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Content analysis of the developed Jordanian mathematics curriculum for the tenth grade according to the thinking levels based on Bloom's taxonomy

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Abstract

The educational system in Jordan has developed the curriculum, especially the mathematics curriculum, for all grades. Therefore, the study aimed to analyse the content of the developed mathematics curriculum for the tenth grade according to the levels of thinking based on Bloom's cognitive taxonomy. The study adopted content analysis as it is the appropriate method to achieve the aim of the study. The study relied on the mathematics curriculum teacher's guide to refer all cognitive objectives and classify them according to atonement levels based on Bloom's cognitive classification. The result showed as: 1) The developed mathematics curriculum for the tenth grade includes all levels of mathematical thinking to a varying extent. 2) The geometry standard in the mathematics curriculum developed for the tenth grade has the highest percentage of thinking levels according to Bloom's cognitive classification. 3) The developed mathematics curriculum for the tenth grade focuses on the level of applied thinking.

Keywords: *Content Analysis, Developed Curriculum, Tenth Grade, Thinking Levels, Bloom's Taxonomy*

INTRODUCTION

The National Center for Curriculum Development (NCCD) was established in Jordan in 2017 and is a national institution that is financially and administratively independent, in response to the recommendations of the National Strategy for Human Resources Development 2016-2025, with the aim of educational reform and developing curricula and textbooks for early childhood, basic and secondary education. Since 2019, the Center has worked on developing school curricula for all educational levels (first to twelfth grade) based on the Collins International Series (National Center for Curriculum Development, 2022).

NCCD, in cooperation with the Jordanian Ministry of Education, sought to modernize and develop the curricula, so that they would

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be useful in raising the cognitive level of students, and since mathematics is one of the most important academic subjects that develop students' thinking and problem-solving skills, it was keen to prepare mathematics curricula according to the best methods used internationally by... Jordanian experts. In order to achieve the three educational goals: cognitive, affective, and psychomotor, and taking into account the preparation of mathematics curricula to present the content in a smooth manner, and within interesting life contexts, which increases students' desire to learn, mathematics curricula for the basic stage contain project-based learning; Enhancing and enriching students' learning of the concepts and thinking skills contained in it (Ghunaimat, 2022).

mathematics is one of the tools that develop thinking and constitutes the most important building blocks of basic education. Because mathematics education has a function beyond teaching numbers and operations, gaining calculation skills that are an indispensable part of daily life, and provides important support such as thinking, making connections between events, making predictions, reasoning and solving problems. This way of thinking is called mathematical thinking (Yildirim, 2017). National Council of Teachers of Mathematics (NCTM) (2014) states, "Effective teaching of mathematics uses evidence of student thinking to assess progress toward mathematical understanding and to adjust instruction continually in ways that support and extend learning" (p. 53).

Mathematical thinking can be seen as a way of understanding mathematical problems based on the various sources collected to study a mathematical object (Mustafa, et al., 2019). The development of mathematical thinking and its processes is carried out through problem-solving activities. With the problem-solving activities, students' skills in using mathematical knowledge, generating and testing hypotheses, checking/proving the accuracy of the obtained result, producing different solutions, inductive/deductive thinking, abstraction, persuasion skills and critical thinking skills develop (Milli, 2009). The teacher plays an important role in supporting the development of students' mathematical thinking (Sapti, et al., 2019).

according to Purwanto (2019) students' thinking processes include three main components, namely: (1) thinking is an invisible cognitive activity, but can be inferred based on visible behaviours, (2) thinking is a process that involves some manipulation of knowledge in the cognitive system, and (3) thinking activities directed at solving problems. Crossland (2015) mentioned Thinking skills are becoming more important because the information explosion means less reliance on memorising facts and more on the ability to understand, analyse, apply, evaluate and create. The recent National Strategies for primary and secondary schools in England labelled the cognitive domain of Bloom's Taxonomy as a set of thinking skills. As a result, these have become a common feature of educational practice.

Bloom's taxonomy is regarded as the preferred tool used in education to formulate such cognitive learning objectives; Bloom's taxonomy involves action verbs based on six thinking levels staggered in ascending order (ElKelish & Ahmed 2022:173). These categories, starting from the bottom and most basic level of thinking, are (1): lower-order thinking: remember – recall basic facts and concepts; understand – explain concepts and ideas; apply – information gained in the first two categories is used in a new situation and (2) higher-order thinking: analyse – taking several ideas and drawing connections between them; evaluate – form own decision or stance; and create – own original work. Bloom's taxonomy ensures a more reliable assessment of students through the development of clear and level-appropriate learning objectives by educators (Bhakti 2010:1440).

