to the pilot study, calculated the correlation coefficient between the two halves of the questionnaire, and the use of the Spearman-Brown equation to measure the split half, as shown in table (6)

Table 6: Questionnaire reliability coefficients and axes in Split half reliability

Questionnaire and axes	reliability coefficients
mathematics curriculum applied to my Preschool	**851.**0**
mathematical processes	**960.**0**
Questionnaire	**883.**0**

Alpha Cronbach Method

The researchers used the Alpha **Cronbach** equation to clarify the general logic of test reliability. Table (7) shows the parameters and dimensions of the questionnaire reliability.

Table 7: Questionnaire reliability coefficients and axes in Alpha **Cronbach**

Questionnaire and axes	reliability coefficients
mathematics curriculum applied to my Preschool	**774.0**
mathematical processes	**845.0**
Questionnaire	**811.0**

Statistical Analysis:

A range of statistical methods used by the current study and reviewed as follows**:**

1. Calculating the validity of the internal consistency of items and extract the correlation coefficients between the score of each item and the degree of all axes, and between each axis and the overall degree of questionnaire.
2. Calculating discriminatory validity using Mann-Whitney U test for independent pairs.
3. Calculating the reliability factor by split half method and calculating the correlation coefficient between the two halves of the questionnaire using the Spearman-Brown equation.
4. Calculating reliability using the Alpha Cronbach Method to verify the reliability of the items used.
5. Frequencies and percentages :(Because of its appropriateness to answer questions associated with the analysis of the content of the Self-Learning Curriculum and the rest of the test questions).

Findings and Discussion

Answering the First Question

To what extent is the content of the units included in the mathematics Self-Learning Curriculum in accordance with the content standards of the National Council of Teachers of Mathematics (NCTM)?

To answer this question, the researchers prepared a content analysis form for mathematics objectives in the Self-Learning Curriculum and compared it to NCTM content criteria to calculate percentages for each of the five content criteria-percentages of the application of the five operations by NCTM in Saudi kindergartens

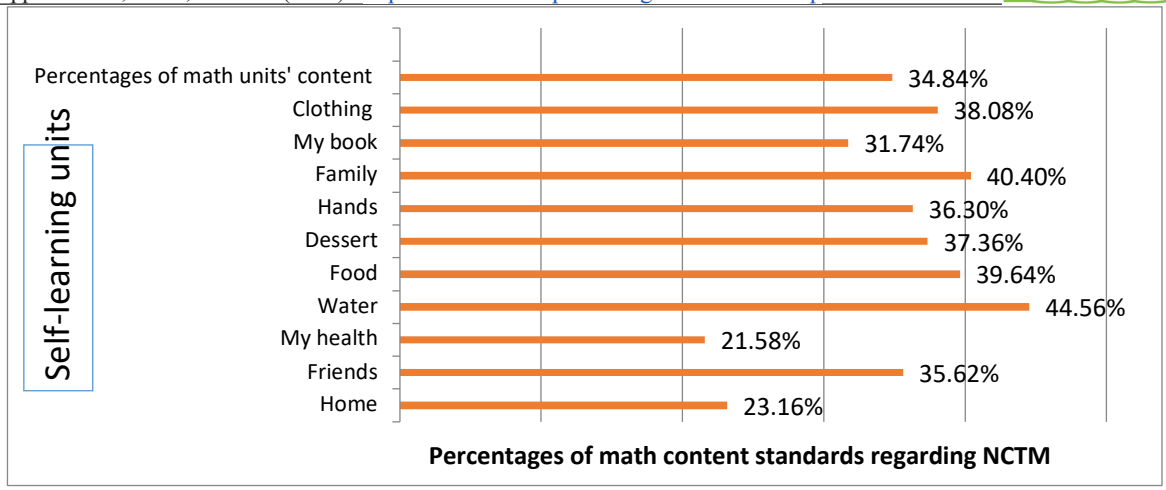

Fig. 1: Percentage of Content Standards in Mathematics Self-Learning Curriculum.

