Tamjeed Journal of Healthcare Engineering and Science Technology **ISSN: 2583-7281**
Volume **1** (2): 2023,Page 30-35, https://doi.org/10.59785/tjhest.v1i2.23 https://tamjed.com/

Investigation of the next generation science standards including in the science book according to E-learn : analytical study

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Abstract

This article briefs educational, In recent years, interest has increased in including standards for the next generation in science books from (k-12), and the main goal of these suggested modifications is to match science instruction to current technological developments and support what students will need to learn in the future. by including NGSS in science textbooks. For the fifth grade of primary school in Iraq, our study analysis of the science book, using online questionnaires on primary school science instructors of the fifth grade before the stage of putting the analysis processes into practise. For this study, 40 replies from schools in waist City made up the data collection. According to the study, the majority of teachers lacked the knowledge and skills necessary to integrate the proposed standard modifications into the existing curricula and their lesson plans. Based on their assessments of the pupils' level of readiness, the teachers offered a number of recommendations

Keywords: Investigation, Next Generation Science Standards (NGSS), E- learn, science book.

1. Introduction

Today, human societies have witnessed great changes as a result of technological progress that has invaded the world and cast its effects on the individual and society [9]. The century in which we live was characterized as the era of science, knowledge and the technological revolution due to the fulfillment of the requirements and aspirations of man, so education in its various institutions should prepare scientifically educated students through its curricula that are able to adapt and conform to these developments by

providing them with appropriate facts and information. It has become imperative for curriculum planners to determine the requirements of the era to prepare a generation that is aware of the standards of the next generation [11]. The knowledge explosion, which is considered one of the most important features of this era, directly affects the curricula, react positively to new knowledge and facts [2].

The majority now accepts it because of the quick advancements in learning systems and technology. The invention of computers sparked this revolution. As time passes and we become reliant on smartphones, tablets, etc. It means that most students now can find knowledge, which means easy access to information through the use of technology. [6].

These gadgets play a significant role in classroom instruction. Electronic educational resources like optical discs or flash drives are replacing books in a progressive process[10]. Knowledge can also be transferred over the Internet, which is available constantly and everywhere [6].

The experts and science teachers have set out new standards called Next Generation Science Standards, the NGSS are K-12 science education standards developed by a group of 26 states, classroom teachers, university educators, and representatives from the business and scientific communities. The standards focus on three core dimensions of science learning: disciplinary core ideas science and engineering practices , and crosscutting concepts [7].

The "disciplinary core ideas" are the fundamental ideas and knowledge that students must learn in order to comprehend the natural world. Practises in science and engineering require the abilities and techniques scientists and engineers use to investigate and solve problems [4]. Crosscutting concepts are general ideas or themes that cut across multiple scientific disciplines [1].

The next generation science standards (NGSS) are designed to rather than having kids memories a list of facts, assist them in developing a deep grasp of science. They emphasize hands-on, inquiry-based learning it's mean (is a pedagogical approach where students are motivated to pose their own questions when facing problems or scenarios. In science learning), where students are encouraged to think critically, solve problems, and engage in scientific experimentation [8].

The Next Generation Science Standards (NGSS) strives to offer a comprehensive and fact-based science curriculum for K–12 students in the United States. The advantages of NGSS in primary education include:

1. Improved Science Literacy: NGSS promotes science literacy by giving pupils a strong foundation in engineering and science principles. Students learn the information, abilities, and attitudes necessary to comprehend the natural world and make wise decisions through the NGSS.
2. Interdisciplinary learning: One of the main goals of NGSS is to encourage interdisciplinary learning. NGSS provides opportunities for students to connect their knowledge of science with other disciplines like mathematics, technology, and engineering [3].
3. Improved critical thinking skills: NGSS emphasizes inquiry-based learning and critical thinking skills, which help students to think and reason in a more analytical and logical way. They will learn how to ask questions, make observations, analyze data, and draw conclusions[12].
4. Greater engagement: The NGSS encourages hands-on learning experiences and investigation-based projects [9].

After looking in the science book for the 5th grade of primary school , it was found that there is a weakness in including the standards of the next generation for science, and through the above, the researchers studied this phenomenon, and they are trying to include next generation standards in the science textbook of the fifth grade.

RESEARCH QUESTION

What is the rate of inclusion of the Next Generation Science Standards(NGSS) in the science book?

TERMS AND DEFINITIONS

Investigation: refer to structured process of asking questions in order to obtain information or to uncover facts.

NGSS: refers to determining what the 5th-grade pupil should possess of scientific knowledge and skills while studying science, which includes three dimensions (Science and Engineering Practices, Crosscutting Concepts and Disciplinary Core Ideas) and it is measured by Observation in this study through a list of standards that created by the researcher

E- learn: Refer to using technology such as computers or smartphones and tablets as a tool to chance teaching and learning.