The Taxonomy was originally developed by Benjamin Bloom in 1956 (Bloom et al., 1956) and went through a major revision in 2001 by Anderson et al. (2001). Bloom's taxonomy is a widely used hierarchy that aligns both curriculum and assessment goals as it describes learning objectives in terms of explicit and implicit cognitive skills and abilities (Das et al., 2021). Banujan et al (2203) mentioned the Revised Bloom's taxonomy is a well-known framework which comprises three learning domains: 1) the Cognitive domain: primarily concerned with intellectual abilities including critical thinking, problem solving, and knowledge building. 2) the Affective domain: concerned with leaners attitudes, values, interests, and appreciation, and 3) the Psychomotor domain: includes students' physical task-accomplishment, mobility, and skill-performance abilities.

Revised Bloom's Taxonomy has been applied to educational settings by teachers and educators who strive to help their learners develop thinking skills with "the idea to create a classification system that could be used to facilitate communication between examiners" (Sobral, 2021, p.149). Eljishi et al (2024) showed Bloom's taxonomy levels with action verbs for each level. Table (1) illustrated that.

Table 1. Bloom's taxonomy levels with action verbs (cognitive domain)

Levels	Categories	Action verbs
Remember		Find, cite, locate, recall, highlight, retrieve, search, define, describe, label, list, match, name, reproduce, state
Understand		Annotate, outline, compare, discuss, convert, explain, extend, generalize, exemplify (give an example), paraphrase, predict, summarize, translate, research, review, restate
Apply		Apply, articulate, calculate, choose, complete, execute, dramatize, practice, share, change, illustrate, operate, teach, examine, classify, compute, demonstrate, discover, manipulate, prepare, produce, relate, show, solve, use
Analyze	Higher-order thinking	Analyze, categorize, deduce, edit, investigate, reverse, select, separate, engineer, examine, establish, break down, conclude, diagram, deconstruct, differentiate, discriminate, distinguish, correlate,
Evaluate		Argue, assess, collaborate, critique, debate, evaluate, hypothesize, judge, moderate, recommend, reflect, test, verify, prioritize, rate, inspect, decide, measure. appraise, conclude, criticize, defend,

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		discriminates, justify, support
Create		Integrate, intervene, model, negotiate, plan, progress, rearrange, formulate, construct, reinforce, revise, structure, substitute, validate, assemble, develop, draft, invent, produce, propose, publish, repurpose, upload, write, synthesize, categorize, combine, compile, compose, create, devise, design, generate, organize, reconstruct, reorganize, rewrite, tell, identify

Ortiz-Garcia and Villarraga (2024) analysed cognitive and knowledge objectives of students from a private Colombian institution measured according to the revised Bloom's taxonomy once content integrated learning was implemented. Data were gathered through an interview with the learners' parents, observation, and video recordings. The results gave evidence that learners develop different processes simultaneously, classified by the mentioned taxonomy, this implementation with children allowed participants to develop cognitive processes with greater emphasis in levels apply and analyze, whereas level understand was developed as part of the process.

Ghunaimat's study (2024) showed that the degree of cognitive needs of mathematics teachers to teach the developed mathematics curriculum is high. These cognitive needs include knowledge of cognitive objectives, teaching strategies, and thinking skills necessary to teach the developed curricula. This indicates the need for mathematics teachers to provide the cognitive requirements to teach the developed curriculum effectively and efficiently.

Ghunaimat (2023) verified the degree to which the Jordanian mathematics curricula developed for the basic stage include the requirements of students with special needs (gifted, learning difficulties) from the point of view of mathematics teachers in the Bani Ubaid Directorate of Education in Irbid Governorate Jordan. The results showed that the degree to which the developed Jordanian mathematics curricula included the requirements for gifted students and students with learning difficulties were medium, and the highest of these requirements for gifted students was: "The mathematics curriculum develops new positive attitudes among students related to scientific and technological progress". The highest of requirements for students with learning difficulties was: "The mathematics curriculum requires mathematics teachers to provide immediate feedback".

Based on what was mentioned previously, and in response to the development of mathematics curricula in Jordan, the study attempts to analyze the content of the developed mathematics curriculum for the tenth grade based on the cognitive objectives according to the revised Bloom's taxonomy of levels of thinking, and to indicate the number of cognitive objectives and their percentage related to the levels of thinking contained in the developed curriculum for the tenth grade, and to clarify this in relation to For school mathematics content areas according to the NCTM classification.

