

The Availability Level of the Aesthetic Approach in Mathematics Textbooks for the Higher Grades at the Primary Stage in Saudi Arabia

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This study aims to establish the presence of aesthetic underpinnings in Saudi mathematics textbooks. For this, the researchers used descriptive-analytical methods. We looked at fourth, fifth, and sixth grade math textbooks. The arbitrated aesthetic method divides 27 signals into seven basic domains. The content availability of each main aesthetic approach area was found to be constant across all books in the elementary stage's upper grades. Aesthetic strategies were used in primary mathematics textbooks at a rate of 34%. The average percentages for the major domains were: 76.9% major themes, 57.7% mental level, 52.8% science framework, 35.4% mathematics and arts, 10.7% mathematics and emotional components, and 2.2 % athletic aesthetic criteria. The researchers suggested designing mathematics courses and texts artistically.

Keywords: textbooks, mathematics, aesthetic approach, mathematical aesthetic, content analysis

Introduction

Scholastic mathematics demonstrates mathematicians' accomplishments by studying significant mathematical concepts and operations, enables students to comprehend mathematics as a science of human intellectual accomplishments, and enables students to meet life requirements through observation of mathematics' application in the real world and enjoyment of its subjective and functional aesthetic.

The National Council of Mathematics Teachers in the United States of America's (NCTM) scholastic mathematics standards emphasized the necessity of assisting pupils in comprehending the essence of mathematics and appreciating its mathematical aesthetic (Asiri et al. 2013).

The aesthetic method is oriented to increase the enjoyment and joy associated with mathematics education. They identify aesthetics in knowledge, the means of accessing and verifying it, and the scientists' efforts to discover, interpret and manage scientific phenomena, and they believe that the aesthetic components elicit satisfaction and help students develop critical thinking abilities.

By incorporating mathematical aesthetic criteria into school mathematics curricula, the aesthetic in mathematics, with its patterns, numbers, shapes, geometric figures, algorithms, proofs, and explanations, becomes an introduction

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that presents mathematics as a vital subject exciting for research and curiosity and justifies and encourages its learning among students (Abdullah 2019).

Gadanidis et al. (2016) believe that aesthetic experiences in mathematics enable students to engage in research and investigation, unlock their imagination, and provide pleasure and variety to mathematics instruction.

Additionally, emphasizing the aesthetic components of mathematics instruction helps children acquire moral ideals. It promotes personality balance in students by connecting the beauty notion to the order, harmony, and consistency inherent in mathematics' beauty.

Sinclair (2009) asserted that an aesthetic approach to mathematics education impacts school mathematics education because it increases students' motivation, alleviates math anxiety, and promotes enjoyment of learning by exposing students to the nature of mathematics and its significance in their lives.

The aesthetic method elicits pleasure in pupils, improves their desire and curiosity about mathematics, and enables them to benefit from its tools. It improves their drive and curiosity for mathematics and benefits from the instruments utilized in daily life. Mathematics has an aesthetic component that should be zed in elementary school students' textbooks. It is founded on information and serves as a vehicle through which the curriculum designer communicates contemporary trends to pupils.

The Problem

The study problem arose from the aesthetic approach's role in achieving certain educational goals through student's practice of various thinking skills, research, and meditation within a framework of satisfying emotional aspects through aesthetic experiences, as confirmed by several studies: (Abdullah 2019, Saleh and Matalqa 2018, Mhenni 2018, Abu Zaid et al. 2017, Suleiman 2016, Minara 2017, Satyam 2016, Cellucci 2015, Sulaiman 2014, Abdul Hadi 2014).

Additionally to the recommendations made by the studies (Abdullah 2019, Ahmed 2018, Satyam 2016, Cellucci 2015, Abdul Hadi 2014), reconsidering the mathematics curriculum's content and placing emphasis on the aesthetic view of mathematics, as well as abandoning the traditional method, is necessary.

The Education and Training Evaluation Commission's national tests revealed students' weakness in mathematics in Saudi Arabian, with 41% of sixth-grade students failing to meet the minimum performance standards expected of them. Additionally, the International Study of World Trends in Academic Achievement in Mathematics and Science (TIMS 2019) revealed a decline in students' average performance in Saudi Arabia. These findings indicate that mathematics education has shortcomings that can be attributable to any educational process.

