The Extent to Which Reflective Thinking Skills Are Included in the Content of Mathematics Textbooks for the 4th Grade in the Sultanate of Oman

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Received: August 31, 2024 Accepted: December 19, 2024 Online Published: January 7, 2025

doi:10.5430/jct.v14n1p67 URL: https://doi.org/10.5430/jct.v14n1p67

Abstract

Although one of the most important elements of curricula is content, the inclusion of reflective thinking in the curriculum content has not been widely investigated in the mathematics curriculum. Exploring the extent to which this type of thinking is included helps curriculum specialists by provided them with feedback on the inclusion of this type of thinking skills in the content of textbooks, which supports and develops it to achieve the goal of enabling students to acquire reflective thinking skills. Therefore, current study aimed to investigate the extent to which reflective thinking skills are incorporated into the content of mathematics textbooks for the 4th grade in the Sultanate of Oman. To achieve this, the researchers used the descriptive analytical method, specifically content analysis, as it is suitable for the nature and objectives of the study. The study population consisted of mathematics textbooks for the 4th grade (Cambridge series, 2020/2021 edition) for the first and second semesters. The list of reflective thinking was then presented to fifteen arbitrators to determine its validity and stability, making the necessary scientific adjustments. The stability of the analysis with time differences was calculated using the (Holsti) equation, and the overall stability coefficient was (0.98), which represents a high stability ratio. likewise, the Cooper equation was used to determine the validity of the analysis, and the overall validity coefficient was (0.95), which reflects a high validity ratio. The study's findings demonstrated that the 4th grade student's book incorporated reflective thinking skills to a high degree. The ability to suggest new solutions received the highest repetition rate (22.65%), then the ability to reach conclusions came in the second place (21.27%), error detection came in the third place (20.63%), providing a convincing interpretation came in fourth place (20.0%), and then the visual thinking skills came in the fifth place (15.4%). Finally, the study recommended incorporating reflective thinking skills into mathematics textbooks for the second cycle of basic education and practicing them.

Keywords: reflective thinking skills, mathematics textbook, Cambridge series, content analysis, 4th graders

1. Introduction

1.1 Introduce to the Research

The field of education is influenced by technological and scientific developments, as they are considered a basis for developing educational systems and advancing society as a whole. This also applies to educational curricula with all their educational components, as they contribute to providing individuals with a shared set of educational experiences to face life challenges and meet their demands. Educational content is one of the most important curriculum elements, as it has a significant impact on achieving the intended educational objectives.

Reflective thinking is defined as analyzing a phenomenon or situation to uncover the internal relationships between its components. Students gain the ability to produce knowledge by linking prior knowledge with current information after analyzing this phenomenon or that situation. Reflective thinking also helps students to modify their prior knowledge by establishing connections between different pieces of information.

Al-Shahri's (2017) study clarifies that reflective thinking skills include: contemplation, observation (through the use

of visual thinking skills), error detection, reaching conclusions, providing convincing interpretations, and suggesting new solutions. Through these skills, students can recognize the nature and dimensions of a problem, restructure its organizational framework, identify errors in its old solution process, find new appropriate solutions, select the suitable experiment to solve it, make a reflective decision, and finally, evaluate the final outcomes.

The cognitive content is one of the fundamental inputs into the educational system. It is impossible to conduct a lesson or experiment without providing cognitive content for students to learn. This content may be straightforward information, such as "*metals expand when heated*"; a skill, such as "*measuring the intensity of an electric current in a circuit using an ammeter*"; or an aspect that evokes emotional responses, such as "*appreciating the role of scientists in society*" (Taaima, 2008).

The Cambridge series for mathematics in the 4th grade offers enjoyable, easy-to-follow, and flexible educational material that assists students in learning through practicing active learning and problem-solving skills. This is achieved through the provision of a student's book and an activity book that includes a range of exercises aimed at enabling students to understand and apply new knowledge, in addition to utilizing problem-solving and mathematical skills in new challenges and everyday life situations (Ministry of Education, 2021).

Reflective thinking skills entail in-depth analysis that follows a comprehensive understanding of the presented situations, enabling students to tackle scientific problems more skillfully. Moreover, reflective thinking enhances critical thinking skills, allowing students to evaluate their ideas and performance, identify areas for improvement, and develop effective strategies to overcome challenges. By engaging in reflective practices, students strengthen their problem-solving capabilities, and lifelong learning skills, and develop a deeper understanding of complex concepts and phenomena (Egmir, & Ocak, 2020).

Therefore, understanding the extent to which reflective thinking skills are incorporated into the 4th grade mathematics content is essential for supporting the student's learning process. This motivated the researchers to conduct the current study to identify the necessary reflective thinking skills that should be incorporated into the content of the mathematics textbooks for 4th grade students.

1.2 Research Problem

Al-Qatrawi's (2010) study emphasized that one of the most important types of thinking skills that teachers and educators seek to develop in learners is reflective thinking. Likewise, Al-Sahari's (2019) study emphasized the importance of designing curricula in a way that fosters the development of different thinking skills, which calls for a focus on a wide range of thinking skills and their integration into the academic content. This is one of the most essential educational objectives, as it will benefit students throughout their entire lives.

Al-Khalidi and Saif (2016) recommended focusing on reflective thinking skills and their integration into textbooks because of their significant role in enhancing students' learning abilities, fostering their problem-solving skills, and developing their capacity for innovation and creativity, instead of solely stressing on memorizing information.

Al-Hurizia's (2019) study emphasized the necessity of developing students' reflective thinking skills and the importance of providing in-service training for teachers on promoting reflective thinking skills among students within the academic curricula.

Beavers et al. (2017) conducted a study that demonstrated improved levels of critical thinking among students when they were provided with structured guidance and appropriate tools. The students were able to demonstrate critical and reflective thinking skills by expressing their ideas in group discussions.

In the same context, several studies have analyzed the content of mathematics textbooks to identify the extent to which they incorporate reflective thinking skills. These studies have shown variations in the percentages of reflective thinking skills due to differences in sample sizes, objectives, methodologies, and measurement tools.

Obaid and Jawad's (2020) study aimed to determine the extent to which reflective thinking skills are incorporated into the content of mathematics textbooks for the first grade of middle school. Using the descriptive analytical approach, explicit and implicit ideas were considered as units, and frequencies were used as enumeration units. The results revealed that the content of the two-part mathematics book for the first grade of middle school was positive in terms of including reflective thinking skills, though the skills of error detection – in particular – were not covered thoroughly.

In addition to the aforementioned, the rationale for conducting this current study includes the scarcity of Omani studies measuring reflective thinking skills in the content of mathematics textbooks for the 4th grade; in addition to the limited number of previous studies – in general – that have examined reflective thinking skills, as they focused

on analyzing different curricula and grade levels.

Based on the continuous pursuit of improving mathematics curricula and in line with the strategic directions of Oman Vision 2040, and emphasizing the importance of enhancing thinking skills, specifically reflective thinking, among students, to promote deeper and more fruitful learning, there is a need to uncover the extent to which reflective thinking skills are incorporated into the content of mathematics textbooks for the 4th grade in Oman, with the aim of improvement and development.

1.3 Research Question

1- What is the extent to which reflective thinking skills are incorporated into the content of mathematics textbooks for the 4th grade in Oman?

1.4 Research Background

The thinking is a set of complex and interconnected human brain processes and activities that enable individuals to interact with themselves or others when encountering a stimulus perceived through one or more senses, leading to one or more responses depending on their circumstances (Al-Balushi, Al-Ghafri, and Al-Balushiyah, 2022).

Thinking is a cognitive process that aids in understanding a problem, generating solutions and alternatives, making judgments and evaluations, drawing comparisons, identifying the positives and negatives of an issue, and analyzing information received through the senses, drawing on prior knowledge. It involves giving meaning to environmental stimuli and providing a framework to help adapt and fit into the surrounding environment.

Most theories in psychology have addressed the concept of thinking and attempted to interpret it according to their principles. One of the most important of these theories is the cognitive theory, which focuses on interpreting thinking. An example is John Dewey's theory of reflective thinking. Dewey defined reflective thinking as: “Deep thinking about an action with the intention of improving it. Reflective thinking includes the element of awareness of performance and the quest for meaning in events”. In this regard, practitioners of reflective thinking build a repertoire of professional experience, knowledge, and post-thinking skills that help them scrutinize their thinking, and cognitive base, and gain a deeper understanding of complex issues. This requires discussions, dialogues, collaborations, and a willingness to take on greater responsibility for one’s performance, as well as patience, perseverance, the ability to make connections, perceive relationships, and make use of past experiences and deploy their implications in the present (Diwani, 2003). Reflective thinking adds meaning to experience by reorganizing it and leads to more comprehensive goals requiring more extensive tasks (Basol & Gencel, 2013, p. 941).

Egmir and Ocak (2020) examined the predictive levels of scientific trends among 4th grade students regarding reflective thinking skills for problem-solving. Their research utilized a correlational survey model, with a sample of 468 students selected through simple random sampling. The results indicated that students had a low level of reflective thinking skills for problem-solving and scientific situations. A strong positive correlation was found between the scientific trends of 4th grade students and their reflective thinking skills for problem-solving. Additionally, while the model constructed to predict reflective thinking for 4th grade students through scientific situations was significant, their reflective thinking for problem-solving was strongly interpreted through these scientific situations.