Statement of the Problem

The National Curriculum Centre in Jordan, in coordination with the Ministry of Education, conducted the development of all school curricula, including mathematics. The development of the mathematics curriculum included all grades from first to twelfth grade during the years 2019-2022. Therefore, the researcher found an opportunity to conduct a study to reveal levels of thinking according to Bloom`s taxonomy, which is included in the 10th grade curriculum. Through the researcher's experience in teaching, he noticed that the developed mathematics curriculum for the tenth grade included a number of levels of thinking presented by the development team of the National Curriculum Centre. In addition to what previous literature indicated about the weak levels of thinking among students in mathematics, the study was therefore an attempt by the researcher to reveal the levels of thinking in the mathematics curriculum developed for the tenth grade by conducting a content analysis of all the cognitive objectives contained in the curriculum, and classifying them according to Bloom's taxonomy of thinking. At its levels (higher and lower). This study attempts to answer the main question: What are the thinking skills included in the cognitive objectives of the mathematics curriculum developed for the tenth grade in Jordan?

Significance of the study

The importance of the study comes from the fact that it relies on the modern scientific method approach in analysing the cognitive objectives in the Jordanian mathematics curriculum developed for the tenth grade. Through its results, the study will provide assistance to mathematics teachers in knowing the levels of thinking according to Bloom's taxonomy, which will help them in selecting effective teaching strategies and evaluation tools that suit the levels of Cognitive objectives. In addition, this study may help draw attention to a necessary issue, which is keeping up with the latest developments in the educational process that teaches thinking, and enriching future studies related to the developed curricula. The study provides feedback to curriculum designers and developers so that the evaluation and development process is carried out according to practical principles that take into account the components of the evaluation and development process, including inputs and outputs.

Study Delimitations:

The study was limited to the mathematics curriculum developed for the tenth grade in Jordan, approved in the 2023-2024 academic year. All cognitive objectives contained in the two parts of the curriculum were analysed according to Bloom's taxonomy. The study was also limited to the areas of school mathematics according to NCTM (2000), which are: number and operations, algebra, measurement, geometry, statistics and probability.

METHODOLOGY

Study Design

The researcher used the descriptive analytical method to suit the study objectives and procedures.

Validity and reliability of the study tool:

The researchers used the analysis of cognitive objectives according to Bloom's taxonomy for the mathematics curriculum developed for the tenth grade in Jordan, based on the mathematics teacher's guide approved by the Jordanian National Curriculum Center. Therefore, the study tool is the content analysis process. It was confirmed that the analysis process adhered to honesty and consistency through its presentation to A group of specialists in the academic field. In order for the validity condition to be met for the subject of content analysis, the tool must agree with the goal to be measured efficiently, and in order for the reliability condition to be

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met if it is reused, whether by content analysis tools, almost the same results must be given by the tool designer himself or by other researchers.

STUDY PROCEDURES

The researcher followed the following steps in implementing his study:

1. Using the teacher's guide for the developed mathematics curriculum for the tenth grade.
2. calculated the number of cognitive objectives included in the developed mathematics curriculum for the tenth grade.
3. calculated the number of cognitive objectives and their percentage based on school mathematics content standards according to the NCTM standard of Content: numbers and operations, algebra, measurement, geometry, statistics, and probability.
4. Classifying the Cognitive objectives and their levels according to Bloom's taxonomy of thinking levels for the first semester the second semester of the tenth-grade mathematics curriculum.
5. The researcher calculated the numbers and percentages for each level of thinking within each study unit, which amounted to 8 units, at a rate of 4 units in each part.
6. The researcher calculated the numbers and percentages for each level of thinking within the areas of school mathematics according to the NCTM content standard: numbers and operations, algebra, measurement, geometry, statistics, and probability.

RESULTS

The study began by counting the number of cognitive objectives included in all study units within the developed mathematics curriculum for the tenth grade, and clarifying the content of each unit according to the NCTM standards for school mathematics content. Table (2) shows the number of cognitive objectives included in the developed mathematics curriculum for the tenth grade.

Table (2):

The number of cognitive objectives included in the developed mathematics curriculum for the tenth grade.