However, the Education Ministry recognized low-quality curricula as barriers to accomplishing the 2020 national transformation (Ministry of Education 2019). Because the majority of Arab education systems use textbooks as a curriculum (Al-Saadawi 2010), and because they serve as the official document that reflects the majority of curriculum components, there are observations about mathematics

books revealed by the evaluation study of the mathematics and science project in Saudi Arabia prepared by the Center for Research Excellence in Science and Mathematics Development (2015). It advised aligning school mathematical standards with the nation's identity and culture and guaranteeing the best possible experiences during future growth processes.

As a result, the necessity for a review of school mathematics textbooks arises, and the study problem is defined as determining the level of aesthetic approach in mathematics textbooks for higher grades at the primary stage in Saudi Arabia.

Questions

The study questions are:

- (1) What aesthetic approach foundations must be available in mathematics books for the higher grades at the primary stage in Saudi Arabia?
- (2) What is the availability level of the necessary aesthetic approach foundations in mathematics books for the higher grades at the primary stage in Saudi Arabia?

Aims

The study aims to:

- (1) Building a list of the aesthetic approach foundations and indicators must be available in mathematics books for the higher grades at the primary stage in Saudi Arabia.
- (2) Identifying the availability level of the aesthetic approach foundations in mathematics books for the higher grades at the primary stage in Saudi Arabia.

Importance

The study importance appears in:

- (1) The current study lists the aesthetic approach foundations in mathematics, which may help designers develop mathematics curricula for the higher grades at the primary stage.
- (2) The study provides curriculum designers with tools and scientific criteria to evaluate mathematics books.
- (3) The study sheds light on the shortcomings in mathematics textbooks in Saudi Arabia, which may help curriculum developers to evaluate and develop them.

- (4) The study may help teachers take care of the aesthetic aspects of mathematics education.
- (5) The current study opens the way for researchers to conduct further research on the aesthetic approach in mathematics education.

The Limits

Objective limits: a list of the aesthetic approach foundations in the light of the content analysis of the mathematics books for the higher grades at the primary stage (fourth, fifth, and sixth) in Saudi Arabia in the academic year 1443 AH.

Temporal limits: Mathematics textbooks prescribed for primary school students, edition 1443 AH.

Spatial limits: Saudi Arabia.

Human limits: Students of the primary stage higher grades in Saudi Arabia.

Study Terminologies

The aesthetic approach: It is define as the building and implementing curricula to achieve educational goals and enjoy the technical and aesthetic aspects in science and emphasize the emotional and appreciation aspects that have often been neglected instead of its importance.

The researchers define it procedurally as the quantitative analysis of mathematics textbooks for the higher classes in light of the aesthetic approach foundations available in mathematics books.

Theoretical Framework and Previous Studies

This part deals with the specification of the aesthetic approach in mathematics in the light of its concept, its importance in mathematics, its foundations in mathematics textbooks, and the related previous studies.

The Aesthetic Approach in Mathematics

Aesthetic education aims to promote the human being since a focus on beauty necessitates developing and integrating students' personalities (Al-Sherbiny 2005). When students enjoy instruction and research due to their interactions with aesthetic experiences, they develop favorable attitudes toward science and learning and an appreciation for the role of scientists.

'Researchers' definitions of the aesthetic approach vary; it is defined as a proposal to develop and implement curricula to accomplish educational goals while also enjoying the technical and aesthetic aspects of science, as well as emphasizing the emotional and appreciation aspects of science that are frequently overlooked in favor of their importance.

Girod et al. (2010) define it as the experiences that individuals gain from their imagination seeking harmony in the strength and beauty of ideas and information that startle amaze the learner well as the splendor of these concepts and information.

Thus, the visual features of the entrance set it apart from other entries. The aesthetic method blends students' emotional, cognitive, and skill development, emphasizing emotional well-being and achieving pleasure in educational settings. The aesthetic method examines integrated phenomena and the whole awareness of the phenomenon to identify its beautiful characteristics.