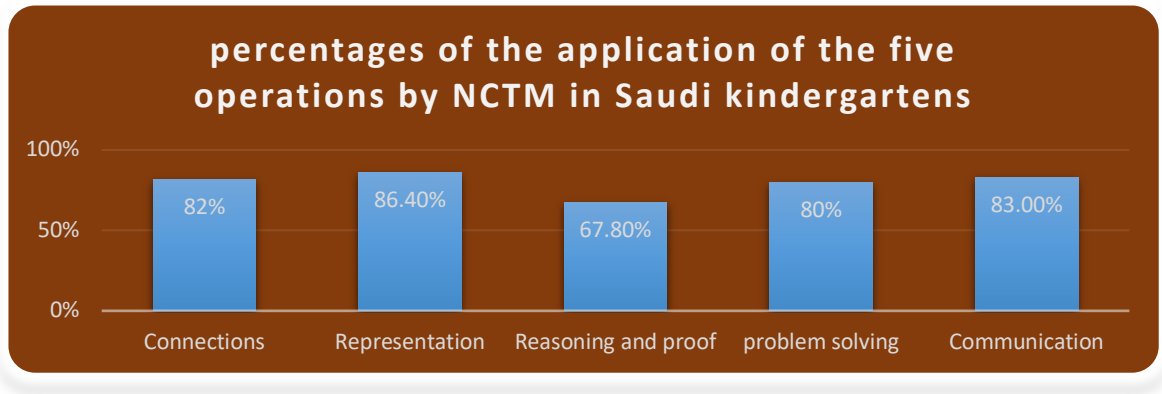

Fig. 2: **percentages of the application of the five operations by NCTM in Saudi kindergartens**

Figure (1) showed the percentages of math content standards for all educational units in the upgraded curriculum reflecting the percentage of all five mathematical standards by NCTM per unit of education individually, so the water, family, food, and clothing units came within the highest ratios among self-learning units in the application of NCTM standards, and ranged from Between (44.6%-38.1%), while my health and safety units, housing, and my book achieved the lowest ncTM rate, ranging from (31.7%-21.6%). This ratio is close to what pekince and Avci found (2016) that they conducted a qualitative analysis of 171 of the planning prepared by (20) teachers for preschool sports activities and researchers found that 78 of the total activities were associated with NCTM standard by about (46%).

Figure (2) shows that the application of representation, communication and connectivity processes are the most achieved in the units of the self-learning curriculum in proportions (86.4%, 83%, 82%), respectively, while the process of problem solving and logical thinking reached the minimum use in the classroom, which indicates that these processes are the least interested in application from the sample point of view, the proportion of those used respectively (80%, 67.80%) despite the critical importance of these two processes specifically in the construction of mathematical concepts. They focus on the child's ability to use his accumulated sports skills to meet challenges such as predictive and hypotheses in order to find a scientific solution to the sports situation.

Answering the Second Question

What are the components of the mathematics curriculum provided by Preschool within Saudi Arabia?

To answer the previous question, the researchers monitored the study sample responses to the mathematics curriculum applied to my Preschool, and then calculated the relative weight as illustrated by the following tables:

In terms of the content of the mathematics curriculum:

Table 8: Shows the study sample responses to the content of the model mathematics curriculum, and relative weight (N= 140)

All components		Most components		Some components		Least components		One component		Relative weight	Response
t	%	t	%	t	%	t	%	t	%		
27	19.3%	10	7.1%	24	17.1%	28	20.0%	51	36.4%	2.53	Some components

According to Saudi developmental standards and NCTM criteria, the mathematics curriculum consists of five parts (1) concepts of mathematical numbers and processes, (2) analysis of data, representation and graphs, (3) geometry and spatial sense, (4) measurement, and (5) patterns and mental skills. The relative weight in the table (8) indicates the use of the sample for some of the five components expected to include the mathematics curriculum, which is similar to the researchers' findings in the question of self-learning content analysis. This finding indicates that the content of the mathematics curriculum needs to be reviewed to include all the basic components of mathematics learning.

In terms of the means and strategies by which parts of the mathematics curriculum are presented:

Table 9: Shows the study sample responses to strategies through which parts of the mathematics curriculum are displayed, and relative weight (N = 140)

All Strategies		Most strategies		Some strategies		Least strategies		One strategy		Relative weight	Response
t	%	t	%	t	%	t	%	t	%		
76	54.3%	12	8.6%	16	11.4%	16	11.4%	20	14.3%	3.77	Most strategies

The literature of the approaches, means and methods of teaching mathematics is implemented in several ways, including (1) theoretical knowledge/teacher-oriented instruction, (2) paperwork and books, (3) 3D physical activities such as real figures and tools, (4) activities of daily life, and (5) 2D-concrete activities such as images and photo cards, and (6) self-learning in the pillars of learning. The relative weight in table (9) indicates the use of the sample for most of these strategies that are expected to be employed when teaching the content of the mathematics curriculum, which is a highly satisfactory result.

In terms of the extent to which 3D physical activities are used to learn mathematics.

Table 10: The study sample responses show how much 3D physical activity is used to learn mathematics, and relative weight (N= 140)

Always		Mostly		Sometimes		Rarely		Never		Relative weight	Response
t	%	t	%	t	%	t	%	t	%		
31	22.1%	67	47.9%	27	19.3%	8	5.7%	7	5.0%	2.76	Mostly

The relative weight in table (10) indicates the use of the sample for 3D physical activities most often, which is a very satisfactory result as it is in line with the structural theories of Piaget and Figotsky, which support the need to learn with real tools as they are the most suitable for learning this type of mathematical science concepts.