Number	Units	NCTM standard of Content	Numbers of Objective	Percentage of Objective
1	Solve a system consisting of a linear equation and a quadratic equation.	Algebra	10	8.2%
2	Circle	Geometry	21	17.2%
3	Trigonometry	Geometry	13	10.6%
4	Triangle Applications	Geometry	19	15.6%
5	Functions	Algebra	19	15.6%
6	Derivatives	Algebra	11	9%
7	Vectors	Number and Operations	11	9%
8	Statistics and Probabilities	Statistics and Probabilities	18	14.8%
Total			122	100%

Table (2) shows that the number of cognitive objectives within the developed mathematics curriculum reached 122 objectives, distributed over 8 study units within the two parts of the curriculum. The circle unit included the highest number of cognitive objectives at a percentage of 17.2%, followed by the Triangle Applications and Trigonometry unit at a percentage of 15.6%, then Statistics and Probabilities unit at a percentage of 14.8%, at last Solve a system consisting of a linear equation and a quadratic equation unit at a percentage of 8.2%.

Based on the table (2), it was calculated the number and percentage of cognitive objectives in the developed mathematics curriculum for the tenth grade were calculated based on school mathematics content standards. Table (3) shows the number of cognitive objectives and their percentage based on school mathematics content standards.

Table (3)

The number of cognitive objectives and their percentage based on school mathematics content standards.

Number	NCTM standard of Content	Number of Objective	Percentage of Objective
1	Number and Operations	11	9.1%
2	Algebra	40	32.8%
3	Geometry		43.4%
4	Statistics and Probabilities		14.7%
Total		122	100%

Table (3) shows that the number of cognitive objectives within the developed mathematics curriculum reached 122 objectives, distributed over 4 NCTM standard of Content for school mathematics. The geometry standard included the highest number of cognitive objectives at a percentage of 43.4%, followed by the Algebra standard at a percentage of 32.8%, then Statistics and Probabilities standard at a percentage of 14.8%, at last Number and Operations standard at a percentage of 9.1%.

Analysis of the developed mathematics curriculum for the first semester of the Tenth grade, consisting of four subjects: Solve a system consisting of a linear equation and a quadratic equation., Circle, Trigonometry, and Triangle Applications. The total number of cognitive objectives in the first semester was 63 objectives. The table (4) shows the names of the units and lessons, the cognitive objectives and their levels according to Bloom's taxonomy of levels of thinking.

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Table (4)
Cognitive objectives and their levels according to Bloom's taxonomy of thinking levels for the first semester of the tenth-grade mathematics curriculum.

NUMBER	UNIT	LESSON	OBJECTIVE	LEVEL
1	Solve a system consisting of a linear equation and a quadratic equation.	Solve a system consisting of a linear equation and a quadratic equation.	Solve a system consisting of a linear and a quadratic equation.	Apply
			Determine the number of possible solutions for a system consisting of a linear equation and a quadratic equation.	Remember
			Modelling a real-life problem using a system consisting of a linear equation and a quadratic equation, then solving the system.	Understand
		Solve a system of two quadratic equations.	Solve a system of two quadratic equations.	Solve a system of two quadratic equations. Apply
			Find out the number of possible solutions for a system of two quadratic equations.	Remember
			Modelling a real-life problem using a system of two quadratic equations, then solving the system.	Analyze
		Simplifying exponential expressions.	Identify relative exponents and their characteristics.	Remember
			Writing exponential expressions in their simplest form.	Understand
		Solve the exponential equation	Solving exponential equations.	Apply
			Solving systems of exponential equations.	Apply
2	Circle	Chords, diameters, and tangents of a circle.	Identify the chord, diameter, tangent, and secant of a circle.	Remember
			Identify the relationships between chord, diameter, and tangent and the theories associated with them, and use them to find lengths and measurements of unknown angles.	Remember
			Proving the validity of relationships using the properties of strings, diagonals, and tangents.	Create
		Arcs and circular sectors.	Calculate the arc length of a circle.	Apply
			Calculate the area of a circular sector.	Apply
			Solve problems about arc length and area of a circular sector.	Apply
		Angles in a circle.	Identify the central angle, the inscribed angle, and the relationship between them.	Remember
			Define the relationship between the measures of common inscribed angles in the same arc.	Remember
			Identify the cyclic quadrilateral and its properties.	Remember
			Defining the tangent angle and its relationship to the inscribed angle in the same arc.	Remember
			Use these relationships to find the measurements of unknown angles in a circle	Apply