The aesthetic approach to mathematics is consistent with mathematics' nature, as seen by the beauty of mathematical patterns and geometric shapes and their algorithms. The aesthetic approach to mathematics education connects mathematics to various disciplines and emphasizes its functional beauty in describing the situations, and issues students are exposed to.

The Importance of the Aesthetic Approach in Mathematics Education

It develops the integrated personalities of the students, refines their behavior, fosters their creative potential, provides emotional and spiritual fulfillment, and fosters favorable attitudes toward the environment and its beauty (Al-Sherbiny 2005).

Mathematics is a universal language. Because the world's symbols, numbers, and mathematical forms are nearly the same, the importance of mathematical beauty in creating universal moral qualities such as honesty, peace, respect for others' viewpoints, and social interaction is apparent (Minara 2017). The artistic perspective on classroom mathematics imbues it with meaning. It converts abstract mathematical concepts and skills into comprehensive and integrated encounters with natural and social events (Gadanidis et al. 2016), bridging the divide between school mathematics and students' real-world issues. It brings mathematics closer to the students' emotions and allows them to appreciate its beauty.

The Foundations of the Aesthetic Approach in Mathematics Textbooks

When establishing curricula and producing mathematics books, a group of scholars cited Mohamed (2008), Sinclair (2009), Yunus (2012), and Hartono (2016).

Foundations and principles can be summarised as follows:

(1) Unifying the science structure:

The aesthetic approach confirms that mathematics education encompasses the primary components of science, which are the results, which include concepts and theories, the second component of science processes, which are the practices and activities used to arrive at mathematical theories and concepts, such as inference and communication, and finally, the values and ethics that should characterize the students' knowledge as honesty and objectivity, which can be accomplished by presenting paragraphs of text.

(2) *Emphasis on the major concepts*

The consistency of mathematics curricula around central concepts and their development in conjunction with the development of the "student's cognitive structure, the unity of the mathematics structure and knowledge of the facts and concepts beneath it, and provides more space for aesthetic considerations of mathematical experiences and concepts, as well as emphasizes the importance of mathematics and its applications in their lives.

(3) *Presenting Integrated Mathematics Topics*

Reduces barriers between scientific disciplines by emphasizing the interconnectivity and interdependence of scientific areas. The aesthetic approach to mathematics education unifies school mathematics curricula across the various fields of mathematics as a science of numbers and measurements. The aesthetic approach enables mathematics to be presented in conjunction with other disciplines and subjects, focusing on fundamental concepts and ideas, seeing them as interconnected concerns, and comprehending them thoroughly. For instance, circumference mathematics can be applied to estimating the circumference of a volcano's crater.

Presenting mathematics integratively enables students to appreciate the beauty of concepts and information, their interconnectedness, the reliance of each domain on mathematics, and the reliance of numerous scientific areas on mathematics, all of which increase motivation to learn.

(4) *Linking Mathematics with the Arts*

It stimulates pupils' imaginations, fosters their creativity, and allows them to express their emotions. The relationship between mathematics themes and concepts and other arts such as architecture, Arabic calligraphy, and others can be defined as the relationship between geometric shapes and decorating art.

(5) *Taking care of the Emotional Aspects*

It emphasizes taking care of the student's emotional needs without sacrificing cognitive and skill development and arousing students' enthusiasm and curiosity through methods that simplify the mathematics, such as using interesting titles for mathematical topics that motivate students to investigate their content, and providing a learning environment in which the student feels safe, comfortable, and enjoys learning mathematical concepts by connecting them to their interests. The narrative contributes to the excitation of the students' conscience through its artistic aspects, which pleasure students, acknowledge the efforts of scientists, and help them develop favorable attitudes toward mathematics.

(6) *Taking into Account the Students' Mental Level*

Because a person perceives beauty in their surroundings based on subjective factors such as mental abilities, it is necessary to consider the gradual introduction of mathematical concepts and standards of mathematical beauty according to the students' mental level, from the tangible to the abstract, when designing the learning experience and situations.