Any program or educational content aimed at developing reflective thinking skills should incorporate diverse teaching methods and different strategies for implementing such content. These should provide students with extensive opportunities for interpretation, making acceptable speculations to reach appropriate conclusions through sequential and organized steps, while testing the hypotheses they develop (Pollard, 2015).

Al-Rushdia (2021) defines reflective thinking skills as: "A set of cognitive processes that rely on the skills of thinking, reflecting, and analyzing a problem by studying it from all angles, searching for a sound conclusion to reach appropriate solutions for the problem." It consists of several skills, including visual thinking skills, error detection, reaching conclusions, providing convincing interpretations, and suggesting new solutions.

Reflective thinking encompasses multiple skills, some studies have addressed them in a more specific and precise manner, while others have discussed them in general. Yost and Sentner classified reflective thinking skills into two groups: the first group includes inquiry skills, such as data collection, analysis, forming appropriate hypotheses, scrutinizing information, and reaching appropriate conclusions, along with providing logical explanations for the problem, phenomenon, or lesson topic. The second group is critical thinking skills, including inference, interpretation, reasoning, and evaluation. Their classification reveals that reflective thinking skills encompass two types of thinking skills: critical thinking and investigative thinking (documented in Hardan, 2016).

Based on the aforementioned, the current research detected the following reflective thinking skills: visual thinking, error detection, reaching conclusions, providing convincing interpretations, and suggesting new solutions, to assess their inclusion in the 4th grade activity book.

The researchers believe it is essential to encourage and train teachers about reflective thinking and its skills through various methods, including enhancing the content of school mathematics books. This plays a pivotal role in developing students' experiences, helping them solve problems appropriately and make suitable decisions. This is confirmed by the studies of Lim and Angelique (2011) and Al-Farisiah (2012).

In light of this, many mathematics curricula have been modified to ensure that learning occurs as intended. For example, the Cambridge mathematics curriculum is designed to have students gather evidence through inquiry, searching various sources, observations, simple scientific experiments, data recording, and making predictions (Al-Sulaitania, 2019).

The mathematics curriculum is divided into two books: the Student's Book and the Activity Book. The Student's Book includes numerous pictures and questions to help students acquire and develop scientific inquiry and cultivate a passion for exploration, linking scientific knowledge to their daily lives. The Student's Book is supported by the phrase "I can," representing success criteria to support the evaluation and assessment of the student's progress. The Activity Book includes a range of exercises, source papers, and worksheets to help learners reinforce understanding, apply knowledge in facing new situations in their daily lives, and develop scientific inquiry skills (Ministry of Education, 2020).

2. Method

2.1 Research Methodology

The current study relies on the descriptive analytical approach to analyze the 4th grade mathematics textbook in light of reflective thinking skills. It is the most suitable approach for observing the phenomenon, collecting data, classifying, comparing, analyzing, and extracting results. This study focused on analyzing the content of mathematics textbooks for the 4th grade, in addition to a set of similar studies, such as Al-Mazidi (2006), Al-Shahari (2017), Kashko (2018), and Shaheen (2019), which adopted this methodology as well.

2.2 Research Population

The research population consisted of the 4th grade mathematics textbooks, for the first and second academic semesters. The analysts were two teachers: one of the researchers and another fellow teacher, along with a school performance evaluation supervisor. The teacher and supervisor were chosen for their extensive experience with the 4th grade mathematics textbooks. The content analysis was conducted over time to analyze the mathematics textbook for the 4th grade, answering the research question after the affirming stability of the analysis sheet.

2.3 Research Sample

The research sample consisted of the student's textbook for the 4th grade mathematics subject, for the first and second academic semesters, with four study units in the first semester and four in the second. The student's textbook for the 4th grade mathematics was chosen due to its many well-organized topics, facilitating content analysis using the analysis unit of paragraphs per topic. The analysis excluded the Teacher's Guide, Activity Book, "I Can" statements, introduction, and indexes as they are not part of the specified topic in question. Table 1 clarifies the entire textbook's content.

Table 1. Number of Paragraphs in the Student's Mathematics Book - First & Second Semesters

Book	First Semester				Second Semester				Total Lessons
	Unit Title and its order	Number of Lessons	Number of Pages	Number of Paragraphs	Number of Lessons	Number of Pages	Number of Paragraphs	Number of Lessons	
Student's Book on Mathematics for the 4th Grade	1-Numbers	11	22	38	5-Geometry	5	14	30	50
	2- measurement	5	10	29	6- measurement	9	20	41	
	3- Data processing	4	8	30	7-Numbers	5	10	26	
	4- Number	7	16	26	8-Data processing	4	8	19	

2.3.1 Data Coding

The data in this study were coded through process of categorizing the content elements or features of the mathematics textbook of grade four within a part of text or picture or chart based on the sub-abilities of each main reflective thinking skills.

Table 2. Coding the Main and Sub-Skills of Reflective Thinking Mathematics' of Grade Four

Skills	Indicating Behaviors	Unit	Information for analyzer to detect the abilities of reflective thinking
1- Visual Thinking Skill	1-1 presenting the topics discussed in simplified graphics	1 to 6	The ability to display aspects of the subject and identify its components; whether through the nature of the subject, or by giving a drawing or a shape that shows its components so that the existing relationships can be discovered visually, or by any of the five senses.
	1-2 simply clarify the drawings, pictures, and shapes of the concept and present its components	1 to 6	
	1-3 showing the relationship between concepts using concept maps and mathematical diagrams	1 to 6	
	1-4 using pictures to present the components of the presented topic	1 to 6	
	1-5 using drawings, shapes, and pictures to clarify incorrect relationships that may result in incorrect perceptions about the concept and topic	1 to 6	
2- Error Detection Skill	2-1 Contribution to modifying some misconceptions	1 to 6	The ability to identify gaps in the subject; This is done by identifying incorrect, illogical relationships, or identifying some wrong or alternative perceptions in accomplishing educational tasks.
	2-2 Presenting topics in a simple and understandable manner	1 to 6	
	2-3 Identifying incorrect relationships in topics, i.e., identifying incorrect steps in problem-solving	1 to 6	
	2-4 The ability to raise questions and present topics in a thought-provoking manner	1 to 6	
	2-5 Assisting in interpreting new concepts related to the lesson topic	1 to 6	
3- Reaching Conclusions Skill	3-1 Ease of transitioning from the general to the specific in content presentation, i.e., from the known to the unknown	1 to 6	The ability to reach a specific logical relationship; By seeing the content of the subject and reaching appropriate results.
	3-2 Using previous experiences to reach conclusions related to the presented lesson	1 to 6	
	3-3 Providing feedback on the validity of the conclusion	1 to 6	
	3-4 Presenting the relationship between the various scientific concepts introduced in the lesson	1 to 6	
	3-5 Presenting the ideas introduced in the lesson in a logical sequence	1 to 6	
4- Providing Convincing Interpretations Skill	4-1 Providing sufficient information to be able to interpret results	1 to 6	The ability to give a logical meaning to the results or interconnected relationships, and this meaning may be based on previous information, or on the nature of the subject and its characteristics.
	4-2 Assisting students in interpreting situations, opinions, and events in light of the given information	1 to 6	
	4-3 Assisting in incorporating the necessary evidence and arguments for supportive interpretation	1 to 6	
	4-4 Linking observations with conclusions	1 to 6	
	4-5 The ability to analyze and interpret ideas	1 to 6	
5- Suggesting New Solutions Skill	5-1 Student's participation in reaching results and suggesting appropriate solutions	1 to 6	The ability to develop logical steps to solve the presented subject, and these steps are based on expected mental perceptions of the presented subject.
	5-2 Developing the skill of formulating appropriate assumptions for solutions that suit the presented lesson	1 to 6	
	5-3 Assisting in providing convincing and logical solutions	1 to 6	
	5-4 Assisting in selecting the appropriate solution in light of specific justifications	1 to 6	
	5-5 Assisting in introducing new issues related to lesson topics	1 to 6	

After selecting the sample to analyze the mathematics book, clarifying the main concepts of reflective thinking abilities and identifying the categories of analysis, they have given instructions on how to analyze by identifying the unit of analysis: word, sentence, paragraph, idea, character, space, and time. Then in a table in which the data repetitions (frequencies) are tabulated, this process done through a list containing a number of data information; to survey opinions about the textbook content, as shown in table 2.

2.3.2 Sources for Deriving the List

The study relied on several sources to construct the list, such as:

- Previous studies and research addressing reflective thinking skills, such as the studies by Abu Nahil (2010), Al-Khalidi and Saif (2016), Al-Shahari (2017), Al-Zenidi and Al-Daghim (2019), and Kashko (2018).
- A review of the Standards Entry Portal for developing school textbooks, based on the justifications provided in the general framework for Omani curriculum standards (Ministry of Education, 2019).
- Objectives of teaching mathematics in primary education.
- Interviews with mathematics specialists, including university professors, educational supervisors, and teachers, benefiting from their views on incorporating reflective thinking skills in mathematics and maintaining the confidentiality of each specialist's data and notes.
- One of the researchers had experience in teaching mathematics for ten years.