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		Circle equation.	Identify the standard form and the general form of the equation of a circle.	Remember
			Write the equation of a circle whose center and radius are known.	Understand
			Find the coordinates of the center and the length of the radius from the equation of the circle.	Apply
			Determine whether or not a given line forms a tangent to a circle whose equation is given.	Understand
			Find the length of the tangent segment from an exterior point to the tangent point on a circle whose equation is known.	Apply
3		Tangent circles.	Describe the positions of two circles in a plane.	Understand
			Calculate the length of the internal and external common tangent.	Apply
			Employing the relationship of the distance between the two centers, the lengths of the radii of two circles, and the length of the common tangent to find unknown lengths.	Apply
		Expansion: tangent circles.	Identify the positions of two circles drawn in the same plane.	Understand
			Exploring the relationship between the distance between the centers and the lengths of the two radii of two circles that are tangent from the inside or outside	Apply
3	Trigonometry	Trigonometric ratios.	Identify the standard position of an angle, the positive measure, and the negative measure of angles.	Remember
			Draw the angle within the unit circle.	Apply
			Determine the quadrant angles, and measure each.	Apply
			Calculating the basic trigonometric ratios for angles whose terminal side intersects the unit circle at a specified point.	Apply
			Using the identity $\sin 2x + \cos 2x = 1$ to find the remainder of the trigonometric ratios of an angle if one of these ratios is known, and the location of the angle's termination side.	Apply
		Trigonometric ratios of angles within one period.	Using the trigonometric ratios of special angles and the reference angle to calculate	Apply
			Use the calculator and the reference angle to calculate the trigonometric ratios of angles within one period.	Apply
			Use the inverse of the trigonometric ratio and the calculator to find the angles within one period if the trigonometric ratio is known.	Apply
			Employing triangular ratios of angles within one cycle in modelling life situations.	Apply
		Representing trigonometric functions.	Representing basic trigonometric functions whose domain is [° 360, 0°] graphically.	Apply
			Identify the properties of basic trigonometric functions through their graphical	Understand

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			representation.	
		Solve trigonometric equations.	Solving a trigonometric equation in which the basic trigonometric ratios include an initial solution (the set of solutions within one cycle).	Apply
			Using trigonometric equations in modelling life situations.	Create
4	Triangle Applications	Direction from the north.	Use the direction from north to determine direction.	Apply
			Finding the direction of a point from a given point.	Apply
			Find the opposite direction.	Apply
			Solve problems about the direction from north.	Understand
		Law of sines.	Deduction of the law of sines.	Create
			Solve a triangle if you know the lengths of two sides and the measure of an angle opposite one of them.	Apply
			Solve a triangle if you know the length of one side and the measures of two angles.	Apply
			Solve real-life problems using the law of sines.	Understand
		Law of cosines	Deduce the law of cosines.	Create
			Solve a triangle if you know the lengths of its two sides and the measure of the angle between them	Apply
			Solve a triangle for which the lengths of all sides are known.	Apply
			Solve real-life problems using the laws of sines and cosines.	Understand
		Use the sine of the angle to find the area of the triangle.	The lengths of two sides, and the measure of the angle between them.	Understand
			Find the area of a triangle known from: The lengths of its three sides.	Apply
			Find the area of a triangle known from: Side length and two angles.	Apply
			Find the area of a triangle known from: Two side lengths, and an angle opposite one of them.	Apply
		Solve three-dimensional problems.	Using trigonometric ratios and the Pythagorean theorem to find unknown lengths in three-dimensional problems.	Apply
			Calculate the angle between a line and a plane.	Understand
			Solve three-dimensional life problems.	Analyze

Table (4) shows the total number of cognitive objectives in the first semester was 63 objectives. Analysis of the developed mathematics curriculum for the second semester of the Tenth grade, consisting of four subjects: functions, derivatives, vectors, statistics, and probability. The total number of cognitive objectives in the second semester was 59 objectives. The table (5) shows the names of the units and lessons, the cognitive objectives and their levels according to Bloom's taxonomy of levels of thinking.

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Table (5)
Cognitive objectives and their levels according to Bloom's taxonomy of thinking levels for the second semester of the tenth-grade mathematics curriculum.