(7) Highlighting the Mathematical Beauty Criteria

It develops a sense of beauty by focusing on two aspects: synthesis, logic, balance, order, and symmetry, as in the concept of an equilateral triangle. This helps students acquire basic knowledge about beauty, which helps them develop their ability to perceive beauty in mathematics topics and enjoy math learning.

Previous Studies

- Previous research has examined the aesthetic approach to mathematics: Obaidah's (2013) study examined the actuality of incorporating mathematics components into teaching from the 'teachers' perspective.
- Abdul Hadi (2014) honed his innovative and mathematical thinking abilities using an artistic approach to mathematics.
- Cellucci (2015) examined the usefulness of mathematics beauty in assisting students' comprehension and discovery, concluding that mathematics beauty aided in boosting students' mathematical discovery and cognitive understanding.
- Satyam (2016) demonstrated the importance of mathematical beauty in achieving surprise and eradicating monotony in educational settings.
- Abdullah's (2019) study demonstrated the efficacy of an aesthetic approach in mathematics instruction to develop humor and aesthetic taste. Both the funny sense scale and the aesthetic taste test revealed statistically significant differences in favor of the experimental group.

It is clear that the previous studies used the aesthetic approach to evaluate teacher performance and teaching using several variables such as mathematical and innovative thinking, sense of humor, the emotion of surprise, understanding, and discovery. In contrast, this study aimed to determine the level of availability of the aesthetic approach in mathematics books.

Methodology and Procedures

Methodology

The researchers used the descriptive-analytical method.

The Study Sample

The study sample consists of primary school mathematics books for the upper grades "fourth, fifth, and sixth" in the first and second semesters in Saudi Arabia for the academic year 1443 AH, a total of six books, and the study used the comprehensive inventory method to the community, due to the study's potential for application to the entire community.

The Study Tool

Following the aesthetic approach's foundations, the researchers collected study data using the content analysis card. By establishing seven major areas of the aesthetic approach, the researchers translated the aesthetic approach's foundations into a content analysis card; the tool's first form had (29) indications distributed throughout seven major domains.

The tool was verified by:

(1) The study tool validity

Its validity is predicated on the opinions of expert arbitrators. The researchers presented the content analysis card in its initial form to a panel of specialized arbitrators, totaling eleven (11) arbitrators, to ascertain their observations and suggestions regarding the analysis card's validity. They provided insightful suggestions and enhancements to the Analysis Card tool that was employed.

As a result, the researchers made appropriate revisions and adjusted the items' linguistic language. Thus, the tool's final version includes (27) indicators distributed among seven primary domains.

(2) The study tool stability

The study employed the re-analysis technique, with a time delay of one year between the first and second analyses (three weeks). The researchers examined a unit of study from the sixth grade of primary school's second semester (the Fractions unit), and then used Holsty's equation to determine the stability. The stability coefficient was (0.93), which is a high number.

Analytical Controls

After confirming the correctness and stability of the content analysis card, the researchers utilized the instrument as follows:

- The analysis's objective was to ascertain the extent to which the aesthetic approach is available in mathematics books for the upper grades at the elementary stage in Saudi Arabia.
- Sample: encompasses all themes covered in elementary school mathematics textbooks for pupils in the upper grades "sixth, fifth, and fourth" throughout the first and second semesters, while taking into account the following procedures:
 - Analyzing all book contents except the cover, book introduction, indexes, mid-semester test, chapter test, and cumulative tests.
 - Analysis of the artistic approach and its indicators in light of the foundations' list.
 - The study includes all scheduled classes and preparation materials and the graphics, shapes, images, and activities included in the content.

- The lesson, its primary activity, exercises, and sub-items were considered repetitions because they all contain the same concept.
- Analyses Categories denoted by the aesthetic approach's foundational domains.
- Categorize partial analyses using the unique indicators indicated in the aesthetic approach areas.
- Unit analysis: Selecting an idea as a unit based on its relation to the study's nature and objectives.

Statistical Treatment

The researchers used:

- Frequencies and percentages.
- Holste's equation calculates the tool stability through the agreement coefficient between the first and second analyses.
- Judgment criterion on the availability level of the aesthetic approach among the study sample according to the Table 1.

