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Analysis of Palestine's ninth-grade science textbook content in light of the Next Generation Science Standards (NGSS) standards

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Abstract

The researchers used the descriptive analytical method to determine the extent of inclusion of the Next Generation Science Standards (NGSS) standards in the science textbook for the ninth grade, and the study instrument was a content analysis card based on a list of (NGSS) standards. They also used many treatments and appropriate statistical methods to achieve the study's objectives. The study's most notable findings included the availability of (NGSS) standards in an acceptable format in a basic ninth-grade science textbook, which were distributed as follows:

The availability of the standards of the basicDisciplinary core ideas was found to be 22 percent, while the standard ofscience and engineering practices was 43 percent, followed by the standard ofCrosscutting Conceptsat 34 percent. The study concluded with a set of recommendations, including reviewing some of the (NGSS) standards included in the science book for the ninth grade, which are the standards of Disciplinary core ideas.

Keywords: (NGSS) standards, Content analysis.

INTRODUCTION

We all know that our age is not traditional or ordinary; we live in a world where technology is the primary means of managing and controlling life, and this necessitates a review of the methods we use to educate our children, as well as a look at the technological tools in our schools and laboratories to see if they are still appropriate for education in this technological age, or have they become obsolete, such as overhead projectors and photocopiers that were once considered the pinnacle of technology.

Science curricula are extremely important and play a significant role in the advancement of societies, as they are used to provide a scientifically educated citizen with a high level of efficiency and performance. This is accomplished through science education that focuses on what the learner does himself under the supervision and guidance of the teacher, and where science education views it as a process that makes scientific inquiry the focus of learning (Khatabia, 2011, p.23).

It was necessary to modify people's attitudes toward science education, to make science curricula more significant in the spread of science, to simplify it, and to equip people to adapt to technological advances and face and solve challenges in their environments (Dahman, 2014, p.106).

Because the book is considered the actual translation and official document of educational curricula, as well as the most important educational source for the learner and the teacher because of its educational value, it was necessary to choose its components very

carefully in order to achieve the educational goals hoped for, and the past years have seen a great interest in the development of science curricula at the international and local level,to reduce the gap between scientific and technological progress and science learning (Al-khawalda, 2005, p.41)

The campaign for science education standards began in the 1990s, and was followed by a series of publications on science education and scientific education standards (NSES) to ensure the quality of science education (Ghaeb, 2016).Many field studies and research conducted by international organizations interested in Science Education in the United States of America (NRC 2012) revealed the weakness and failure of learners' results in international tests of Science and mathematics (TIMSS), as well as a lack of noticeable development of learners since 2017 (Phillips, 2015). Previous research have also identified flaws in existing scientific curricula specifically in the integration between science, mathematics and language curricula.In addition to the separation of science branches, the lack of emphasis on scientific practices in science education, the difference from the performance-based assessment (NSTS 2012), and as a result of the shortcomings of the national standards of scientific education (NSES), The Next Generation Science Standards (NSES) have been developed and are based on the general framework of science teaching from kindergarten to high school, which aims to focus on the science and engineering practices of learners under the supervision of the National Research (NRC) in 2013 (Riwaqa, 2016, p.455).

The Next Generation Science Standards (NGSS) outline a modern vision of student education and science teaching, as well as what science instruction should be like in the twenty-first century.They are standards that emphasize the integration of three dimensions in science education: science and engineering practices (SEPs), Disciplinary Core Ideas (DCI), and Crosscutting concepts (CCS), where learners are observed using science and engineering practices through the design of experiments and computer programs, and the application of Crosscutting Conceptsfor a deeper understanding of the basic ideas in the following branches of science (physics - earth - biology – science and engineering) throughout the years of study from kindergarten to secondary school.In contrast to the previous science standards (NSES), which focused on memorizing and information, these standards explain the desired performance of the learner by focusing on understanding and application through scientific investigation and engineering design (teachers.Retrieved 5 22, 2017).

Many studies have been conducted on the (NGSS) standards, including the (Rowland, 2014) study, which demonstrated the effectiveness of the (NGSS) standards in the development of learners' understanding of motivation, as well as the Bowman and Govell (2014) study on the (NGSS) standards, whose findings explained the importance of the (NGSS) standards in the transition dynamic standards that focus on learning, critical thinking, linking practice, and scientific content.