NUMBER	UNIT	LESSON	OBJECTIVE	LEVEL
5	Functions	Functions of polynomials.	Identify polynomial function, its degree, and coefficients.	Remember
			Represent the polynomial function graphically, and find its domain and range.	Apply
			Apply addition, subtraction, and multiplication to functions of polynomials.	Apply
			Solve real-life problems about functions of polynomials.	Analyze
		Division of polynomials and rational functions.	Finding the quotient of a polynomial by another polynomial.	Apply
			Identify relative functions, and find their domain and range.	Understand
			Representing rational functions graphically, and finding asymptotes.	Apply
			Solve real-life problems about division and rational functions.	Analyze
		Composition of Functions	Define the concept of compound functions, and the condition of combining two conjunctions.	Evaluate
			Calculating the value of the complex functions of a given number.	Apply
			Finding the functions rule for a compound whose two component bases are known.	Evaluate
			Solve real-life problems about constructing functions.	Analyze
		Inverse Functions.	Define inverse functions.	Remember
			Find the inverse functions of a one-to-one functions, and determine its domain and range.	Understand
			Solve real-life problems using inverse functions.	Analyze
		Sequences.	Writing the next term in a given sequence using the relationship between its terms.	Create
			Writing consecutive terms whose general term is known.	Apply
			Deriving the general limit rule for linear, quadratic, and cubic sequences.	Create
			Solve real-life problems about sequences.	Analyze
6	Derivatives	Estimating Slope.	Find the slope of a tangent graphed at a point on the coupling curve.	Apply
			Draw a tangent and estimate its slope at a point on the coupling curve.	Understand
			Writing the tangent equation.	Understand
			Estimating the instantaneous speed at a point on a distance-time curve.	Understand
		Differentiation.	Define the concept of the derivative of a polynomial.	Understand
			Finding the derivative of polynomials using laws.	Remember
			Finding the slope using the derivative.	Understand
			Finding the instantaneous velocity and instantaneous acceleration using the derivative.	Understand
		Maximum and	Identify critical points.	Remember

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		Minimum Values	Finding maximum and minimum values of polynomials.	Analyze
			Solve real-life problems about maximum and minimum values of polynomials.	Analyze
7	Vectors	Vectors in the Coordinate Plane	Identify the vector, write it in coordinate form, and represent it in the coordinate plane.	Remember
			Find the magnitude of the vector and determine its direction.	Remember
			Find the vector velocity.	Remember
		Adding and Subtracting Vectors	Distinguish between equal vectors, parallel vectors, and vector inverses, and express them With symbols.	Remember
			Solve problems about adding, subtracting, and multiplying vectors by real numbers, geometrically and algebraically.	Apply
			Identify the zero vector.	Remember
			Finding the resultant of two or more vectors geometrically and algebraically in mathematical and real-life situations.	Understand
		Scalar Product	Find the dot product of two vectors.	Evaluate
			Define the relationship between dot product and vector magnitude.	Understand
			Find the angle between two vectors.	Apply
			Calculating the amount of work produced by a force in moving an object a specific distance.	Apply
8	Statistics and Probabilities	Scatter Graphs	Identify the form of diffusion.	Understand
			Describe the relationship between two data sets represented by diffusion.	Understand
			Representing data of two variables manually and using technology tools.	Apply
			Drawing the best matching straight line in diffusion form, and finding its equation manually, using technology tools.	Understand
			Use the best fit to estimate the value of one variable if the value of the other variable is known in a variety of real-life situations.	Analyze
		Cumulative Frequency Graph	Drawing the cumulative frequency curve manually, using technology tools.	Evaluate
			Estimating the quartiles Q1, Q2, Q3, the interquartile range, and percentiles for frequency tables with categories, and interpreting the meaning of each of them within life situations.	Understand
			Finding the percentile rank of a value from distribution data.	Apply
		Measures of Variation for Frequency Tables with Class Intervals	Finding the variance and standard deviation of data organized into frequency tables with categories, and interpreting the meaning of each of them in various life situations.	Apply
			Find the variance and standard deviation of data represented by a histogram.	Apply
		Probability of Mutually Exclusive Events	Distinguishing two mutually exclusive events from two non-mutually exclusive events.	Understand
			Finding probabilities of mutually exclusive and non-mutually exclusive events in various life situations.	Analyze
			Representing random experiments with Venn diagrams and using them to find probabilities.	Evaluate

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			Find the probability of the complementary event.	Understand
		Probability of Independent and Dependent Events	Distinguishing two independent events from two independent events.	Understand
			Finding probabilities of independent events and non-independent events within various life situations.	Analyze
			Representing random experiments with a probability tree, and using it to find probabilities.	Evaluate
			Finding conditional probability of events in various life situations.	Analyze

The number of cognitive objectives in all study units in the tenth-grade mathematics curriculum was calculated according to Bloom's cognitive taxonomy. Table (6) shows this.