The initial version of the list included five main skills, under which there were 25 behavioral indicators of reflective thinking. The five main skills are: visual thinking, error detection, reaching conclusions, providing convincing interpretations, and suggesting new solutions.

2.4 Validity and Reliability of the Research Tools

2.4.1 Content Analysis Sheet for Reflective Thinking Skills

This phase involved the following steps:

- Referring to previous studies and research addressing reflective thinking skills, such as the studies by Abu Nahil (2010), Al-Khalidi and Saif (2016), Al-Shahari (2017), Al-Zenidi and Al-Daghim (2019), and Kashko (2018).
- Conducting interviews with mathematics specialists, including university professors, educational supervisors, and teachers, benefiting from their views on incorporating reflective thinking skills in mathematics.
- Preparing the initial version of the list, including five main skills with 25 behavioral indicators of reflective thinking. The five main skills are: visual thinking, error detection, reaching conclusions, providing convincing interpretations, and suggesting new solutions.
- Developing the analysis sheet by defining its purpose, which is to determine the extent to which reflective thinking skills are incorporated into the content of the 4th grade mathematics textbooks in Oman. This involved determining analysis categories, units, frequency, and reflective thinking skills, as follows:
    - Categories of Analysis: The five skills previously mentioned: are visual thinking, error detection, reaching conclusions, providing convincing interpretations, and suggesting new solutions.
    - Units of Analysis: The five units specified by Pearson (2008): are topic, word, item, character, paragraph, as well as space and time measures. The units of analysis used in this research are topics of the 4th grade mathematics textbooks, through extracting paragraphs, and then observing the entire topic, which is the basis because of its suitability to the nature of the study.

2.4.2 Units of Analysis

Pearson (2008) specified five units of analysis in this field, which are word, topic, character, item, as well as space and time measures. The "topic" was used as the content analysis unit, referring to a simple sentence or idea revolving around a specific issue, which is one of the most important analysis units (Obaidat et al., 2020, p. 137).

2.4.3 Determining the Level of Analysis

The level of inclusion of reflective thinking skills in the mathematics curriculum for 4th grade students was determined, as shown in Table 3.

Table 3. Estimating the Degree to which Reflective Thinking Skills are Included in the Content of the Mathematics Curriculum for the 4th Grade

Percentage		Degree of Inclusion
From	To	
0%	20%	Very low included
Greater than 20%	40%	low included
Greater than 40%	60%	moderately included
Greater than 60%	80%	highly included
Greater than 80%	100%	Very highly included

2.4.4 Parameters Governing the Analysis Process

- A set of parameters govern the analysis process:
- The analysis of the content of the two-part mathematics textbooks for the 4th grade student in Oman included five units.
- The analysis was conducted within the scientific content framework of the 4th grade mathematics textbook, excluding the index, introduction, "I Can" statements, and scientific inquiries at the end of each unit.
- The 4th grade mathematics textbook was analyzed twice.
- The study sample itself was analyzed by an academic professor who is an expert in curricula and mathematics teaching methods.
- Analyzing, interpreting, and comparing results after data collection using the content analysis sheet.

2.4.5 Validity of the Content Analysis Sheet

In content analysis, validity refers to the comprehensiveness of the form, i.e. including all elements that should be included in the analysis, and the clarity of its paragraphs and items, ensuring a uniform understanding and application by all users (Obaidat et al., 2020, p. 206).

The validity of the analysis sheet was confirmed by presenting its initial version to 15 judges, experts in curricula, teaching methods, and second-subject teachers (Appendix B), to ensure its comprehensiveness, suitability, and alignment with its intended purpose. Suggestions and comments from the judges were considered, and modifications were made based on their consensus to arrive at the study tool in its final form, which was derived from the Standards Entry Portal for developing school textbooks, based on the justifications provided in the general framework for Omani curriculum standards (Ministry of Education, 2019).

Reliability of the Content Analysis Sheet:

In content analysis, reliability refers to the degree of agreement among analysts in their analysis of content elements or the degree of agreement an individual has with themselves if the analysis is repeated after a period (Al-Sayed, 1979, p. 514). Obaidat et al. (2020, p. 159) define stability as: "*The ability to obtain the same results if the same form is used again to analyze the same content*."

There are various methods for measuring reliability, one of the most common and suitable for content analysis studies is the re-analysis method, which involves conducting the analysis twice on the same material and determining the relationship between them in the form of a specific degree, indicating the stability coefficient, revealing the extent of agreement between the two analyzes. The higher the degree, the higher the stability coefficient (Taima, 2008, p. 224). Re-analysis can take two forms:

1. Stability over time, or temporal consistency, where the researcher obtains the same results if the analysis is repeated after a period of three to four weeks from the initial analysis.
2. Stability across individuals, or inter-rater reliability, where two or more researchers working independently reach the same results by applying the same analysis categories and units to the same content (Fatah Allah, 2015, p. 158).

To ensure the tool's reliability and suitability for the application, the content of the research population, represented by the 4th grade mathematics curriculum, was analyzed as follows:

First: Calculating Stability Over Time Using Holsti's Equation:

One of the researchers analyzed the mathematics curriculum using the analysis form to measure stability and then repeated the analysis a month after the initial analysis.

The stability coefficient was then calculated by determining the agreement ratio between the two analyzes using Holsti's equation:

$$\text{Holsti} = \frac{2A}{(N1 + N2)}$$

Where

2A: The number of cases agreed upon in the two analyzes.

N1: The number of cases in the first analysis (the number of frequencies at the first analysis).

N2: The number of cases in the second analysis (the number of frequencies in the second analysis). This equation was chosen because of its suitability for descriptive and analytical methods.

Table 4. Stability Coefficient of the Analysis Tool Over Time According to the Holsti Equation

Reflective Thinking Skills	The 1st Frequencies of Analysis (one of the Researchers)	The 2nd Frequencies of Analysis (Same Researchers) After a Month	Number of Agreements	Number of Frequencies Agreed Upon × 2	Reliability Coefficient
Skill of visual Thinking	146	153	146	292	0.97
Skill of Error Detection	195	187	187	374	0.97
Skill of Reaching Conclusions	201	204	201	402	0.99
Skill of Providing Convincing Interpretations	189	199	189	378	0.97
Skill of Suggesting New Solutions	214	220	214	428	0.98
Total	945	963	937	1874	0.98

Table 4 illustrates that the stability coefficient for the five skills was 0.97, 0.97, 0.99, 0.97, and 0.98 respectively. The overall stability coefficient reached 0.98, which is a suitable stability ratio that assures the researchers of the tool's applicability. The acceptable agreement percentage between the two analyzes for the validity and stability of the analysis is between 0.80-100% (Fatah Allah, 2015, p. 163).

Second: Calculating Inter-Rater Reliability Using Cooper's Equation:

It relies on calculating the agreement and disagreement ratio between the two analyzes using the following equation:

$$\text{Percentage of Agreement} = \frac{\text{Number of Agreements x 100\%}}{\text{Number of Agreements + Number of Disagreements}}$$

Stability Across Individuals:

Two teachers analyze the same material, and then the stability coefficient is calculated using the following equation:

$$\text{Stability Equation} = \frac{\text{Number of Agreements}}{\text{Number of Agreements + Number of Disagreements x 100\%}}$$

If the percentage is 85% or higher, the analysis results are adopted.

Table 5 illustrates that the stability coefficient for the five dimensions was 0.97, 0.95, 0.99, 0.93, and 0.92 respectively. The overall stability coefficient reached 0.95, which is a suitable and high ratio that assures the researchers of the tool's applicability.

Table 5. The Stability Coefficient of the Analysis Tool According to the Cooper Equation

Reflective Thinking Skills	Frequency of analysis (the one researcher)	Frequency of analysis (external analyzer)	Number of Agreements	Number of Frequencies Agreed Upon × 2	Reliability Coefficient
Skill Visual Thinking	146	150	146	4	0.97
Skill of Error Detection	195	187	187	8	0.95
Skill of Reaching Conclusions	201	202	201	1	0.99
The skill of Providing Convincing Interpretation	189	176	176	13	0.93
Skill of Suggesting New Solutions	214	198	198	16	0.92
Total	945	913	908	42	0.95

The Tool in Its Final Form:

The researchers arrived at the final version of the reflective thinking skills list (Appendix E), consisting of five general skills, each with 5 behavioral indicators (i.e. 25 in total). They are as follows:

1. Visual Thinking: This skill included five behavioral indicators.
2. Error Detection: This skill included five behavioral indicators.
3. Reaching Conclusions: This skill included five behavioral indicators.
4. Providing Convincing Interpretations: This skill included five behavioral indicators.
5. Suggesting New Solutions: This skill included five behavioral indicators.