Problem statement: Many conferences, including the Egyptian society of curricula's twenty-first scientific conference (2009), the Egyptian society of curricula's second international scientific conference (2014), the first international conference of curricula in Sudan (2015), and the educational development conference in Jordan (2015), emphasized the need to develop and address science curricula in the Arab world.Current curricula are unable to prepare students for the twenty-first century because they lag behind current global trends in science education. The findings of educational studies in the Arab world, such as Al-Ghamdi study (2012), Al-Fahidi study (2012), AL-Shaili study (2010), and Hijazi study (2014), all agreed on the importance of taking into account current global trends in current science curricula and addressing vulnerabilities in order to prepare students to serve their communities. The Al-Shamrani et al. (2016) study emphasized the need to restructure science textbooks in Saudi Arabia in order to harmonize current international standards, and the current study seeks to analyze the content of science textbooks for the ninth grade in

order to reveal the extent to which they include the (NGSS) standards.

Questions: The study questions are derived from the following basic question “What are the NGSS standards contained in the ninth grade science textbook?”

Sub-questions:

1. What (NGSS) standards should be available in ninth grade science textbooks?

2. How much of the (NGSS) standards are included in ninth grade science textbooks?

Objectives: The current study aims to:

1. Identify the (NGSS) standards that should be included in ninth grade science textbooks.

2. Reveal the extent of (NGSS) standards inclusion in ninth grade science textbooks.

Importance: The importance of the study lies in the following:

1. List the Next Generation Science Standards (NGSS).

2. Highlighting current worldwide trends that are important for science curriculum development.

3. Draw the attention of people involved in curriculum planning and development to the need to develop present science curricula in order to align them with the Next Generation Science Standards (NGSS).

4. Develop an analytical instrument for The Next Generation Science Standards (NGSS) that may be used in other science curricula research at all levels of education.

Limitations:

- Objective limitations: the objective limits of the study were limited to the analysis of the content of ninth grade science textbooks.

- Time limitation: 2020-2021 Academic year.

Terminology:

Content Analysis: Procedurally (as defined by the researchers): A scientific method for displaying and collecting data and information in a quantitative and organized manner, and then organizing them according to common standards in the content of ninth-grade science textbooks in order to determine the extent to which they include the Next Generation Science Standards (NGSS).

Next Generation Science Standards: Researchers adopt the definition of (Bybee, 2014): Standards describing a modern vision of Science Education and Learning, based on the National Research Council's (NRC, 2012) general framework for teaching K-12, which includes three dimensions (Crosscutting Concepts, Disciplinary Core Ideasin the branches of Science, and Science and Engineering practices), where science education is based on the integration of those three dimensions through engineering and scientific design, as well as the application of cross-cutting and interdisciplinary approaches.

Theoretical framework and previous studies:

Next Generation Science Standards:

NGSS standards are considered to be modern set standards that appeared in 2013, they were created to keep up with the twenty-first century and to equip future generations to meet the demands of the time. The Next Generation Science Standards (NGSS) were created using recent field research and the basic framework of Science Education from kindergarten to high school in order to identify the dimensions needed by the learner and to focus on understanding and combining science and engineering.

Definition:

The NGSS Standards emphasize the need to practice and connect science and engineering to the discipline's main science-related principles;that's in order to prepare individuals for the challenges and requirements of the Twenty-First Century, many definitions of the NGSS standards were presented, including the definition of the “Nsts 2012” site: NGSS standards are based on the integration of the three dimensions in the form of expected

performance, and include these dimensions (Disciplinary Core Ideas, Science and engineering practice, and Crosscutting Concepts).

Reiser 2013 defines NGSS standards as standards that have been developed on the basis of the necessity to make scientific education interesting and effective for students by combining the three dimensions:

Disciplinary Core Ideas (DCI), where the focus shifts from a large amount of scientific content in the complicated sciences to a small number of profound and scientifically developed ideas across grades and stages of study from K to 12.

Science and Engineering Practices (SEP), it focuses on the great role of scientific and engineering practices, to develop key ideas through scientific investigation, understanding of phenomena and model building.

Crosscutting Concepts (CCS), focuses on the development of interpretive ideas, where science education is focused on the requirements of learners and requires the development of coherent and sophisticated scientific ideas.