Table (6)

The number of cognitive objectives in all study units in the tenth-grade mathematics curriculum

Units	Level of objective thinking skills						Total
	Remember	Understand	Apply	Analyze	Evaluate	Create	
Solve a system consisting of a linear equation and a quadratic equation.	3	2	4	1			10
Circle	7	4	9			1	21
Trigonometry	1	1	9	1		1	13
Triangle Applications		5	11	1		2	19
Functions	2	2	6	5	2	2	19
Derivatives	2	6	1	2			11
Vectors	5	2	3		1		11
Statistics and Probabilities		7	4	4	3		18
Total	20	29	47	14	6	6	122

Table (6) shows that the "Apply" level of thinking achieved the highest number of cognitive goals, 47 goals, then the "Understanding" level, the number of cognitive goals 29, then the "Remember" level, the number of cognitive goals 20, then the "Analyze" level, the number of cognitive goals 14, and finally the two "Evaluation" levels. "And " Create ", the number of cognitive objectives is 6.

The percentage and number of cognitive objectives were calculated according to Bloom's cognitive taxonomy in all study units in the tenth-grade mathematics curriculum within the content areas of school mathematics according to the NCTM classification.

Table (7)

The percentage and numbers of cognitive objectives in all study units in the tenth-grade mathematics curriculum within the content areas of school mathematics according to the NCTM standard of Content.

Level of objective thinking skills	NCTM standard of Content								Total	
	Number and Operations		Algebra		Geometry		Statistics and Probabilities			
	N	Per.	N	Per.	N	Per.	N	Per.	N	Per.
Remember	5	4.2%	7	5.7%	8	6.6%	-	-	20	16.4%
Understand	3	2.4%	10	8.2%	10	8.2%	7	5.7%	30	24.5%
Apply	2	1.6%	11	9.1%	29	23.8	4	3.3%	46	37.8%
Analyse	-	-	8	6.6%	2	1.6%	4	3.3%	14	11.5%
Evaluate	1	0.9	2	1.6%	-	-	3	2.4%	6	4.9%
Create	-	-	2	1.6%	4	3.3%	-	-	6	4.9%
Total	11	9.1%	40	32.8%	53	43.4%	18	14.7%	122	100%

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Table (7) shows "Remember" level is the highest level in "Number and Operation" standard at percentage 4.2% from total cognitive objectives. The highest in "Algebra" standard is "Apply" at percentage 9.1% from total cognitive objectives, the highest in "Geometry" standard is "Apply" at percentage 23.8% from total cognitive objectives. And the highest in "Statistics and Probabilities" standard is "Understand" at percentage 5.7% from total cognitive objectives. Table (7) shows also the level "Apply" is the highest level in cognitive objectives at overall at percentage 37.8% from total cognitive objectives.

DISCUSSION

The results showed the number of cognitive objectives within the developed mathematics curriculum reached 122 objectives, distributed over 8 study units within the two parts of the curriculum. The circle unit included the highest number of cognitive objectives at a percentage of 17.2%. It contains 5 lessons; it is considered one of the largest units within the mathematics curricula developed for the tenth grade.

The geometry standard included the highest number of cognitive objectives at a percentage of 43.4%, It contains 3 units, such as: Circle, Trigonometry, and Triangle Applications. the highest level in "Geometry" standard is "Apply" at percentage 23.8% from total cognitive objectives. This is due to the fact that the geometry standard is dominated by the application of Geometry theories and procedural knowledge included in the curriculum. It requires students to apply the thinking skills necessary for a deep understanding of Geometry concepts and laws, and to possess the thinking skills that enable them to possess Geometry thinking skills.

The results showed that the "Apply" level of thinking achieved the highest number of cognitive goals, 47 goals, this is due to the applied thinking level requiring students to apply the conceptual and procedural knowledge contained in the mathematics curriculum developed for the tenth grade. The applied thinking level encourages students to achieve deep understanding, possess the ability to remember mathematical facts, and understand them in a way that enhances their learning process for school mathematics. The developed curriculum includes a wide range of mathematical concepts, mathematical procedures, and mathematical laws, all of which require students to apply them to reach the correct solution.

The mathematics curriculum developed for the tenth grade achieves acceptable levels of thinking appropriate to the academic stage, as the curriculum includes all levels of thinking according to Bloom's cognitive taxonomy, and the curriculum also contains school mathematics standards according to NCTM, and all school mathematics standards include different levels of mathematical thinking, Students are able to possess all mathematical thinking skills within Bloom's taxonomy in all academic units, and within all school mathematics standards.