Research Procedures

This study involved the following procedures:

1. Reviewing educational literature, its updates, books, research, educational studies, websites, proceedings of educational seminars, conferences, and relevant meetings related to reflective thinking skills.
2. Identifying the 4th grade mathematics textbooks.
3. Analysts: Two teachers, one of whom is a researcher, and a teacher, both with a bachelor's degree, along with a school performance evaluation supervisor.
4. Validating the tools.
5. Preparing the study tools as follows: A content analysis sheet to identify reflective thinking skills in 4th grade mathematics textbooks.
6. After obtaining the approval from the experts to conduct the study, a sample of the 4th grade mathematics textbooks, consisting of five study units for the first and second academic semesters, was analyzed, excluding the introduction, indexes, and "I Can" statements as they are not part of the topic chapters in question. Two teachers, one of whom is a researcher, both with a bachelor's degree, analyzed the sample with the assistance of a curriculum and mathematics teaching methods expert, handling the information confidentially, and accessed only for scientific research.
7. A sample of the 4th grade mathematics textbooks, consisting of five study units in two parts (the first and second academic semesters), was analyzed, excluding the introduction, indexes, and "I Can" statements as they are not part of the prescribed topical chapters.
8. Submitting the study form to judges to ensure face validity (judges' validity). Modifications were made based on the judges' comments.
9. Assigning another analyst, a second-subject supervisor with a close connection to 4th grade mathematics curriculum and analysis experience, to analyze the same sample and compare the results with the previous analyst to measure the stability degree of each analysis. Cooper's and Holsti's equations were used for this purpose.
10. Analyzing the content of the 4th grade mathematics books, identifying reflective thinking skills, and extracting frequencies and percentages.

11. Utilizing the SPSS statistical package for data entry, processing, and analysis.
12. Interpreting the results, discussing them, and providing recommendations and suggestions.

3. Results and Discussion of Analyzing the 4th Grade Mathematics Curriculum

The researchers analyzed the content of the 4th grade mathematics curriculum in Oman, calculated frequencies and percentages, and the overall results are presented in the following table:

Table 6. Results of Analysis of the 4th Grade Mathematics Curriculum

#	The Skills	Total Frequencies	Percentage, Based on Total Frequencies	Total Paragraphs in the Book	Percentage, Based on Number of Paragraphs	Ranking Based on the Most Frequent Skills
1	Visual Thinking	146	15.45%	239 paragraphs	61%	5
2	Error Detection	195	20.63		81.5%	3
3	Reaching conclusions	201	21.27%		84.1%	2
4	Providing Convincing Interpretation	189	20		79	4
5	Suggesting New Solutions	214	22.65%		89.5%	1
	Total	945	100%		-	-

Table 6 shows that the total frequency count for the basic skills of reflective thinking was 945. Reflective thinking skills were incorporated into the 4th grade mathematics curriculum in varying proportions. The skill of suggesting new solutions achieved the highest frequency count, ranking first with a percentage of 22.65%. Reaching conclusions ranked second with 21.27%, followed by error detection at 20.63%, providing convincing interpretations at 20.0%, and finally, visual thinking at 15.45%. These results can be summarized in the following Figure 1.

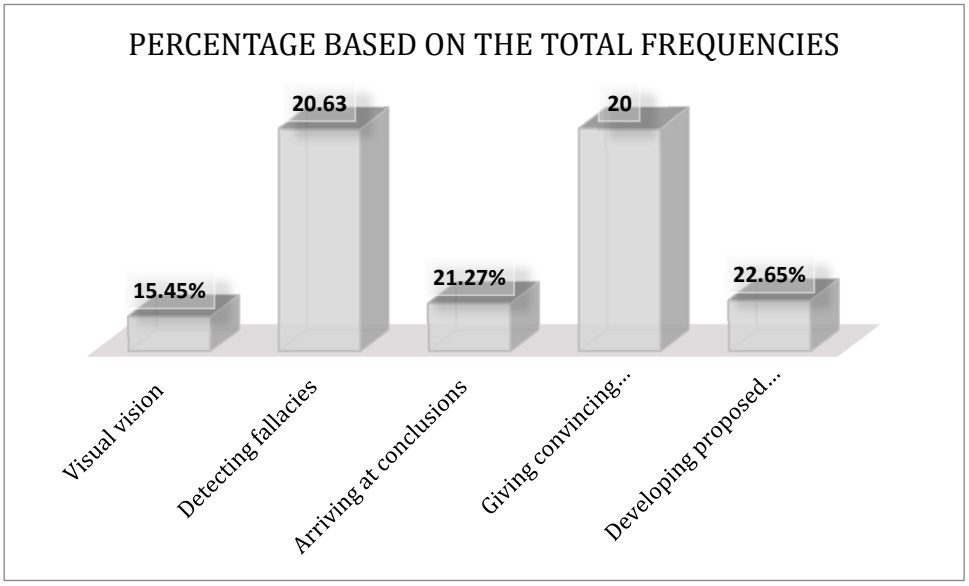

Figure 1. Percentages of Frequencies of the Basic Skills of Reflective Thinking in the 4th Grade Mathematics Course

The number of frequencies was calculated per paragraph, with each paragraph serving as the analysis unit, referring to written passages related to a single applied idea, examples, activities, questions, or discussions (one paragraph each). The results indicate that the skill of "Suggesting New Solutions" achieved the highest degree of availability, with 89.5% considering the number of paragraphs in the book, indicating a very high degree of inclusion in the content of the 4th grade mathematics textbooks. The second-highest inclusion degree went for the skill of "Reaching Conclusions" with 84.1%, followed by "Error Detection" at 81.5%, "Providing Convincing Interpretations" at 79.0%,

and finally, "Visual Thinking" at 61.0%, all indicating a high degree of inclusion in the content of the 4th grade mathematics textbooks.

The previous results highlight the significant attention given to the skill of "Suggesting New Solutions" in the 4th grade mathematics curriculum, achieving a solitary percentage of 22.65% of the total frequencies. This is because it focuses on discussing the book's topics, and ideas within the lesson, training in formulating appropriate assumptions for solutions that suit the presented issue, inquiring into real-life situations, and introducing new issues related to the lesson. However, its percentage in some mathematics textbooks is very low, as found in Al-Shahari's (2017) study. This result differs from Abu Nahil's (2010) study, which indicated that it ranked fourth with a relative weight of 65.71% among reflective thinking skills. It also differs from Al-Khalidi and Saif's (2016) study, which showed that it ranked fourth among reflective thinking skills with a percentage of 18.35%.

It is evident that the skill of "Reaching Conclusions" ranked second, with 21.27% of the total frequencies. This is because of its importance in shifting from a content formulation of memorization and repetition to thinking and inferring, depending on the age stage. In the middle age stage, the development of mental abilities is increasing, and the skill of "Reaching Conclusions" expands the students' horizons, enabling them to link facts together. Therefore, it should be included in mathematics textbooks. Moreover, the subject of mathematics and its scientific content, based on a network of concepts, theories, and generalizations that interlock as tight-knit systems, necessitates that mathematics curricula include the skill of "Reaching Conclusions" to enable students to perceive the relationships between concepts, theories, and laws and re-examine them in light of their previous experiences, benefiting from them in building subsequent knowledge and transitioning students from memorizing to thinking. This result differs from Abu Nahil's (2010) study, which indicated that the skill of "Reaching Conclusions" ranked first with a relative weight of 74% among reflective thinking skills.

The skill of "Error Detection" ranked third, with 20.63% of the total frequencies. This is because of the importance of this skill in constructing concepts, especially in mathematics as well as other subjects in general. Mathematics aims to establish correct concepts and rectify inaccurate ones. It is a skill that builds concepts in mathematics, and the content of the book contributes to analyzing and modifying misconceptions among students. This result aligns with Abu Nahil's (2010) study, which indicated that the skill of "Error Detection" ranked third with a relative weight of 72.63%. Similarly, it agrees with Al-Khalidi and Saif's (2016) study, which stated that it ranked third among reflective thinking skills with a percentage of 21.29%.

The skill of "Providing Convincing Interpretations" ranked fourth, with 20.0% of the total frequencies. This is because of its role in developing thinking by relying on teachers' use of electronic sites, enrichment programs, books, references, and scientific journals, which students refer to, benefiting from them in enriching and expanding on the subject. This agrees with the findings of studies by Al-Shahari (2017), as well as Al-Khalidi and Saif (2016). However, this result differs from Abu Nahil's (2010) study, which indicated that The skill of "Providing Convincing Interpretations" ranked second with a relative weight of 73.31% among reflective thinking skills.

The skill of "Visual Thinking" ranked fifth - and last - with 15.45% of the total frequencies. This is because of its importance in clarifying scientific facts and abstract ideas visually, as it presents facts more clearly than words can convey. Images, drawings, and shapes in the mathematics book significantly support students' understanding of the written cognitive content. This is confirmed by Ibrahim's (2011) study. This result agrees with Abu Nahil's (2010) study, which indicated that the skill of "Visual Thinking" ranked fifth with a relative weight of 63.92% among reflective thinking skills. It also agrees with Al-Khalidi and Saif's (2016) study, showing that it ranked fifth, and last, among reflective thinking skills with a percentage of 2.97%.