“Pratt (2013)” site mentions that NGSS standards were developed to highlight the signed performance of learners so that the three dimensions of each of the (NGSS) standards are connected, and the study stage and the different subjects and materials are also connected. It was formulated in general in the form of a table of three sections (performance expectations, main fund, and associated fund).

Performance expectations: In the form of a title and a scientific code, which provides the predicted results on a report sentence that includes the three aspects listed below (concepts, practices, and ideas)

-Explanatory sentence supported by examples of expected performances.

-Assessment limits: indicate the extent to which the class is expected to perform.

-Engineering correlations that demonstrate expected performance by integrating the link between science and engineering through practice and key ideas.

Main fund: and it include the following 3 dimensions:

1- Internal blue box: explains science and engineering practices dimension.

2-internal Orange Box: explains Core disciplinary ideas dimension.

3-internal Green Box: explains Crosscutting concepts dimension.

Associated fund: comes after the main fund it describes the main ideas in the specialization that are taught in the same class, demonstrates the relationship between basic mathematical ideas and the Arabic language, and shows the relationship between basic specialization ideas and those taught in the lower and upper classes.

Expected performance:

1-Practices in science and engineering (blue color indication: practices in science and engineering have been prepared to form the performance above).

2-Disciplinary core ideas (indication of the Color Purple: phrases transferred from the framework of Science Education).

3 - Crosscutting concepts (green color indication: phrases derived from the framework of Science Education that apply to performance).

Correlation/connected to:

- Other branches of science taught in the same class.

- Main specialization ideas taught by younger students and older students.

- The main ideas taught in mathematics and English.

According to the researchers' conclusion from the above, the NGSS standards are more general than previous Science standards, and focus on expected performance through the

idea of integration between the three dimensions (ideas, concepts, and practices), in order to provide a good education for the community, and prepare cadres scientifically and professionally to be qualified for the twenty-first century, and focuses on depth in addressing the basic scientific ideas of science through scientific investigation, and the construction of engineering models as an engineering and scientific practice for disciplinary core ideas and crosscutting concepts between science and engineering.

Next Generation Science standards (NGSS) components:

Composed of the following three dimensions:

Disciplinary Core Ideas DCI

Science and Engineering practices SEP

Crosscutting Concepts CCS

Disciplinary Core Ideas:

It concentrates on a small number of specialized scientific ideas and gives learners more time to explore each one in more depth, including time for scientific investigation, argument, and the values of the ideas given.

It also focuses on science and engineering education in order to facilitate the cognitive integration of scientific explanations, cognitive content with engineering, and scientific procedures that need to be examined, as well as engineering design, it also includes the following key interdisciplinary ideas:

First domain: Physical science:

The interactions of matter (structure of matter, chemical reactions, and nuclear processes) Energy (definitions of energy, conservation and transfer of energy, the relationship between energy and force), motion and constancy (forces and motion, types of reactions, stability and instability of systems), waves and their applications in the technology of information transfer (properties of waves, electromagnetic radiation, information technologies and their tools)

Second domain: Life science:

From molecules to living organisms (structure and function, growth and development of organisms; Organization of matter and energy production in organisms, information processes).Ecosystems (interdependent linkages in ecosystems, matter and energy transfer cycles in systems, ecosystem dynamics and functioning, social interactions), genetics (trait inheritance, trait variability), biological evolution (evidence of common ancestry, natural selection, adaptation, biodiversity and humans).

Third domain: Earth and Space Science:

The earth's location (universe and stars, Earth and solar system, history of Planet Earth), Systems Ecology (Earth's materials and systems, plate formations and system interactions, water's involvement in Earth's surface processes, weather and climate, biogeography) Earth and Human activity (natural resources, natural hazards, human impacts on natural systems, global climate change).

Fourth domain: Engineering, Technology, and Applications of Science:

Engineering design (identification and definition of an engineering problem, development of feasible solutions, optimization of design), the relationship between engineering, technology, science and society (the interdependence of Science, Engineering and technology, the impact of Engineering, Technology and science on society).