Table 1. *Judgment Criterion on the Availability Level of the Aesthetic Approach*

Percentage		Availability level
From	to	
0%	20%	Very low
More than 20%	40%	Low
More than 40%	60%	Medium
More than 60%	80%	High
More than 80%	100%	very high

Study Results and Discussion

The Answer to the First Question

"What are the foundations of the aesthetic approach that is required to be available in mathematics textbooks for the higher grades at the primary stage in Saudi Arabia?"

The researcher studied educational literature and existing study on aesthetics. The researchers used aesthetic approach foundations to establish the aesthetic approach's availability in mathematics textbooks and then recast the sub-indicators and analysis in that light, presenting them to a panel of specialized arbitrators and amending them based on their observations. The researchers identified (27) sub-indicators, which included the following:

Unifying the science structure:

- (1) The book presents scientists' practices and activities to access mathematical theories and concepts.
- (2) The book highlights the scientific values and ethics that accompany the scientific activity.
- (3) The book presents the mathematical concepts and findings of scientists.

Emphasis on the major concepts:

- (1) The book provides mathematical content according to the cumulative structure characteristic and the tribal requirements for studying different topics.
- (2) The book organizes the mathematical content lessons around total concepts that include sub-mathematics concepts.
- (3) The book presents the basic conceptual and procedural knowledge in the balanced lesson.

Presenting mathematics in an integrated way:

- (1) The book links mathematical applications with other social and scientific disciplines.
- (2) The book includes applications that integrate the branches of mathematics (numbers and their operations, geometry, algebra and analysis, statistics, and probability).
- (3) The book motivates students to recall previous experiences from different disciplines.
- (4) The book includes open activities where students present their relevant experiences in the lesson.

Linking mathematics with arts:

- (1) The book links mathematical concepts and arts.
- (2) The book refers to applying mathematical concepts in different arts in local and global cultures.
- (3) The book provides an opportunity to practice technical activities related to mathematics.
- (4) The book encourages the observation and inference of mathematics concepts in the artwork.

Taking care of the students' emotional aspects:

- (1) The book provides interesting titles for students for mathematics lessons.
- (2) The book includes paragraphs that develop students' positive attitudes towards mathematics, highlighting its functional beauty in their lives.

- (3) The book promotes meditation on mathematical concepts and savoring their beauty.
- (4) The book urges appreciation and pride in the efforts of mathematicians.
- (5) The book presents stories of the mathematical concepts, historical development, and the challenges scientists faced upon discovery.

Taking into account the students' mental level:

- (1) Gradual provision of mathematical content from the concrete to the abstract level.
- (2) The book presents the topic to consider the individual differences among students.
- (3) The book links mathematics to the students' reality.
- (4) The book presents the information to stimulate the learner's mental processes.
- (5) The book includes various methods of learning assessment.

Mathematics beauty criteria:

- (1) The book presents paragraphs explaining the standards of mathematics beauty.
- (2) The book is directed to note the standards of mathematical beauty in the mathematical situation.
- (3) The book stimulates the observation and conclusion of the mathematical beauty criteria in the students' environment.

The Answer to the Second Question

"What is the availability level of the necessary aesthetic approach foundations in mathematics textbooks for the higher grades at the primary stage in Saudi Arabia?"

The frequencies and percentages of the evidence for each indicator of the analysis card areas in each class book. The researchers present a summary of the results in the light of the aesthetic approach in Table 2.

Table 2. *Summary of the Mathematics Books Results from Analysis for The Fourth-Grade at Primary School in the Light of the Aesthetic Approach*

No.	Domain	Semester	Average Frequency of Domain	Percentage of Domain	Average Percentage of Two Classes	Availability Level
1	Unification of the science structure	First	52	44%	48.5%	medium level
		second	67	53%		
2	Emphasis on major concepts	First	99	85%	72.5%	high level
		second	76	60%		
3	Introducing mathematics in an integrated manner	First	96	49%	35%	low level
		second	35	21%		
4	Connecting	First	10	7%	8.5%	very low

	mathematics with the arts	second	16	10%		level
5	Emotional care	First	2	1%	4.5%	very low level
		second	16	8%		
6	Considering the mental level	First	126	65%	60%	medium level
		second	116	55%		
7	mathematics beauty standards	First	2	2%	2,5%	very low level
		second	4	3%		
The average of the aesthetic approach foundations in the fourth-grade books of primary school					33.07%	low level