Nevertheless, the results of the current study differ from those of Al-Khalidi and Saif (2016), which stated that the most prevalent skill in the mathematics book was "Providing Convincing Interpretations" with a percentage of 34.35%, followed by "Reaching Conclusions" at 22.24%, "Error Detection" at 21.29%, and "Suggesting New Solutions" at 18.35%. They also differ from Al-Shahari's (2017) study, which showed that "Visual Thinking" ranked first with a medium inclusion percentage of 41.79%, followed by "Error Detection" in second place with a medium inclusion percentage of 33.37%, "Reaching Conclusions" with a medium inclusion percentage of 10.34%, "Providing Convincing Interpretations" with a medium inclusion percentage of 7.35%, and finally, "Reaching Conclusions" with 6.52%. The results also differ from Kashko's (2018) study, which ranked the skills as follows: first, "Visual Thinking" with a percentage of 39%, followed by "Suggesting New Solutions" at 22%, "Error Detection" at 16%, "Providing Convincing Interpretations" at 13%, and finally, "Reaching Conclusions" at 10%.

Calculating Frequencies and Percentages for the Degree of Inclusion of Behavioral Indicators Indicative of Each Primary Skill in the Units of the 4th grade Mathematics Curriculum:

First: Visual Thinking Skill

The following table presents the total frequencies and percentages for the Skill of Visual Thinking, which ranked fifth - and last - among reflective thinking skills in the content of the 4th grade mathematics curriculum in Oman.

Results of the Visual Thinking Skill for the 4th Grade in the Mathematics Curriculum

The Skill of Visual Thinking included five behavioral indicators, with frequencies and percentages calculated for each indicator to determine the extent to which it is incorporated into the 4th grade mathematics curriculum for the two semesters.

Index 1 illustrates that the indicative behaviors of the Skill of Visual Thinking had a total of 146 frequencies, which suggests that these indicating behaviors are incorporated into the 4th grade mathematics curriculum. These frequencies for the skill are distributed across the five behavioral indicators as follows:

Indicator 1-3, "showing the relationship between concepts using concept maps and mathematical diagrams," ranked first among the indicators of the Visual Thinking Skill with 33.6%. Indicator 1-2, "simply clarify the drawings, pictures, and shapes of the concept and present its components," ranked second with 30.8%. Indicator 1-1, "presenting the topics discussed in simplified graphics", ranked third with 19.2%. Indicator 1-5, "using drawings, shapes, and pictures to clarify incorrect relationships that may result in incorrect perceptions about the concept and topic, ranked fourth with 15.7%. Finally, Indicator 1-4, "using pictures to present the components of the presented topic," ranked last with 0.68%.

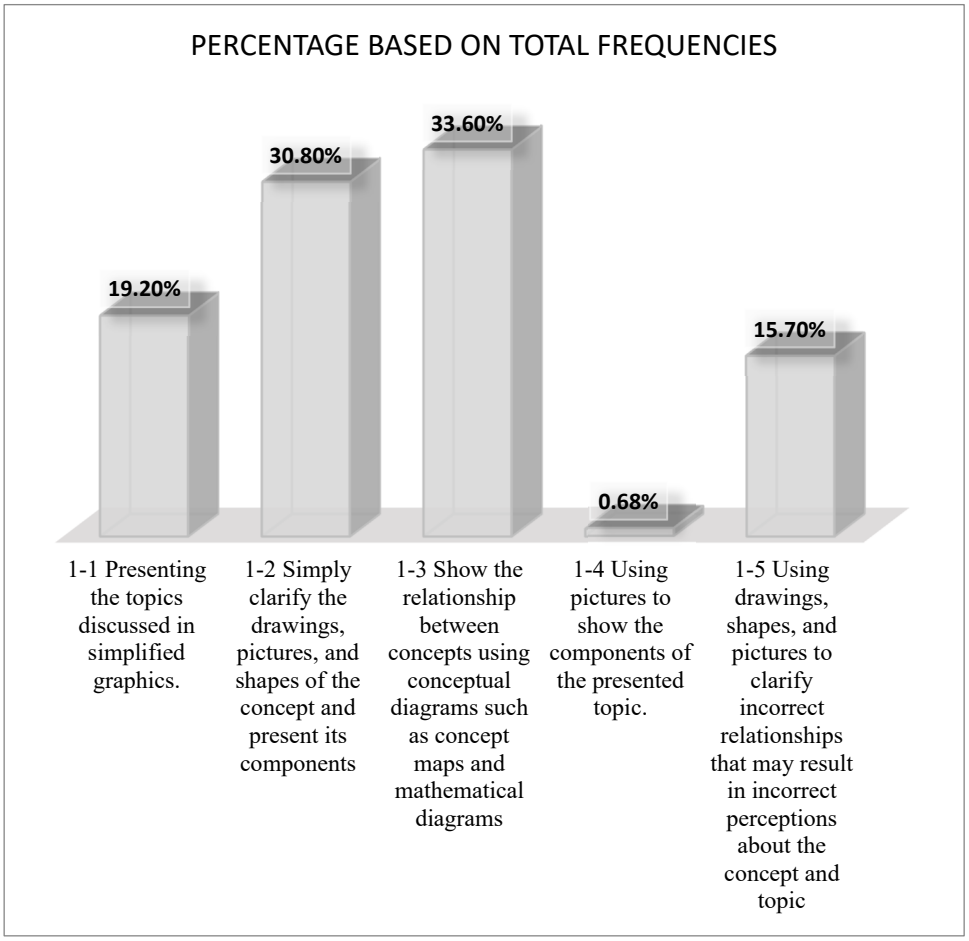

Figure 2. Percentages of total Frequencies of the First Skill Indicators (Visual Thinking) in the 4th Grade Mathematics Curriculum in the Two Semesters

This is because the mathematics curriculum should rely on concept maps to display the relationship between various mathematical concepts, as they facilitate understanding for 4th grade students. It also relies on drawings and illustrative images; presenting the topics as simple drawings, and images are used to demonstrate the components of the problem presented in the lesson. Simple drawings aid in the precise clarification of concepts, and the book considers the importance of this skill as it helps clarify and interpret ideas that are challenging to express in written text. This agrees with Al-Shahari's (2017) study, which indicated that images are characterized by their significant ability to clarify scientific facts and abstract ideas visually, presenting facts more clearly than words can convey.

As for the study units, the highest percentage, 19.2%, came in the first unit, "Numbers." This is because drawings and images help clarify meanings, abstract terms, and abstract concepts of numbers, which are challenging for students in the early stages of primary education to understand without clarification through drawings and images. Many educational studies have confirmed the importance of images in mathematics textbooks for their role in supporting students' understanding of written cognitive content, such as Ibrahim's (2011) study. On the other hand, this skill achieved the lowest percentage, 17.5%, in the fifth unit, "Geometry," because this unit relies on interpretations to reach solutions and understand scientific concepts.

These results can be summarized graphically in the figure 2.

Second: Error Detection Skill

Index 2 presents the total frequencies and percentages for the second skill, Error Detection, which ranked third among the reflective thinking skills in the content of the 4th grade mathematics curriculum.

Results of the Error Detection Skill for the 4th Grade in the Mathematics Curriculum

The Skill of Error Detection included five behavioral indicators, with frequencies and percentages calculated for each indicator to determine the extent to which it is incorporated into the 4th grade mathematics curriculum.

Index 2 illustrates that the indicative behaviors of the Error Detection Skill had a total of 195 frequencies, which suggests that these indicating behaviors are incorporated into the 4th grade mathematics curriculum. These frequencies for the skill are distributed across the five behavioral indicators as follows:

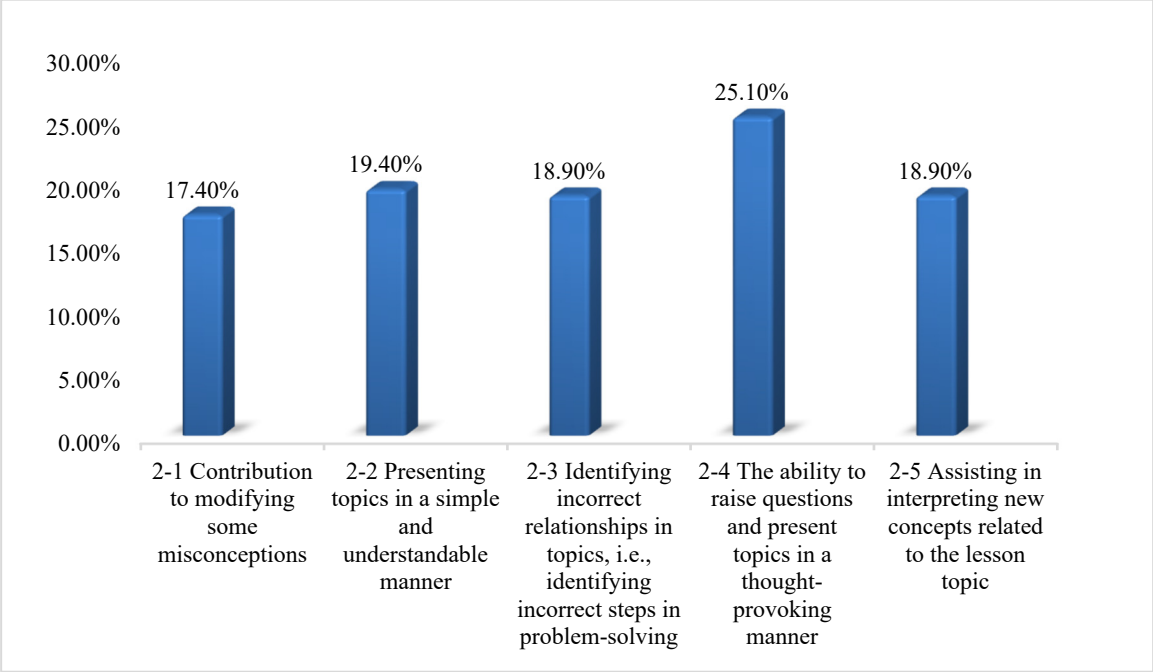

Figure 3. Percentages of Total Frequencies of the Second Skill Indicators (Error Detection) in the 4th Grade Mathematics Curriculum in the Two Semesters