Science and Engineering Practices:

Integration of scientific and engineering practices helps learners understand cognitive and scientific development, and practices allow them to investigate, build models, and discover science. Engaging in engineering practices helps learners understand engineering and link science and engineering,and learners can solve society's present concerns and problems (effective energy generation, disease treatment and prevention, keeping a clean supply of water, and solving problems related to global

environmental change) these science and engineering practices include the following:

Asking questions (for science) and defining problems (for engineering)

Developing and using models

Planning and carrying out investigations

Analyzing and interpreting data

Using mathematics and computational thinking

Constructing explanations (for science) and designing solutions (for engineering)

Engaging in argument from evidence

Obtaining, evaluating, and communicating information

Crosscutting Concepts:

Shared concepts are useful in science because they help students link and adjust basic ideas, and their application enriches scientific and engineering methods and comprehension of key ideas, allowing them to create a cumulative and coherent understanding of science and engineering.

The concepts:

Patterns

Cause, effect, mechanism and explanation

Scale, proportion, and quantity

Systems and system models

Energy, matter, flows, cycles, and conservation

Structure and function

Stability and change

NGSS standards characteristics:

According to NGSS lead stats, the (NGSS) standards include various qualities and characteristics that distinguish them from previous National Science Education Standards (NSES).

(NGSS) standards reflect the internal connection of the nature of science as practice and discovery to the outside world: The general framework on which the (NGSS) standards are established is designed to illustrate the picture of science in science and engineering in terms of learners engaging in scientific and engineering practices at various stages of their studies and applying common concepts to a deeper understanding of the fundamental ideas in their fields, as well as students engaging in the three dimensions (ideas, concepts, practices).

(NGSS) standards depict the learner's expected performance: the standards represent the learner's expected performance at the end of a class or stage of study.

The NGSS standards show scientific concepts and ideas in a coherent way by focusing on basic ideas in science and engineering, which is the key to linked science education, where the basic ideas are not covered for each academic year, but rather cover the evolution of knowledge from one class to the next and give the learner the opportunity to learn overlapping ideas in order to fully understand science by the end of high school.The previous Science Curriculum teaches a set of isolated facts that are not interconnected but within the framework of K - 12, however NGSS standards aims to build a coherent scientific knowledge with the aim of creating a scientific culture while focusing on a limited number of scientific ideas, and consider what the learner must learn and teach in the current and subsequent year with the deletion of repeated content and giving the learner responsibility for progress and development

The (NGSS) standards emphasize both deep understanding and application of scientific content: focusing on the primary specialized ideas is not required in (NGSS); what matters is that those ideas are integrated and linked with common practices and concepts.

The NGSS Standards are aimed to educate students for universities, citizenship, and professional life. They are founded on a strong scientific foundation that links

knowledge to reality and its challenges, as well as using, producing, and spreading information.

The NGSS standards are linked to the standards for teaching language and mathematics: the purpose of linking them to the standards for language and mathematics is to develop the learner's language and mathematical skills, and it is recognized that mathematics is the language of science, and that science cannot be taught without mathematics or language.

Procedure:

The methodology: The researchers employed an analytical descriptive technique in this study, which included content analysis of the ninth-grade science and life curriculum in light of the (NGSS) standards.

Population: The study population is represented by the ninth-grade book Science and Life, both parts in the first and second semester, within the Palestinian curriculum in Gaza and the West Bank for the academic year 2018-2019.

Instrument: The current study instrument, which consisted of a list of (NGSS) standards, was translated and then turned into a content analysis card, and the following is a thorough description of how the researchers used the instrument and determined its psychometric features.

First: By using the list of the New Generation Science standards (NGSS).

Their objective was to identify the (NGSS) requirements that needed to be met in the ninth-grade science textbook.

Content Analysis instrument description:

Analysis objective: Determine the quantity of information in Palestinian ninth-grade science textbooks that met the New Generation Science Standards (NGSS) in the school year 2020-2021.

Analysis sample: The first and second semesters, which are made up of two books, reflected the analysis sample of all the material of the topics of Palestinian ninth grade science textbooks that were used in the academic year (2020/2021).

Analysis categories: The categories of the analysis in this study are the Next Generation Science Standards NGSS, which are represented by the standards included in the content (Disciplinary Core Ideas of Science and Engineering, Scientific and Engineering Practices, Crosscutting Concepts).

Analysis units: The researchers adopted the paragraph as a content analysis unit for its relevance to the subject of the study.