Science book: Refers to the book prepared by the Ministry of Education of Iraq that includes biological, physical and chemical concepts and facts in 2018

OBJECTIVES OF THE STUDY

To find out the rate of inclusion "of the Next Generation Science Standards" (NGSS) in the science textbook.

METHODOLOGY

Method : Experimental

Technique : Observation

SAMPLE OF THE STUDY

The researcher selected a sample consisting from science book for 5th grade of primary

Table 1: SAMPLE OF THE STUDY

Sample	Level	Year	Page No
Science book	5th grade	2018	226

DATA COLLECTION

The Next Generation Science Standards (NGSS) were founded in 2010 by a group of scientists, educators, and other experts in science education. The NGSS initiative was led by the American Association for the Advancement of Science (AAAS), the National Research Council (NRC), the National Science Teachers Association (NSTA), and Achieve. These organizations collaborated to create a set of K-12 science education standards that would be founded on the most recent scientific findings and effective teaching techniques. The three dimensions were used by the researcher, which are called (Science and Engineering Practices, Disciplinary Core Ideas, Crosscutting Concepts).

The researcher got a list of the main standards for science standards (NGSS) and prepared a list of science standards related to the fifth grade of primary school.

Table 2: The Next Generation Science Standards (NGSS

5-PS1 Matter and Its Interactions

Students who demonstrate understanding can:

5-PS1-1. Develop a model to describe that matter is made of particles too small to be seen. [Clarification Statement: Examples of evidence could include adding air to expand a basketball, compressing air in a syringe, dissolving sugar in water, and evaporating salt water.] [Assessment Boundary: Assessment does not include the atomic-scale mechanism of evaporation and condensation or defining the unseen particles.]

5-PS1-2. Measure and graph quantities to provide evidence that regardless of the type of change that occurs when heating, cooling, or mixing substances, the total weight of matter is conserved. [Clarification Statement: Examples of reactions or changes could include phase changes, dissolving, and mixing that forms new substances.] [Assessment Boundary: Assessment does not include distinguishing mass and weight.]

5-PS1-3. Make observations and measurements to identify materials based on their properties. [Clarification Statement: Examples of materials to be identified could include baking soda and other powders, metals, minerals, and liquids. Examples of properties could include color, hardness, reflectivity, electrical conductivity, thermal conductivity, response to magnetic forces, and solubility; density is not intended as an identifiable property.] [Assessment Boundary: Assessment does not include density or distinguishing mass and weight.]

5-PS1-4. Conduct an investigation to determine whether the mixing of two or more substances results in new substances.

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Developing and Using Models

Modeling in 3–5 builds on K–2 experiences and progresses to building and revising simple models and using models to represent events and design solutions.

- Develop a model to describe phenomena. (5-PS1-1)

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in 3–5 builds on K–2 experiences and progresses to include investigations that control variables and provide evidence to support explanations or design solutions.

- Conduct an investigation collaboratively to produce data to serve as the basis for evidence, using fair tests in which variables are controlled and the number of trials considered. (5-PS1-4)
- Make observations and measurements to produce data to serve as the basis for evidence for an explanation of a phenomenon. (5-PS1-3)

Using Mathematics and Computational Thinking

Mathematical and computational thinking in 3–5 builds on K–2 experiences and progresses to extending quantitative measurements to a variety of physical properties and using computation and mathematics to analyze data and compare alternative design solutions.

- Measure and graph quantities such as weight to address scientific and engineering questions and problems. (5-PS1-2)

Disciplinary Core Ideas

PS1.A: Structure and Properties of Matter

- Matter of any type can be subdivided into particles that are too small to see, but even then the matter still exists and can be detected by other means. A model showing that gases are made from matter particles that are too small to see and are moving freely around in space can explain many observations, including the inflation and shape of a balloon; the effects of air on larger particles or objects. (5-PS1-1)
- The amount (weight) of matter is conserved when it changes form, even in transitions in which it seems to vanish. (5-PS1-2)
- Measurements of a variety of properties can be used to identify materials. (Boundary: At this grade level, mass and weight are not distinguished, and no attempt is made to define the unseen particles or explain the atomic-scale mechanism of evaporation and condensation.) (5-PS1-3)

PS1.B: Chemical Reactions

- When two or more different substances are mixed, a new substance with different properties may be formed. (5-PS1-4)
- No matter what reaction or change in properties occurs, the total weight of the substances does not change. (Boundary: Mass and weight are not distinguished at this grade level.) (5-PS1-2)

Crosscutting Concepts

Cause and Effect

- Cause and effect relationships are routinely identified, tested, and used to explain change. (5-PS1-4)

Scale, Proportion, and Quantity

- Natural objects exist from the very small to the immensely large. (5-PS1-1)
- Standard units are used to measure and describe physical quantities such as weight, time, temperature, and volume. (5-PS1-2),(5-PS1-3)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes consistent patterns in natural systems. (5-PS1-2)

DATA ANALYSIS/PROCEDURES

The researcher read the subject to define the ideas that are included in it in order to determine the standard to which the idea contained in the paragraph or subject belongs. Then the analysis results were emptied into a special analysis form by giving one repetition for each idea. The analysis was on the 5th-grade book, the researcher excluded the cover, introductions, graphic figures and indexes.