Indicator 2-4, “the ability to raise questions and present topics in a thought-provoking manner,” ranked first among the indicators of the Error Detection Skill with 25.1%. The researchers attribute this to the textbook authors' focus on

explaining abstract concepts in detail, as well as the nature of mathematics, which involves explaining new terms. Indicator 2-2, "presenting topics in a simple and understandable manner," ranked second with 19.4%. Indicator 2-3, "identifying incorrect relationships in topics, i.e., identifying incorrect steps in problem-solving," ranked third with 18.9%. Indicator 2-5, "assisting in interpreting new concepts related to the lesson topic," ranked the same with 18.9%. Finally, Indicator 2-1, "contribution to modifying some misconceptions," ranked last with 17.4%. The researchers attribute this to the fact that 4th grade students still being in the primary education stage, i.e., at the beginning of cognitive formation, without complex conceptions that need modification in the 4th grade mathematics curriculum.

As for the study units, the highest percentage, 24.8%, came in the first unit "Numbers." This is because this unit is more complex, requiring students to distinguish between similar concepts to understand them. Its topics tend to be complex - to some extent - rather than straightforward, suggesting inferences for students to reach the correct solution. On the other hand, this skill achieved the lowest percentage, 6.6%, in the third unit, "Data Handling," because of the simplicity of the topics in the first two units, which rely more on memorization.

These results can be summarized graphically in the figure 3.

Third: Reaching Conclusions Skill

Index 3 presents the total frequencies and percentages for the third skill, Reaching Conclusions, which ranked second among the reflective thinking skills in the content of the 4th grade mathematics curriculum.

Results of the Reaching Conclusions Skill for the 4th Grade in the Mathematics Curriculum

The Skill of Reaching Conclusions included five behavioral indicators, with frequencies and percentages calculated for each indicator to determine the extent to which it is incorporated into the 4th grade mathematics curriculum.

Index 3 illustrates that the indicative behaviors of the Reaching Conclusions Skill had a total of 201 frequencies, which suggests that these indicating behaviors are incorporated into the 4th grade mathematics curriculum. These frequencies for the skill are distributed across the five behavioral indicators as follows:

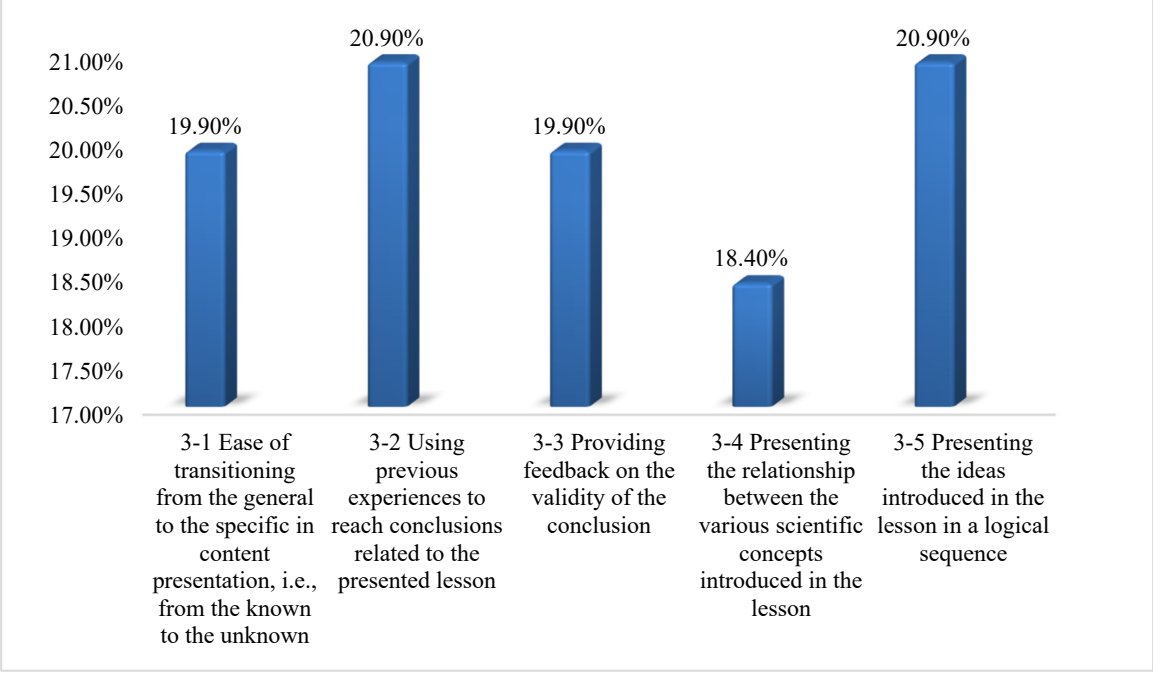

Figure 4. Percentages of Total Frequencies of the Third Skill Indicators (Reaching Conclusions) in the 4th Grade Mathematics Curriculum in the Two Semesters

Indicator 3-2, "using previous experiences to reach conclusions related to the presented lesson," as well as Indicator 3-5, "presenting the ideas introduced in the lesson in a logical sequence," ranked first among the indicators of the Error Detection Skill with 20.9%. Indicator 3-, "ease of transitioning from the general to the specific in content

presentation, i.e., from the known to the unknown," as well as Indicator 3-3, "providing feedback on the validity of the conclusion," ranked second with 19.9%. Finally, Indicator 3-4, "presenting the relationship between the various scientific concepts introduced in the lesson," ranked last with 18.4%.

The researchers attribute this to the importance of this skill (using previous experiences to reach conclusions related to the presented lesson) for the primary stage in particular because thinking at this stage is more flexible. Therefore, content formulation should allow for thinking and inferring rather than memorization solely. This can only be achieved by making use of previously learned information and past experiences, reflecting modern perspectives, and some modern theories in the field of learning, such as constructivism theory.

As for the study units, the highest percentage, 21.4%, came in the first unit "Numbers." This is because this unit is closely linked to students' lives, and it urges them to seek knowledge through the exercises they perform to reinforce information in their minds. On the other hand, this skill achieved the lowest percentage, 9.5%, in both the seventh and eighth units, because of the simplicity of these units, including straightforward exercises performed independently by the student, presenting no difficulty as these exercises require only simple inference processes.

These results can be summarized graphically in the figure 4.

Fourth: Providing Convincing Interpretations Skill

Index 4 presents the total frequencies and percentages for Providing Convincing Interpretations Skill, which ranked fourth among the reflective thinking skills in the content of the 4th grade mathematics curriculum.

Results of Providing Convincing Interpretations Skill for the 4th Grade in the Mathematics Curriculum

The Skill of Providing Convincing Interpretations included five behavioral indicators, with frequencies and percentages calculated for each indicator to determine the extent to which it is incorporated into the 4th grade mathematics curriculum in the two semesters.

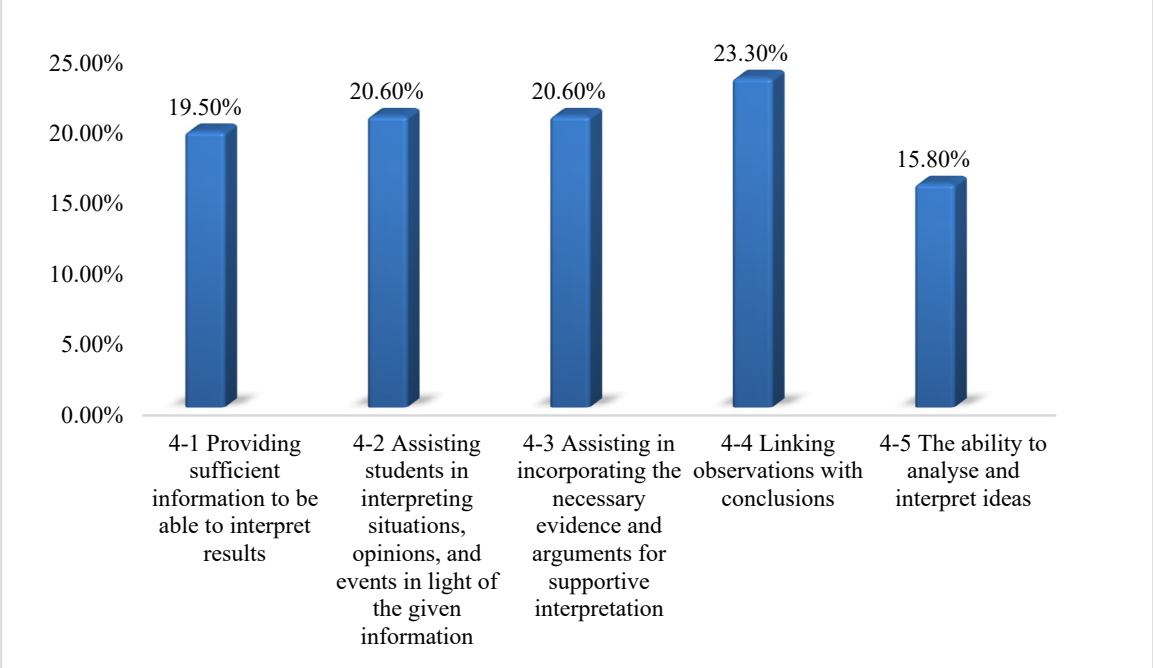

Figure 5. Percentages of Total Frequencies of the Fourth Skill Indicators (Providing Convincing Interpretations) in the 4th Grade Mathematics Curriculum in the Two Semesters