Registration unit:

It is the smallest part in the study material's content that will be subjected to analysis by the researchers, and it is subjected to counting and measurement, and its absence or appearance is considered to have a certain significance in the results of the analysis, the researchers have adopted the paragraph in this study as a unit of registration.

Analysis process regulations:

Regulations must be established to control the analysis process, and the following regulations have been found by researchers:

The analytical procedure covers all of the subjects covered in the first and second academic year editions of the ninth grade science textbooks (2018-2019).

A teacher's guide or any pamphlets related to the books will not be included in the analysis procedure.

The book's preface, index, and cover were not included in the analysis.

Each lesson's activities and calendar questions, as well as the end of each study module, were included in the analysis.

If received in the form of 1 – 2 – 3...) And so on, anything that branches from the question or activity of sub-items was considered a repetition.

List sources: The list was compiled from a variety of sources, including educational

literature and previous studies on (NGSS) standards.

Final image of the list: The list of NGSS standards indicators, which must be met in the content of the ninth grade science textbook, grew to include (21) sub-indicators and (3) main standards, which are as follows:

Disciplinary core ideas, which included four sub-standards. Physics has four parts, life science has four parts, earth and space has three parts, and engineering and its applications has five parts.

Scientific and engineering practices included 10 sub-standards.

Crosscutting concepts included 7 sub-standards.

NGSS standards validity: A list that is all set and ready and does not need to be presented to arbitrators, as this list has been ruled by scientists and presented to a large number of specialists, and was used in dozens of Arab and foreign studies, but it was presented to the arbitrators to judge the translation, and the form in which the analysis card was presented.

The researchers converted the assembled set of (NGSS) standards into a content analysis card, which included (21) indications distributed across (3) standards in its final form.

Instrument validity: The researchers analyzed the material with the help of another science teacher, where the analysis and procedures were agreed upon, and then each of them was given the required analysis to work on reaching the results individually. The first book was chosen at random, and the percentage of agreement between the analysts was calculated using the Holsti equation. (Taima, 2008, p. 226)

R= 2A/(N1+N1)

R= stability coefficient according to Holsti

M= Points of agreement between researchers

N1= Analysis of the first researcher

N2= Analysis of the second researcher

According to several researchers, the lowest value of the two analyses was utilized in the numerator because it was closest to the correct results, and the following table indicates the value of consistency.

Table (1): *calculation of constancy of the content analysis of ninth grade science textbook of (NGSS) standards:*

#	Skill	Skill classification	Analyst I	Analyst II	Agreement points	Stability coefficient
1	NGSS standards	Disciplinary Core Ideas	166	168	148	%88
2		Science and engineering practices	142	125	112	%83
3		Crosscutting Concepts	102	104	91	%88
4		Total	410	397	351	%87
5		Overall stability coefficient				%87

The value of the coefficient of stability appeared to be 87 percent in the previous Table (1), indicating that the analysis card has a high degree of stability that can be relied upon in the analysis of the content of ninth grade science textbooks, as (Taima, 2008, p.226) pointed out that the coefficient of stability must not be less than 60 percent to be adopted.

Statistical treatments:

The researchers in this study used repetitions and percentage to analyze the data collected.

Answer and discussion on the first question:

The first question “What (NGSS) standards should be available in ninth grade science textbooks?”

To answer this question, the researchers obtained a list of NGSS standards by reviewing some studies that dealt with NGSS standards, translated the list, and then presented it to a number of arbitrators and specialists in curricula and teaching methods to confirm the wording and translation, where the list, in its final form, consisted of three basicstandards under which 21 sub-indicators are as shown in Table No. (2):

Table (2) *shows the number of dimensions, NGSS standards and indicators that were adopted after being presented to the arbitrators by the researchers*