It is clear from Table 2 the frequencies of the aesthetic approach indicators in mathematics books for the fourth grade at primary school and their percentages concerning some lessons in the book where the percentage of all domains was (33.07%), and the domain (emphasis on major concepts) came first with a percentage of (72.5%). Then, in the second place, the domain (observing the mental level) was with a percentage of (60%). The domain (unifying the science structure) ranked third with a percentage of (48.5%). The domain (presenting mathematics integrated) ranked fourth with a percentage of (35%). Then the domain (linking mathematics with the arts) ranked fifth with a percentage of (8.5%) and the domain (Caring for Emotional Aspects) ranked before the last with a percentage (4.5%). The domain of (Athletic Beauty Standards) ranked last with a percentage of (2.5%).

Table 3. Summary of the Mathematics Books Results from Analysis for the Fifth-Grade at Primary School According to the Aesthetic Approach

No.	Domain	Semester	Average Frequency of Domain	Percentage of Domain	Average Percentage of Two Classes	Availability Level
1	Unification of the science structure	First	69	55%	52.5%	medium level
		second	62	50%		
2	Emphasis on major concepts	First	93	74%	73.5%	high level
		second	90	73%		
3	Introducing mathematics in an integrated manner	First	75	45%	38.5%	low level
		second	52	32%		
4	Connecting mathematics with the arts	First	7	4%	6.5%	very low level
		second	15	9%		
5	Emotional care	First	3	2%	3%	very low level
		second	7	4%		
6	Considering the mental level	First	123	58%	56.5%	medium level
		Second	113	55%		
7	mathematics beauty standards	First	0	None	1%	very low level
		second	3	2%		
The average of the aesthetic approach foundations in the fifth-grade books of primary school					33.07%	low level

It is clear from Table 3 the frequencies of the aesthetic entrance indicators in mathematics books for the fifth grade at the primary school, and their percentages concerning some lessons in the book where the percentage of all domains reached

(33.07%), and the domain (emphasis on major concepts) came first with a percentage of (73.5%). Then, in the second place, the domain of (observing the mental level) was with a percentage of (56.5%). The domain (unifying the science structure) came in third place, with a percentage of (52.5%). The domain (presenting mathematics in an integrated manner) ranked fourth, with a percentage of (38.5%). Then the domain (linking mathematics with the arts) ranked fifth with a percentage of (6.5%). The domain (Caring for Emotional Aspects) ranked penultimate was with a percentage (3%). The domain of (Mathematics Beauty Standards) ranked last with a percentage (1%).

Table 4. Summary of the Mathematics Books Results from Analysis for the Sixth-Grade at Primary School According to the Aesthetic Approach

No.	Domain	Semester	Average Frequency of Domain	Percentage of Domain	Average Percentage of Two Classes	Availability Level
1	Unification of the science structure	First	59	56%	57.5%	medium level
		second	55	59%		
2	Emphasis on major concepts	First	91	87%	84.5%	high level
		second	77	82%		
3	Introducing mathematics in an integrated manner	First	43	31%	32.5%	low level
		second	43	34%		
4	Connecting mathematics with the arts	First	20	14%	17%	very low level
		second	25	20%		
5	Emotional care	First	22	11%	11.5%	very low level
		second	22	12%		
6	Considering the mental level	First	105	53%	56%	medium level
		Second	91	59%		
7	mathematics beauty standards	First	5	5%	2.5%	very low level
		second	0	None		
The average of the aesthetic approach foundations in the sixth-grade books of primary school					37.3%	low level

It is clear from Table 4 the frequencies of the aesthetic approach indicators in mathematics books for the sixth grade at primary school, and their percentages concerning some lessons in the book where the percentage of all domains reached (33.07%), and the domain (emphasis on major concepts) came first with a percentage of (84.5%). Then, in the second place, the domain of (unifying the science structure) was with a percentage of (57.5%) and ranked third in the domain of (observing the mental level) with a percentage (56%). The domain (providing mathematics in an integrated manner) ranked fourth, with a percentage of (32.5%). Then the domain (linking mathematics with the arts) ranked fifth with a percentage (17%). The domain (Caring for Emotional Aspects) ranked was with a percentage of (11.5%). The domain of (Athletic Beauty Standards) ranked last with a percentage of (2.5%).