Index 4 illustrates that the indicative behaviors of the Providing Convincing Interpretations Skill had a total of 189 frequencies, which suggests that these indicating behaviors are incorporated into the 4th grade mathematics curriculum. These frequencies for the skill are distributed across the five behavioral indicators as follows:

Indicator 4-4, "linking observations with conclusions," ranked first among the indicators of the Providing Convincing Interpretations Skill with 23.3%. Indicator 4-2, "assisting students in interpreting situations, opinions,

and events in light of the given information," as well as Indicator 4-3, "assisting in incorporating the necessary evidence and arguments for supportive interpretation," ranked second with 20.6%. Indicator 4-1, "providing sufficient information to be able to interpret results," ranked third with 19.5%. Finally, Indicator 4-5, "the ability to analyze and interpret ideas," ranked last with 15.8%.

The researchers attribute the high percentage of "assisting students in interpreting situations, opinions, and events in light of the given information" to the nature of mathematics, which involves explaining new terms in various topics, as well as the textbook's attention to vocabulary and terminology as a primary means of understanding the content.

As for the study units, the highest percentage, 17.4%, came in the first unit "Numbers." This is because this unit includes topics that require clear scientific interpretations. On the other hand, this skill achieved the lowest percentage, 10.1%, in the third unit, "Data Handling."

These results can be summarized graphically in the figure 5.

Fifth: Suggesting New Solutions Skill

Index 5 presents the total frequencies and percentages for the Suggesting New Solutions Skill, which ranked first among the reflective thinking skills in the content of the 4th grade mathematics curriculum.

Results of the Suggesting New Solutions Skill for the 4th Grade in the Mathematics Curriculum

The Skill of Suggesting New Solutions included five behavioral indicators, with frequencies and percentages calculated for each indicator to determine the extent to which it is incorporated into the 4th grade mathematics curriculum in the two semesters.

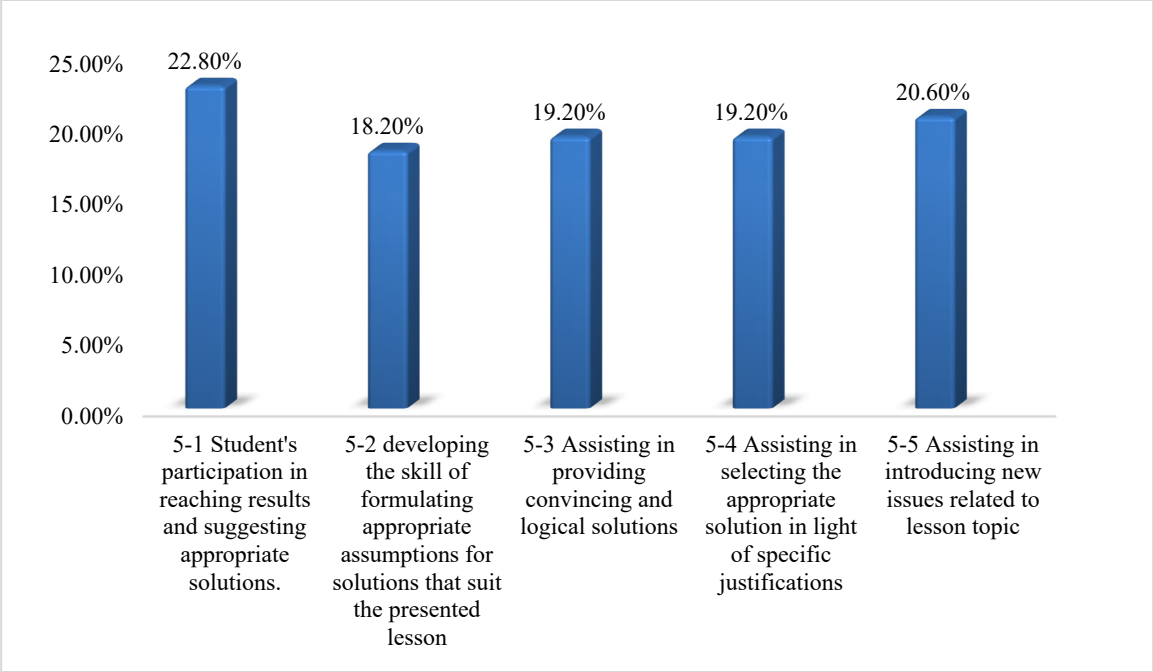

Figure 6. Percentages of Total Frequencies of the Fifth Skill Indicators (Suggesting New Solutions) in the 4th Grade Mathematics Curriculum in the Two Semesters

Index 5 illustrates that the indicative behaviors of the Suggesting New Solutions Skill had a total of 214 frequencies, which suggests that these indicating behaviors are incorporated into the 4th grade mathematics curriculum. These frequencies for the skill are distributed across the five behavioral indicators as follows:

Indicator 5-1, "student's participation in reaching results and suggesting appropriate solutions," ranked first among the indicators of the Suggesting New Solutions Skill with 22.8%. Indicator 5-5, "assisting in introducing new issues related to lesson topics," ranked second with 20.6%. Indicator 5-3, "assisting in providing convincing and logical solutions," as well as Indicator 5-4, "assisting in selecting the appropriate solution in light of specific justifications," ranked third with 19.2%. Finally, Indicator 5-2, "developing the skill of formulating appropriate assumptions for

solutions that suit the presented lesson," ranked last with 18.2%.

The researchers attribute this to the fact that selecting the appropriate solution depends on evaluating the suggested solutions to choose the most proper one that suits the problem's circumstances and variables. Problem-solving requires experience, learning, practice, and knowledge. This is challenging for 4th grade students; thus, the scientific content of the mathematics textbook provides activities to assist students in selecting the appropriate solution in light of specific justifications.

As for the study units, the Skill of Suggesting New Solutions achieved the highest percentage, 22.8%, in the first unit, "Numbers." This is because the first unit relies on concepts and established scientific theories which helps the learner to reach the results and suggest appropriate solutions, in addition to containing fixed laws in numbers and data handling. On the other hand, this skill achieved the lowest percentage, 8.8%, in the seventh and eighth units, which focus on topics that do not rely on the skill of suggesting new solutions as they discuss clear processes based on observation and inference.

These results can be summarized graphically in the figure 6.

4. Conclusion

4.1 Research Results

To answer the research question, the content analysis sheet prepared for this purpose was applied, and the 4th grade mathematics curriculum for the academic year 2020 was analyzed. The validity of the analysis sheet was verified through face validity (arbitrators' validity), and its stability was confirmed by calculating stability over time using Holsti's equation, with an overall stability coefficient of 0.98, which is a high stability ratio. Stability across individuals was also calculated using Cooper's equation, resulting in an overall stability coefficient of 0.95, which is considered a high stability ratio as well.

Statistical processes were performed using frequencies and percentages to determine the extent to which the 4th grade mathematics textbook incorporates reflective thinking skills. The study results revealed that the 4th grade mathematics textbook incorporates reflective thinking skills to a high degree, with varying inclusion percentages. The skill of Suggesting New Solutions achieved the highest repetition count, ranking first with a percentage of 22.65%. Reaching Conclusions ranked second with 21.27%, followed by Error Detection at 20.63%, then Providing Convincing Interpretations at 20.0%, and finally, Visual Thinking at 15.4%.

Based on the study results, it became clear that it is necessary to establish a comprehensive and logical judgment based on the criteria of the content analysis of the textbook content and the appropriate decisions about the quality of the content of mathematics books of the basic education stage according to the reflective thinking. It is an important tool to design content which address this type of thinking in order to develop students' thinking.

This helps students understand the content and deal with it using the evidence included in it and presenting it in the form of reflective ideas that interpretate and address it deeply and objectively, which is reflected in the student's thinking performance and its application in his daily life.

4.2 Research Recommendations

The research result emphasizes the role of researchers and specialists in designing curricula to address reflective thinking in curricula in order to enhance its skills among students, especially since some of its skills support continuous learning to achieve sustainable learning in the era of artificial intelligence and digital transformation.

Consequently, the recommendations have been made:

1. The necessity of working on incorporating the cognitive aspect of reflective thinking skills explicitly into the mathematics curriculum to instill the indicators associated with these skills in students' minds, encouraging them to practice the activities related to reflective thinking skills more effectively.
2. The necessity of linking the reflective thinking activities available in mathematics books at the education stages with students' social life, green education and surrounding environment, enabling them to make connections among prior knowledge, information, and life interactions.