Standard	#	Indicators	frequency	
Disciplinary Core Ideasfor science and engineering	1	Incorporate Physical Science, which includes:	First semester	Second semester
	A	Subject composition and its characteristics	29	16
	B	Chemical reactions	12	58
	C	Energy and stability	24	12
	D	Waves and Their Applications in Technologies for Information Transfer	4	13
	Total		69	99
	2	Incorporate content for Life Science, which includes:		
	A	Environmental systems	27	32
	B	Heredity	0	0
	C	Biological evolution in terms of unity and diversity	21	14
	D	Structure and function of molecules to the organism	23	18
	Total		71	54
	3	Incorporate content for Earth and Space Science, which includes:		
	A	Location of the Earth in the universe	11	6
	B	Ground systems	13	9
	C	Earth and human activity	8	5
	Total		32	20
	4	Incorporate content for Engineering, Technology, and Applications of Science, which includes:		
	A	Knowing and identifying the engineering problem	8	21
	B	Solving engineering problems	8	12
	C	Improving engineering design	12	23
	D	The impact of engineering and technology on society	3	8
	E	Reciprocal dependence between engineering, science and technology	2	7
	Total		33	71
	Grand total		205	244
Science and engineering practices	1	Planning and carrying out investigations of the studied phenomenon.	69	58
	2	Asking questions about the phenomena	48	52
	3	Problem identification and engineering design	26	28
	4	Developing and using models	44	49
	5	Analysis and interpretation of data	41	46
	6	Mathematical and computational thinking	32	24
	7	Engaging in argument from evidence	54	52
	8	Design of geometric solutions to the studied problem or phenomena	47	51

	9	Building scientific explanations for phenomena	46	47
	10	Obtaining, evaluating, and communicating information	36	32
	Grand total		443	439
Crosscutting Concepts	1	Note the patterns and forms of school phenomena.	51	56
	2	The use of Scale, Proportion, and Quantity of the studied phenomena.	53	61
	3	The concept of energy and matter (flow, cycles, conservation) of the phenomena studied	42	35
	4	Structure and function of the studied phenomena	37	26
	5	Stability and change of the studied phenomena	35	44
	6	System and system building models	45	53
			62	78
	Grand total		325	353

The second question “How much are the standards of (NGSS) included in ninth grade science textbooks?”

To answer this question, the researchers applied the Content Analysis instrument that was prepared for this objective, and analyzed the Palestinian ninth grade science textbooks in its first and second parts, which were used in the academic year 2018/2019, and then calculate the repetitions and percentages for each dimensionin the ninth grade textbooks in its first and second parts.

First: Results of the ninth grade science textbook analysis, part I:

The researchers applied the Content Analysis instrument to the science textbook's first part and calculated the frequency and percentage of each of the three dimensions of The NGSS standards in the textbook, the results were as shown in Table (3):

Table (3): *NGSS standards analysis results in the ninth grade science textbook (part I)*

dimension	Frequency	%
Disciplinary Core Ideas for science and engineering	205	21.07
Science and engineering practices	443	45.53
Crosscutting Concepts	325	33.4
Total	973	100

The researchers then analyzed the book and found the ratio of each standard of the standards for the three basicdimensions in the content of the science textbook developed for the ninth grade (part I) as follows:

First: Disciplinary Core Ideasfor science and engineering:

The dimension of Disciplinary Core Ideasincluded (4) basic standards, including (16) sub-index, where the frequency and percentages were calculated to determine the availability of the dimension of Disciplinary Core Ideasin the science textbook developed for the ninth grade (part I).Table (4) show the frequencies and percentages of the basic science and engineering specialty ideas dimension and its availability in the textbook:

Table (4): *Disciplinary Core Ideasdimension analysis resultsof the ninth grade (part I)*

Dimension/ Disciplinary Core Ideasfor science and engineering			
#	Main standards	frequency	%
1	Incorporate Physical Science	69	33.66
2	Incorporate content for Life Science	71	34.63
3	Incorporate content for Earth and Space Science	32	15.61
4	Incorporate content for Engineering, Technology, and Applications of Science	33	16.1
Total		205	100

Second: Science and engineering practices

The dimension of Science and engineering practices included (10) sub-indicators, where the frequency and percentages were calculated to know the availability of the dimension of Science and engineering practices in the science textbook for the ninth grade (part I), and table (5) show the frequencies and percentages of the scientific and engineering practices dimension and its availability in the book:

Table (5) *Science and engineering practicesdimension analysis results of the ninth grade (part I)*