CONCLUSIONS

Based on the study results, the study presents the conclusion as follows:

1. The developed mathematics curriculum for the tenth grade includes all levels of mathematical thinking to a varying extent.
2. The geometry standard in the mathematics curriculum developed for the tenth grade has the highest percentage of thinking levels according to Bloom's cognitive taxonomy.
3. The developed mathematics curriculum for the tenth grade focuses on the level of applied thinking

REFERENCES

1. Banujan, K., Kumara, S., Prasanth, S., & Ravikumar, N. (2023). Revolutionising Educational Assessment: Automated Question Classification using Bloom's Taxonomy and Deep Learning Techniques – A Case Study on Undergraduate Examination Questions. *International Journal of Education and Development using Information and Communication Technology.* 19 (3). 259-278.
2. Bhakti, S.L.O.W., 2010, 'Bloom's Taxonomy: Original and Revised', Jurnal eksis 6(2), 1440–1605**.**
3. Crossland, J. (2015). Thinking Skills and Bloom's Taxonomy. Association for Science Education, *Primary Science*. 140. 32-34. https://www.researchgate.net/publication/285766349
4. Das, S., Mandal, S., & Basu, A. (2021). Classification of action verbs of Bloom's taxonomy cognitive domain: An empirical study. *Journal of Education, 202*(4), 554-566.
5. Eljishi, Z. Abdel-Hameed, F., Khuddro, A., Zayed, S. (2024). Translating Bloom's Taxonomy Action Verb List into Arabic for Teacher Preparation Programs: Challenges/Problems and Solutions. 12 (1). 295-303. http://dx.doi.org/10.7575/aiac.ijels.v.12n.1p.295By
6. ElKelish, W.W. & Ahmed, R., (2022), Advancing accounting education using LEGO Serious play simulation technique, Accounting Education. 31(2), 167–183. https://doi.org/10.1080/09639284.2021.1905011
7. Ghunaimat, M., (2023). The Degree to which the Developed Jordanian Mathematics Curricula for the Basic Stage Include the Requirements of Students with Special Needs. *Migration Letters*. 21 (2), 501-519. https://doi.org/10.59670/ml.v21i2.6200
8. Ghunaimat, M., (2024). The Training Needs of Mathematics Teachers in Light of The Developed Collins Mathematics Curricula in Jordan. Journal of Namibian Studies, 40: 228-251
9. Milli, B. (2009). Primary school mathematics course 6-8. classes curriculum]. MEB Printing House.
10. Mustafa, S., Sari, V., & Baharullah, B. (2019). The Implementation of Mathematical Problem Based Learning Model as an Effort to Understand the High School Students' Mathematical Thinking Ability. International Education Studies, 12(2), 117– 123. https://doi.org/10.5539/ies.v12n2p117
11. National Center for Curriculum Development (NCCD). (2022). Mathematics curriculum. Jordan.
12. National Council of Teachers of Mathematics. (2014). Principles to actions: Ensuring mathematical success for all. Author.
13. Ortiz-Garcia, W., and Villarraga, Z. (2024). Revised Bloom's Taxonomy To Analyze The Scope Of CLIL Classes With Children. *HOW Journal*. 31 (1), 11 – 35. https://doi.org/10.19183/how.31.1.788
14. Purwanto, W. R. (2019). Students' Thinking Process in Solving Mathematical Problems Viewed from a Gender

DOI: 10.5281/zenodo.13985100

Perspective. Proceedings of the UNNES National Postgraduate Seminar, 895– 900.
15. Sapti, M., Irawan, E. B., As'ari, A. R., Sa'dijah, C., & Wijaya, A. (2019). Comparing Model-Building Process: A Model Prospective Teachers Used in Interpreting Students' Mathematical Thinking. *Journal on Mathematics Education*, 10(2), 171–184.
16. Sobral, S. (2021). Bloom's taxonomy to improve teaching-learning in introduction to programming. *International Journal of Information and Education Technology, 11* (3), 148-153. https://doi.org/10.18178/ijiet.2021.11.3.1504
17. Yildirim, D. (2017). *Examining the mathematical thinking processes of secondary school students in geometry problems*. [Doctoral dissertation, Anadolu University]. https://doi.org/10.17240/aibuefd.2018..-362044

DOI: 10.5281/zenodo.13985100