In terms of the stages of study (level in Preschool) to learn the mathematics curriculum:

Table 11: Shows the study sample responses to the study stages (Preschool level) to learn the math syllabus, and relative weight (N= 140)

Level one		Level two		Level three		All stages		Relative weight	Response
t	%	t	%	t	%	t	%		
7	5.0%	11	7.9%	39	20.9%	83	59.3%	3.41	Level three

Table (11) shows that mathematics curriculum is offered to third-level Preschool children, who are children aged 5-6 years.

In terms of the language in which the mathematics curriculum is taught:

Table 12: Shows the study sample responses about the language in which the mathematics curriculum is taught, and the relative weight (N = 140)

Arabic		English		Two languages		Relative weight	Response
t	%	t	%	t	%		
102	72.9%	2	1.4%	36	25.7%	1.53	Arabic

Table (12) shows that Arabic is the most common language in teaching the mathematics curriculum from the sample's point of view, making it easier to learn as it is taught in the mother tongue and therefore making it the closest to the language that most children in Saudi Arabia have mastered.

In terms of the extent to which the components of the math curriculum help the children of the class:

Table 13: the sample satisfaction with the components of the mathematics curriculum currently used in Preschool

Extremely		Very		Moderate		Little		Least		Relative weight	Response
t	%	t	%	t	%	t	%	t	%		
31	22.1%	54	38.6%	41	29.3%	8	5.7%	6	4.3%	3.69	Very

Table (13) reflects the sample satisfaction with the components of the mathematics curriculum currently used in Preschool as it helps their children to learn mathematical concepts significantly.

Answering the Third Question

How long is the time devoted for teaching the child mathematics operations in the classroom during his/her day in Preschool?

In terms of time used to learn the math syllabus, table No. (14) shows the study sample responses to the time used to learn the math syllabus, and relative weight (N = 140).

Table 14: The study sample responses to the time used to learn the math

Other		Half an hour		An hour		Relative weight	Response
t	%	t	%	t	%		
26	18.6%	96	68.6%	18	12.9%	1.94	Half an hour

The results in the table (14) indicated that approximately 70% of the sample members spend half an hour to learn and teach mathematics in Preschool, which is a developmentally appropriate period for this age group for mental activities requiring concentration. In terms of the number of times allocated to the presentation of mathematics curriculum activities, the results in the table (15) indicated that the relative weight of the number of times allocated weekly to mathematics education came at a rate of (3) times per week.

Table 15: Shows the study sample responses on the number of times allocated to the presentation of mathematics curriculum activities, and relative weight (N = 140)

One time		Two times		Three times		Four times		Five times		More than five times		Relative weight	Response
t	%	t	%	t	%	t	%	t	%	t	%		
21	15.0%	43	30.7%	33	23.6%	15	10.7%	24	17.1%	4	2.9%	2.93	Three times

These results were in support of foreign research that indicated that the lack of time devoted to mathematics education, La Paro (2009), as mentioned in (Piasta, Yeager Pelatti & Miller, 2014) [17]. which studied (240) Preschool and (730) pre-K classes, found that Preschool children spend (6%) of the time learning mathematics, which is half the time devoted to language learning. La Paro's study confirmed the limitations and complexity of the studies available regarding the time aspect of mathematics and science learning due to the overlap of teaching mathematical concepts with scientific and linguistic concepts.

Conclusion

This study revealed results in accordance with other studies such as the importance of reviewing the educational curriculum of mathematics in Preschool. In addition, the interest in teaching mathematics quality in the programs of preparing teachers so that the focus is on learning mathematical concepts in Preschool children in ways and strategies that are effective and developmentally appropriate.

Learning mathematics at lower levels such as primary and first grade may put children on a high path of school achievement throughout their subsequent studies. And that's what sarama and Clements' study indicated, as mentioned in Elia I., Mulligan J., Also, provide educational attitudes appropriate to development.

Where the Sarama and Clements study indicated as mentioned in Elia I., Mulligan J., Anderson A., Baccaglini-Frank A., Benz C. (2018)) that early childhood is more important in developing children's abilities and tendencies to learn higher-quality early childhood education is essential in any educational system and research in this area can have a strong educational and social impact. [19].

Recommendations

Through this research study and in the light of the results, researchers recommend the following:

1- Providing workshops to develop the skills of Preschool teachers in the design of mathematics activities in light of the developmental standards of the Saudi child, and the standards of mental processes for children (NCTM) This is recommended by the Leffingwell Study (1999, Al-Jabri (2018), on the need of female teachers for many training

programs to develop their skills.

2- Directing decision makers to review the mathematics curriculum of Preschool in line with the educational outputs of the Kingdom's Vision 2030.

3- Conducting follow-up studies that explore the relationship between improving the Preschool mathematics program and the results of students in international examinations.