FINDINGS OF THE STUDY

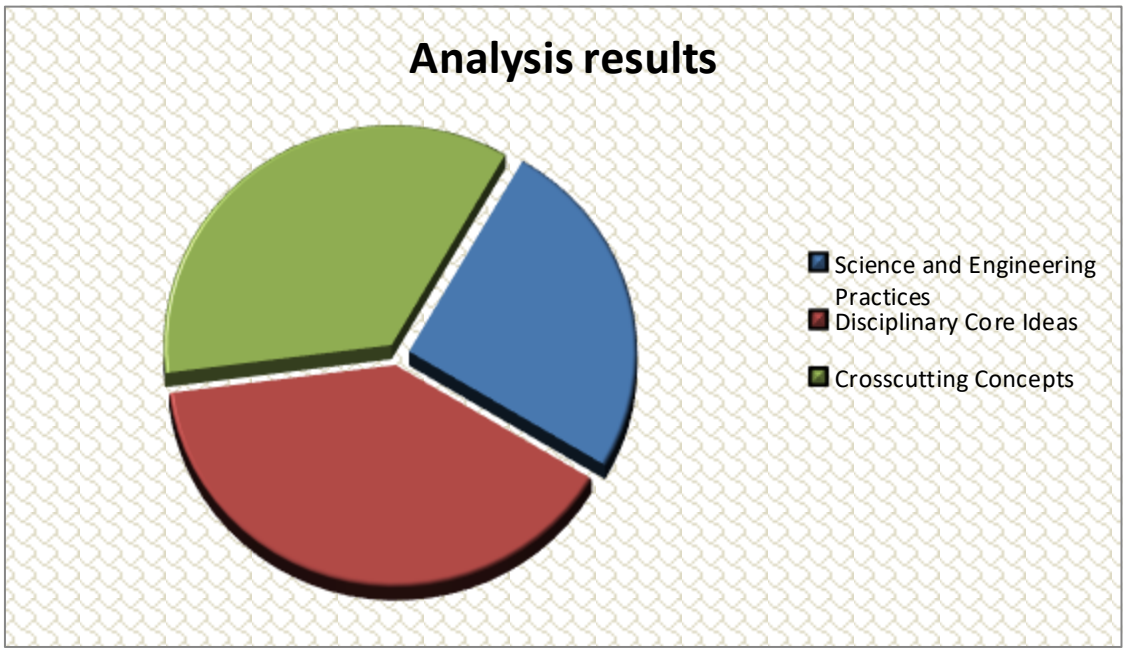
After finishing from the analysis procedures, the researcher got the following results.

Table 3: Analysis results

Standards of GNSS		Results							
		Chapter IV		Chapter V		Chapter VI		Total	
1	Science and Engineering Practices	F	%	F	%	F	%	F	%
		38	27%	42	38%	35	25%	115	29%
2	Disciplinary Core Ideas	46	33%	37	33%	54	39%	137	35%
3	Crosscutting Concepts	55	39%	31	28%	48	35%	134	34%
	Total	139	100%	110	100%	137	100%	386	100%

From the above table (3) show us the standard Science and Engineering Practices got (115) Repetition out of the total Repetitions of this standard in the science book for the fifth grade, which numbered (386), with a percentage of (29%). The sequence of this standard is the third compared to other standards, and the standard Disciplinary Core Ideas got (137) Repetition out of the total Repetitions of this standard in the science book for the fifth grade, which numbered (386), with a percentage of (35%), the sequence of this standard is the first compared to other standards. and the standard Crosscutting Concepts got (134) Repetition out of the total Repetitions of this standard in the science book for the fifth grade, which numbered (386), with a percentage of (34%), the sequence of this standard is the second compared to other standards.

Figure 1: **Design of the Analysis results**



Conclusion

In this paper, findings from our study highlight the lack of knowledge and a lot of concern among most teachers on how the NGSS can be integrated into the Science book for the 5th grade of primary school did not care enough to include the next generation standards in it sufficiently, which are supposed to be included in science book so that they help a pupil to understand the world through experiences and practices that must be available in the book, we noticed Disciplinary Core Ideas stander and got the first, through these results, we found the science book gave great attention to the Disciplinary Core Ideas standard, compared with other standards.

EDUCATIONAL IMPLICATIONS AND RECOMMENDATIONS

- Preparing classrooms and providing the necessary furniture, equipment and teaching aids to help teachers teach according to GNSS.
- Interest in Next generation science standards that were weakly included, such as Science and Engineering Practices, so it should be included when authorship a book in the future.
- Using GNSS in Science book content for the primary stage in order to increase pupils' recognizing and develop their thinking.

SUGGESTIONS FOR FURTHER RESEARCH

- Using the next generation standards in other's books for another stages grade of primary school for the purpose of analytical study procedures.

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