Dimension/ Science and engineering practices			
#	Main standards	frequency	%
1	Planning and carrying out investigations of the studied phenomenon.	69	15.58
2	Asking questions about the phenomena	48	10.84
3	Problem identification and engineering design	26	5.87
4	Developing and using models	44	9.93
5	Analysis and interpretation of data	41	9.26
6	Mathematical and computational thinking	32	7.22
7	Engaging in argument from evidence	54	12.19
8	Design of geometric solutions to the studied problem or phenomena	47	10.61
9	Building scientific explanations for phenomena	46	10.38
10	Obtaining, evaluating, and communicating information	36	8.13
Total		443	100

Third: Crosscutting Concepts:

The Crosscutting Conceptsdimension included 7 standards, where the frequency, percentages were calculated to know the availability of the crosscutting concepts dimension in the ninth grade science textbook (part I), table (6) show the frequencies and percentages of the crosscutting concepts dimension and its availability in the textbook:

Table (6): *Crosscutting concepts dimension analysis results of the ninth grade (part I)*

Dimension/ Crosscutting Concepts			
#	Main standards	frequency	%
1	Note the patterns and forms of school phenomena.	51	15.69
2	The use of Scale, Proportion, and Quantity of the studied phenomena.	53	16.31
3	The concept of energy and matter (flow, cycles, conservation) of the phenomena studied	42	12.92
4	Structure and function of the studied phenomena	37	11.38
5	Stability and change of the studied phenomena	35	10.77
6	System and system building models	45	13.85
7	Cause, effect, mechanism and explanation of the phenomena studied	62	19.08
Total		325	100

According to researchers, the distribution of the ratios of indicators was good to meet the school stage, age, and issues of the content of the scientific textbook for the ninth grade, as shown in table no (6) above.

Second: the results of the ninth grade science textbook analysis- Part II:

The researchers applied the Content Analysis instrument to the second part of the science textbook and calculated the frequency and percentage of each of the three dimensions of the NGSS standards in the textbook, the results were as shown in Table (7):

Table (7): *Results of the NGSS standards analysis in the ninth grade science textbook (part II)*

Dimension	Frequency	%
Disciplinary Core Ideasfor science and engineering	244	23.67
Science and engineering practices	434	42.1
Crosscutting Concepts	353	34.24
Total	1031	100

The researchers attribute these ratios to the nature of the science taught for ninth grade and the age level of students as these ratios are appropriate for age and content.

The researchers then analyzed the book and found the ratio of each of the standards for the three main dimensions in the content of the ninth grade science textbook (part II) and they were as follows:

First: Disciplinary core ideas for science and engineering

The dimension of disciplinary core ideas of Science and engineering consisted of four main standards and sixteen sub-indexes, with the frequency and percentage calculated to determine whether the dimension of disciplinary core ideas of Science and engineering was available in the ninth grade science textbook (Part II).

Table (8) displays the frequency and percentage of the Science and Engineering dimension's disciplinary fundamental ideas, as well as their availability in the book's content.

Table (8): *results of the ninth grade science textbook analysis in the disciplinary core ideas of Science and engineering dimension (Part II)*

Dimension/ Disciplinary Core Ideas for science and engineering			
#	Main standards	frequency	%
1	Incorporate Physical Science	99	40.57
2	Incorporate content for Life Science	54	22.13
3	Incorporate content for Earth and Space Science	20	8.2
4	Incorporate content for Engineering, Technology, and Applications of Science	71	29.1
Total		244	100

Table No. (8) shows that it came in last place for including content of Earth and space science by 8.2, which is a low percentage compared to the rest of the indicators and the first part; and the researchers attribute this weakness to the fact that the first part discussed space and the universe and the second part did not, implying that the book content in the first and second parts as a whole discusses the universe and space appropriately.

Second: Science and engineering practices:

The dimension of science and engineering practices included (10) sub-indicators, where the frequency and percentage were calculated to know the availability of the science and engineering practices dimension in the ninth grade science textbook (Part II), and Table (9) shows the frequency and percentage of science and engineering practices and their availability in the content of the book:

Table (9): *results of the ninth grade science textbook analysis in the science and engineering practicedimension(Part II)*

Science and engineering practices			
#	Main standards	frequency	%
1	Planning and carrying out investigations of the studied phenomenon.	58	13.21
2	Asking questions about the phenomena	52	11.85
3	Problem identification and engineering design	28	6.38
4	Developing and using models	49	11.16
5	Analysis and interpretation of data	46	10.48
6	Mathematical and computational thinking	24	5.47
7	Engaging in argument from evidence	52	11.85
8	Design of geometric solutions to the studied problem or phenomena	51	11.62
9	Building scientific explanations for phenomena	47	10.71

10	Obtaining, evaluating, and communicating information	32	7.29
Total		394	100

It is clear from Table No (9) above that this gradation and diversity in indicators is attributed by researchers to the large variety of topics in the content of the science textbook for the ninth grade.