4- Ensuring that early childhood teacher education programs are carefully built and based on the latest international standards in mathematics education for young children (content and processes to be used)

5- Paying attention to reviewing the activities of teaching mathematical concepts in the curriculum to include them in a balanced way (concepts of numbers and calculations - patterns, dwells and algebra - measurement - geometry and spatial sense - data and probability analysis) with emphasis to develop all five recommended mathematics processes regarding (NCTM), (problem solving).

Conflict of interest

The authors declare that there is no conflict regarding the publication of this paper.

References

[1] Goodman & Sianesi. Early education and children's outcomes: How long do the impacts last? *Fiscal Studies,* 26, 513-548. (2005).

[2] Melhuish, E. et al. Preschool influences on mathematics achievement. *Science*, 321, 1161-1162. (2008).

[3] Education and training evaluation authorityThames Report 2019. A first version. Kingdom of Saudi Arabia. (2020).

[4] Watts, Tyler W; Duncan, Greg J; Chen, Meichu; Claessens, Amy; Davis-Kean, Pamela E; Duckworth, Kathryn; Engel, Mimi; Siegler, Robert; Susperreguy, Maria. The role of mediators in the development of longitudinal mathematics achievement associations. *Child Development*, 86, 1892–1906. (2015). doi:10.1111/ cdev.12416.

[5] Duncan, G. J., Dowsett, C. J., Claessens, A., Magnuson, K., Huston, A. C., Klebanov, P., . . . & Sexton, H. School readiness and later achievement. *Developmental Psychology*, 43, 1428–1446. (2007). doi:10.1037/0012-1649.43.6.1428.

[6] Elia I., Mulligan J., Anderson A., Baccaglini-Frank A., Benz C. Early Childhood Mathematics Education: Reflections and Moving Forward. In: Elia I., Mulligan J., Anderson A., Baccaglini-Frank A., Benz C. (eds) Contemporary Research and Perspectives on Early Childhood Mathematics Education. ICME-13 Monographs. Springer, Cham.. (2018) https://doi.org/10.1007/978-3-319-73432-3_16

[7] Smith, Susan S. *Early childhood mathematics*. (5th Ed.). NY: Pearson, New York. (2013).

[8] Development Company for Educational Services. Early learning criteria for the age group (3-6) years. Development company for educational services. Riyadh. (1436 H- 2015).

[9] Coppel, C., & Predkamp, S. Developmentally appropriate practice in early childhood programs. (i3). Arab Education Office for the Gulf States. Riyadh (2011).

[10] Smith, Susan, S. Mathematics for early childhood. Translated by Al-Absi, M., and Hashim AHouse of Thought, . Amman: p. 18-22. (2014).

[11] Saskatchewan Online Curriculum. *Mathematical Processes.* Online resource: www.curriculum.gov.sk.ca. (2011).

[12] Dearing, E., McCarthy, K. & Taylor, B. A. Does higher quality early child care promote low-income children's math and reading achievement in middle childhood? *Child Development, 80*(5) 1329-1349. (2009).

[13] Jordan, N. C., Kaplan, D., Ramineni, C., & Locuniak, M. N. Early math matters: Preschool number competence and later mathematics outcomes. *Developmental Psychology*, 45, 850–867. (2009). doi:10.1037/a0014939.

[14] Al-Sheikhi, H., S. The relationship between the educational achievement in mathematics among first and fourth graders in Saudi Arabia and their enrolment or lack of Preschool. Scientific Journal.32 (2), p. 235-282. (2016).

[15] Sobha, K., T., M. Analysis of the content of the Preschool Self-Learning Curriculum and the extent to which it contains critical and creative thinking skills. Journal of the Association of Modern Education, 4 (11), p. 35-112. (2011).

[16] Jackson, C. D., & Leffingwell, R. J. The role of instructor in creating math anxiety in students from Preschool through

college. *Mathematics Teacher*, *92*(7), 583–586. (1999).

[17] Al-Jabri, N., Al-Shawarib, A., A. Educational practices in mathematics education and mathematics content are the most important from the point of view of Preschool teachers. Studies - Educational Sciences: University of Jordan - Deanship of Scientific Research, 45 (3), p. 119-135.(2018).

[18] Elwan , R. H, El Said, A S. E. M, Ebrahim. H. A. A, Nounou. N .A.H, Hassan. N. A.M, Abdelaty.S.A, Alshuridah .S. M. , Al-Baker, W. Y. Common online early childhood education Patterns during the Corona Pandemic. CENTRAL ASIA AND THE CAUCASUS .22(5), 1072–1096. (2021). https://doi.org/10.37178/ca-c.21.5.085

[19] Piasta, S. B., Yeager Pelatti, C.,& Miller, H. L. Mathematics and science learning opportunities in preschool classroom. *Early Education and Development, 25*(4), 445-468. (2014). doi.org/10.1080/10409289.2013.817753