Table 5. Summary of the Mathematics Books Results from Analysis for the Higher Grades at the Primary Stage According to the Aesthetic Approach

No.	Domain	Percentage Of the fourth-grade books	Percentage Of the fifth-grade books	Percentage Of the sixth-grade books	Average percentage of higher grades books	Availability Level
1	Unification of the science structure	48.5%	52.5%	57.5%	52.8%	medium level
2	Emphasis on major concepts	72.5%	73.5%	84.5%	76.8%	high level
3	Introducing mathematics in an integrated manner	35%	38.5%	32.5%	35.3%	low level
4	Connecting mathematics with the arts	8.5%	6.5%	17%	10.6%	very low level
5	Emotional care	4.5%	3%	11.5%	6.3%	very low level
6	Considering the mental level	60%	56.5%	56%	57.5%	medium level
7	mathematics beauty standards	2.5%	1%	2.5%	2%	very low level
The average of the aesthetic approach foundations in the higher grades books of the primary school		33.07%	33.07%	36.8%	34.47%	low level

As shown in Table 5, the results of analyzing the content of mathematics books for the higher grades at the primary stage, in general, demonstrated consistency in terms of the convergence of percentages for the availability of the aesthetic approach in mathematics books for each domain of the aesthetic approach between each grade of the higher grades at the primary stage. This consistency can be attributed to the spiral organization of the current (emphasizing the major concepts, taking into account the mental level, unifying the science structure, presenting mathematics in an integrated manner, linking mathematics with the arts, taking care of emotional aspects, standards of mathematical beauty).

These results can be discussed as follows:

The domain of emphasizing major concepts gained the top spot with 76.8 percent and a high degree of availability, owing to the spiral organization of the mathematics curriculum. The major concepts are introduced in broad strokes first, followed by their comprehensive presentation at each level. This finding is consistent with Al-Maliki and Al-Riyashi (2019) and Khalil and Al-Suloli (2015) about the order in which concepts are presented, and lessons are connected.

However, there are certain inadequacies in the indication of conceptual and procedural knowledge due to publications focused exclusively on the procedural element. Concentrating on the procedural part of books affects the domain's availability in books, which is consistent with (Al-Ahmadi 2020).

With a percentage of 57.5 percent and availability at an average degree, the realm of considering pupils' mental abilities came in second place. For the age stage, and by presenting information in ways that do not adequately account for the individual variances amongst pupils, the presentation does not stimulate the student's mental processes. This finding is consistent with (Al-Ahmadi 2020) and (Khalil and Al-Suloli 2015) findings that the Gradual presentation of mathematical concepts and ideas from the tangible to the abstract is missing in illustrations, representations, and real-world situations.

The domain of unifying the science structure came in third place with a percentage of (52.8 percent) and a medium degree of availability. This result stems from the fact that mathematics textbooks presented the science structure in various ways, initially emphasizing the cognitive aspect and then practicing. As a result, scientists' activities decreased by 49%, while scientific values and ethics decreased by 10%, and this result is consistent with (Al-Tamimi 2017).

The domain of integrated mathematics came in fourth place with a percentage of 35.4 percent and a low degree of availability. This finding is consistent with (Khalil and Al-Suloli 2015) regarding the lack of strong connections between mathematical concepts and other fields. However, the NCTM's School Mathematics Principles (NCTM 2000) emphasized the importance of mathematics in students' scientific and practical lives.

- The domain of mathematics and the arts was ranked fifth, with a proportion of 10.7 percent and a very low degree of availability. This is due to a lack of interest in the content or activities that support the practice of mathematically related artistic activities and a lack of presentation of content for applications of mathematics in the arts that benefit students. This finding concurs with (Khalil and Al-Sulouli 2015) regarding the book's inclusion of activities.