Third: Crosscutting Concepts

The dimension of crosscutting concepts included (7) concepts, where the frequency and percentage were calculated to determine the availability of the crosscutting concepts dimension in the ninth grade science textbook (Part II).

Table (11) shows the frequency and percentage of the crosscutting concepts dimension and their availability in the content of the book.

Table (10): *results of the ninth grade science textbook analysis in the crosscutting concepts dimension (Part II)*

Dimension/ Crosscutting Concepts			
#	Main standards	frequency	%
1	Note the patterns and forms of school phenomena.	56	15.86
2	The use of Scale, Proportion, and Quantity of the studied phenomena.	61	17.28
3	The concept of energy and matter (flow, cycles, conservation) of the phenomena studied	35	9.92
4	Structure and function of the studied phenomena	26	7.37
5	Stability and change of the studied phenomena	44	12.46
6	System and system building models	53	15.01
7	Cause, effect, mechanism and explanation of the phenomena studied	78	22.1
Total		533	100

The three dimensions content in the science textbook for the ninth grade in its first and second parts:

To reach the final results, the researchers present the following comparison between the ratios for each dimension of the NGSS standards in ninth grade science textbook parts I and II after the presentation of each book separately, the results were as shown in the following table (11) :

Table (11): *summary of the science textbook analysis for the ninth grade content of NGSS standards.*

Dimension			
	Part I	Part II	Both parts
Disciplinary Core Ideas	21.07	23.67	22.37
Science and engineering practices	45.53	42.1	43.815
Crosscutting Concepts	33.4	34.24	33.82
Total	100	100	100

When looking at the results of the analysis of the ninth grade science textbook in its first and second parts in table (11), we can see that it has included all of the NGSS standards, but in different proportions, which the researchers attribute to the consistency of the content of the science textbook for the ninth grade in its parts.

Recommendations:

The researchers make the following recommendations based on the findings of this study:

1. Restructuring the construction of ninth-grade science textbooks to make them more effective for learners by including more scientific and engineering practices, more crosscutting concepts with a focus on depth in dealing with the main specialized ideas of the branches of Science and engineering, and moving away from the scientific narrative of scientific concepts of the branches of Science, as well as the repetition of previous scientific ideas from one class to another or from one stage to another.

2. Include programs to prepare science teachers in universities for the Next Generation Science Standards (NGSS) and teaching

competencies according to the (NGSS) standards.

3. The need to examine the range and sequence matrix of basic stage science curricula, which have been in place for more than 25 years, and update it to reflect contemporary scientific and technical breakthroughs in science education and learning.

4. The necessity to educate curriculum specialists about international standards for curriculum development, such as the NGSS standards.

5. The need to analyze and repair the flaws and poverty in ninth-grade science texts.

6. Offering seminars and workshops to educate teachers and specialists about the international NGSS scientific teaching standards.

7. Work on establishing and building courses based on international standards such as the NGSS standards.

8. Work on developing specific standards based on international norms for Palestinian scientific courses.

Proposals:

The researchers propose the following studies based on the findings of the current study:

1. In light of the NGSS standards, create a study for the the evaluation and development of scientific curricula at various stages of general education.

2. A comparative study of the content of ninth-grade science textbooks in Palestine and other countries using the (NGSS) standards.

3. Present a proposed concept for NGSS standards in basic science texts.

4. An examination of science teachers' basic stage training competencies in light of the NGSS standards.

5. Conducting research into the content of Palestinian science books for various educational levels in light of the NGSS standards.

6. Conducting research to examine the content of Palestinian science books for various educational levels using international standards rather than the NGSS standards.

7. Conducting comparative studies between NGSS and other global standards.

8. Conduct comparative studies of the content of books from nearby countries that built their curricula using NGSS standards.

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