4.3 Research Suggestions

The researchers suggest the following future research and studies:

1. Conducting a study on the design of a mathematics book content that activates the learner's role in the

following aspects of reflective thinking skills: analyzing and interpreting ideas, moving from the general to the specific, using drawings, shapes and images to clarify incorrect relationships.

2. Conducting a study on a suggested proposed for design a mathematics curriculum that includes employing reflective thinking in sustainable learning styles using artificial intelligence.

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Index 1

Frequencies and Percentages for the First Skill (Visual Thinking) for the 4th Grade in Mathematics for the Two Semesters

The First Skill	Indicating Behaviors	First Semester								Second Semester								Total Frequencies	Percentages	Rank
		1st Unit		2nd Unit		3rd Unit		4th Unit		5th Unit		6th Unit		7th Unit		8th Unit				
		Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%			
Visual Thinking Skill	1-1 presenting the topics discussed in simplified graphics	4	2.7%	4	2.7%	4	2.7%	4	2.7%	1	0.68%	6	4.1%	2	1.4%	3	2.1%	28	19.2%	3
	2-1 simply clarify the drawings, pictures, and shapes of the concept and present its components	8	5.5%	4	2.7%	4	2.7%	6	4.1%	5	3.4%	9	6.2%	5	3.4%	4	2.7%	45	30.8%	2
	3-1 showing the relationship between concepts using concept maps and mathematical diagrams	11	7.5%	5	3.4%	4	2.7%	6	4.1%	5	3.4%	9	6.2%	5	3.4%	4	2.7%	49	33.6%	1
	4-1 using pictures to present the components of the presented topic	--	0%	--	0%	--	0%	1	0.68%	--	0%	--	0%	--	0%	--	0%	1	0.68%	5
	5-1 using drawings, shapes, and pictures to clarify incorrect relationships that may result in incorrect perceptions about the concept and topic	5	3.4%	3	2.1%	1	0.68%	5	3.4%	1	0.68%	1	0.68%	4	2.7%	3	2.1%	23	15.7%	4
	Total	28	19.2%	16	10.9%	13	8.9%	22	15.1%	12	8.2%	25	17.1%	16	10.9%	14	9.6%	146	100%	---

Index 2

Frequencies and Percentages for the Second Skill (Error Detection) for the 4th Grade in Mathematics for the Two Semesters

The Second Skill	Indicating Behaviors	First Semester								Second Semester								Total Frequencies	Percentages	Rank
		1st Unit		2nd Unit		3rd Unit		4th Unit		5th Unit		6th Unit		7th Unit		8th Unit				
		Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%			
Error Detection Skill	1-2 Contribution to modifying some misconceptions	7	3.6%	1	0.5%	1	0.5%	6	3.1%	4	2.1%	8	4.1%	5	2.6%	2	1.0%	34	17.4%	4
	2-2 Presenting topics in a simple and understandable manner	5	2.6%	5	2.6%	4	2.1%	4	2.1%	4	2.1%	8	4.1%	4	2.1%	4	2.1%	38	19.4%	2
	3-2 Identifying incorrect relationships in topics, i.e., identifying incorrect steps in problem-solving	10	5.1%	4	2.1%	1	1.0%	7	3.6%	2	1.0%	5	2.6%	5	2.6%	3	1.5%	37	18.9%	3
	4-2 The ability to raise questions and present topics in a thought-provoking manner	10	5.1%	5	2.6%	4	2.1%	7	3.6%	5	2.6%	8	4.1%	5	2.6%	5	2.6%	49	25.1%	1
	5-2 Assisting in interpreting new concepts related to the lesson topic	5	2.6%	4	2.1%	3	1.5%	7	3.6%	5	2.6%	7	3.6%	4	2.1%	2	1.0%	37	18.9%	3
	Total	37	18.9%	19	9.7%	13	6.6%	31	6.6%	20	10.2%	36	18.5%	23	11.7%	16	8.2%	195	100%	---

Index 3

Frequencies and Percentages for the Third Skill (Reaching Conclusions) for the 4th Grade in Mathematics for the Two Semesters

The Third Skill	Indicating Behaviors	First Semester								Second Semester								Total Frequencies	Percentages	Rank
		1st Unit		2nd Unit		3rd Unit		4th Unit		5th Unit		6th Unit		7th Unit		8th Unit				
		Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%			
Reaching Conclusions Skill	1-3 Ease of transitioning from the general to the specific in content presentation, i.e., from the known to the unknown	6	2.9%	5	2.4%	4	1.9%	6	2.9%	4	1.9%	6	2.9%	5	2.4%	4	1.9%	40	19.9%	2
	2-3 Using previous experiences to reach conclusions related to the presented lesson	11	5.5%	5	2.4%	4	1.9%	5	2.4%	4	1.9%	6	2.9%	4	1.9%	3	1.4%	42	20.9%	1
	3-3 Providing feedback on the validity of the conclusion	8	3.9%	4	1.9%	4	1.9%	5	2.4%	5	2.4%	7	3.5%	3	1.4%	4	1.9%	40	19.9%	2
	4-3 Presenting the relationship between the various scientific concepts introduced in the lesson	9	4.4%	4	1.9%	4	1.9%	4	1.9%	5	2.4%	4	1.9%	3	1.4%	4	1.9%	37	18.4%	3
	5-3 Presenting the ideas introduced in the lesson in a logical sequence	9	4.4%	4	1.9%	4	1.9%	5	2.4%	5	2.4%	7	3.5%	4	1.9%	4	1.9%	42	20.9%	1
	Total	43	21.4%	22	10.9%	20	9.9%	25	12.4%	23	11.4%	30	14.9%	19	9.5%	19	9.5%	201	100%	---

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Frequencies and Percentages for the Fourth Skill (Providing Convincing Interpretations) for the 4th Grade in Mathematics for the Two Semesters

The Fourth Skill	Indicating Behaviors	First Semester								Second Semester								Total Frequencies	Percentages	**Rank**
		1st Unit		2nd Unit		3rd Unit		4th Unit		5th Unit		6th Unit		7th Unit		8th Unit				
		Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%			
Providing Convincing Interpretations Skill	1-4 Providing sufficient information to be able to interpret results	6	3.1%	5	2.6%	4	2.1%	5	2.6%	5	2.6%	5	2.6%	3	1.5%	4	2.1%	37	19.5%	3
	2-4 Assisting students in interpreting situations, opinions, and events in light of the given information	6	3.1%	4	2.1%	4	2.1%	4	1.9%	4	2.1%	8	4.2%	5	2.6%	4	2.1%	39	20.6%	2
	3-4 Assisting in incorporating the necessary evidence and arguments for supportive interpretation	8	4.2%	3	1.5%	3	1.5%	6	3.1%	5	2.6%	5	2.6%	5	2.6%	4	2.1%	39	20.6%	2
	4-4 Linking observations with conclusions	10	5.3%	5	2.6%	4	2.1%	6	3.1%	5	2.6%	5	2.6%	5	2.6%	4	2.1%	44	23.3%	1
	5-4 The ability to analyze and interpret ideas	3	1.5%	5	2.6%	4	2.1%	6	3.1%	2	1.0%	4	2.1%	2	1.0%	4	2.1%	30	15.8%	4
	Total	33	17.4%	22	11.6%	19	10.1%	27	14.3%	21	11.1%	27	14.3%	20	10.5%	20	10.5%	189	100%	----

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Frequencies and Percentages for the Fifth Skill (Suggesting New Solutions) for the 4th Grade in Mathematics for the Two Semesters

The Fifth Skill	Indicating Behaviors	First Semester								Second Semester								Total Frequencies	Percentages	Rank
		1st Unit		2nd Unit		3rd Unit		4th Unit		5th Unit		6th Unit		7th Unit		8th Unit				
		Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%	Fs	%			
Suggesting New Solutions Skill	1-5 Student's participation in reaching results and suggesting appropriate solutions	11	5.1%	5	2.3%	4	1.8%	7	3.2%	5	2.3%	8	3.7%	5	2.3%	4	1.8%	49	22.8%	1
	2-5 Developing the skill of formulating appropriate assumptions for solutions that suit the presented lesson	8	3.7%	4	1.8%	3	1.4%	6	2.8%	3	1.4%	6	2.8%	5	2.3%	4	1.8%	39	18.2%	4
	3-5 Assisting in providing convincing and logical solutions	11	5.1%	4	1.8%	3	1.4%	7	3.2%	5	2.3%	6		1	0.46%	4	1.8%	41	19.2%	3
	4-5 Assisting in selecting the appropriate solution in light of specific justifications	10	1.6%	4	1.8%	2	0.93%	7	3.2%	4	1.8%	7	3.2%	4	1.8%	3	1.4%	41	19.2%	3
	5-5 Assisting in introducing new issues related to lesson topics	9	4.2%	5	2.3%	4	1.8%	5	2.3%	5	2.3%	8	3.7%	4	1.8%	4	1.8%	44	20.6%	2
	Total	49	22.8%	22	10.3%	16	7.4%	32	14.9%	22	10.3%	35	16.3%	19	8.8%	19	8.8%	214	100%	--

Acknowledgments

Not applicable.

Authors contributions

Not applicable.

Funding

Not applicable.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Sciedu Press.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.