- The care of emotional aspects domain was ranked sixth with a percentage of 4.9 percent and availability at a very low level, indicating the content's inability to pique students' enthusiasm and motivate them to learn mathematics through methods that simplify the subject rather than as an abstract cognitive subject. This finding is compatible with (Al-Maliki and Al-Ghamdi 2019), who assert that mathematics books have weaknesses, including the stories of historical scientists and their endeavors to build mathematics and activities with emotional purposes.

- While the domain of Mathematical Beauty criterion attained the seventh and final position with a percentage of 2.2 percent and availability at a very low level, this is obvious by the absence of paragraphs explaining the Mathematical Beauty criteria in mathematics books. Mathematics incorporates aesthetic values, which may result from the emphasis on cognitive and skill development while building mathematics curricula; however, other research has stressed the aesthetic dimension's importance in mathematics (Sinclair 2009).

Recommendations

Due to the spiral organization of the mathematics curriculum, the domain of emphasising major concepts took the top rank with 76.8 percent and a high degree of availability. The major concepts are introduced in broad strokes first, followed by a detailed discussion of each subject at each level. This finding is consistent with Al-Maliki and Al-Riyashi (2019) and Khalil and Al-Suloli (2015) about the sequencing concepts and lessons. However, there are some shortcomings in the indication of conceptual and procedural knowledge due to publications that are purely procedural in nature. Concentrating on the procedural portion of books affects the availability of the domain in books, which is compatible with Al-Ahmadi (2020).

The domain of considering pupils' mental talents came in second place with a percentage of 57.5 percent and availability at an average level. Due to the students' age stage and the fact that the information is presented in ways that do not appropriately account for individual differences among pupils, the presentation does not contribute to stimulating the students' mental processes. This study is consistent with Al-Ahmadi (2020) and Khalil and Al-Suloli (2015) findings that depictions, representations, and real-world scenarios lack a gradual presentation of mathematical concepts and ideas from the tangible to the abstract.

With a proportion of 52.8 percent and a moderate degree of availability, the domain of unifying the science framework is placed in third place. This outcome is because mathematics textbooks presented the science framework in various ways, emphasizing first the cognitive part and later the practical aspect. As a result, scientists' activities declined by 49%, while scientific values and ethics declined by 10%, a finding congruent with Al-Tamimi (2017).

With a proportion of 35.4 percent and a low degree of availability, the domain of integrated mathematics is placed in fourth place. This study corroborates (Khalil and Al-Suloli 2015) the absence of strong linkages between mathematical notions and other domains. However, the NCTM's School Mathematics Principles (NCTM 2000) emphasized mathematics' role in students' scientific and practical lives.

- Mathematics and the arts were ranked fifth, with a share of 10.7% and a very low degree of availability. This is due to a lack of interest in the content or activities that promote mathematically linked creative activities and a dearth of content relating to mathematical applications in the arts that benefit students. This conclusion is consistent with Khalil and Al-Sulouli (2015) about the inclusion of activities in the book.

- The care of emotional aspects domain was ranked sixth with a percentage of 4.9 percent and availability at an extremely low level, indicating the content's inability to pique students' enthusiasm and motivate them to learn mathematics through simplified methods rather than as an abstract cognitive subject. This finding is consistent with Al-Maliki and Al-Ghamdi (2019) who say that mathematics books have flaws, including historical scientists' stories and their efforts to develop mathematics and activities for emotional reasons.

- While the domain of Mathematical Beauty criterion was ranked seventh and final with a percentage of 2.2 percent and availability at a very low level, this is evident by the absence of paragraphs explaining the Mathematical Beauty criteria in mathematics books. Mathematics integrates aesthetic values, resulting from the emphasis placed on cognitive and skill development while developing mathematics curricula, but other studies have emphasized the importance of the aesthetic dimension in mathematics (Sinclair 2009).

Suggestions

The researchers suggest the following studies:

1. Evaluating and developing mathematics curricula according to the aesthetic approach in general education stages.
2. Comparative studies to analyze mathematics textbooks for the primary and intermediate levels in Saudi Arabia and developed countries with the TIMSS results.
3. Evaluating the teaching performance of mathematics teachers in general education stages according to the aesthetic approach.

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