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Scientific and Engineering Practices Included in the Content of the Science Book for the Second Intermediate Grade in Saudi Arabia

Abstract

This study aims to identify the percentage of inclusion of scientific and engineering practices in the content of the science book for the second intermediate grade in Saudi Arabia. To achieve the aim of the research, a descriptive and analytical method was used. A content analysis card based on the list of scientific and engineering practices found in (NRC, 2012). Appropriate statistical analyses were carried out to calculate the frequency and the percentage of all practices. The results showed that the availability of all scientific and engineering practices in the content of the analyzed book was very low, as the inclusion percentage ranged from (2.7% - 27.4%). The content did not include the practice of "engaging in the argument based on the evidence", "where the inclusion rate was (0%). The study recommended a review of the framework of the content of science books to ensure that students undoubtedly practice scientific and engineering practices.

Keywords: Scientific and Engineering Practices, Science Book Content, Second Intermediate Grade, Saudi Arabia.

Introduction

The Next Generation Science Standards (henceforth NGSS) movement is the most prominent trend in the field of evaluating science books. It has gained widespread in various countries of the world. These standards have become a distinctive feature of the current era. These standards can be the real guarantee for all students to have sufficient knowledge of science and engineering at the end of high school. These standards are important to make these students able to solve the scientific and engineering problems that face them in their lives, and to be motivated to continue gaining knowledge outside the boundaries of the school. It will enable them to possess skills that qualify them to engage in business and jobs in the future labor market related to the field of science, engineering and technology, and to be educated scientifically.

The NGSS Standards document includes three main dimensions (NGSS, 2012; NRC, 2013):

1. Disciplinary Core Ideas: They represent the aspect of the theoretical knowledge content of the standards. They also consist of four topics: physical sciences biological sciences, earth and space sciences, and applications of science, engineering and technology.
2. Science and Engineering Practices: They represent the aspect of the applied practice of the standards. They consist of eight common practices between science and engineering. They are as follows: questioning and identifying problems; developing and using models; planning and carrying out investigations; data analysis and interpretation; use of mathematics and

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computational thinking; creating interpretations and design solutions; engaging in evidence-based debate; and obtaining, evaluating and matching information.

3. Crosscutting Concepts: They are composed of a set of concepts and tools that bring theory closer to application. They are also the extent of overlapping concepts in different scientific disciplines. They contain seven components: patterns, cause and effect, measurement, ratio and quantity, systems and system models, energy and matter, fit of form to function, stability and change.

NGSS aims to develop learners' abilities to explain scientific phenomena and create solutions to the problems they face, through implementing scientific and engineering practices, basic ideas and comprehensive concepts (the NGSS Land States, 2013). It tries to shift the purpose of teaching Science Book from students 'knowledge of science content to students' knowledge development, and use it, along with scientific practices to understand the world (Berland et al. 2016). (NGSS, 2013) describes scientific practices as the behaviours of scientists in engaging in the investigation, building models and theories about the natural world, while engineering practices describe the behaviours that engineers use in designing and building models and systems. The goal of the practices is not only to identify the scientific and engineering knowledge content but rather to understand The methods used by scientists and engineers in research.

Scientific and engineering practices are of great importance especially in the current era in which the tremendous development of knowledge and the urgent need for scientific knowledge and global technology, so the educational system must be developed to work on developing the scientific and engineering culture, and the use of teaching methods that are related to engineering designs in the classroom at the elementary stage, It would be the first step is correct to start developing scientific and engineering culture among elementary school students, and this will help them make decisions about their career (Kuhu, Arvidsson, Lesperannce, & Corprew, 2017).

Scientific and engineering practices are also considered asa means of engaging students in science and acquiring science knowledge, as the students' preoccupation with scientific practices which makes these activities the content in which students learn to conduct experiments, collect data and evidence, develop liaison and communication skills, develop models and tools, use mathematics and the ability to evaluate controversialclaims based on evidence and proves as well as planning, doing surveys andthe ability of interpretation (Bybee, 2011). Therefore, scientific and engineering practices have various purposes and seek to achieve more than one goal, such as developing students' cognitive and practical abilities and creating a well-educated generation possessing the relevant skills of the 21st century, such as problem-solving, critical thinking, cooperation and communication skills (Osbrone, 2014).

The National Research Council (NRC) uses the term "Practices" instead of "Skills" to emphasize active participation in scientific research. It also makesit clear that integration into scientific investigation or engineering design is not limited to skill, but requires mastery of associated knowledge. (NGSS, 2013), the concept of practice and the analysis of science as the practice has a central and essential role for criticism and evaluation, as it is considered a key to the valuable capabilities and understanding of the meaning of all science fields, (Ford, 2015).

The shift from just investigation in science to practising the science in the NGSS science standards requires the teacher to design and engineer an educational environment that leads to establish a science teaching system, and this requires the teacher to change his teaching practices, the method of evaluating students and designing activities (Dushi & Bybee, 2014), and this is what the study of Al-Shiyab (2019) called for in which it concluded that the level of secondary science teachers regarding the possession of the indicators of conducting scientific and engineering practices came to a moderate level, namely (asking questions and identifying the problem, analyzing and interpreting data, obtaining, evaluating and communicating information). While the practices that came at a very low level, they are: (planning and carrying out investigations, developing and using models, constructing interpretations and designing solutions, engaging in arguments with evidence, using mathematics and computational thinking).

While the study conducted by (Brownstein, Horvath, 2016) showed that the most scientific and engineering practicesthat are carried out by teachers are: Analyzing and interpreting data, building interpretations and designing solutions, obtaining and communicating information, the least of which was the practice of asking questions. It was found that the most common practices undertaken by teachers were arranged in the following order: the practice of analyzing and interpreting data, constructing interpretations and designing solutions, obtaining information and utilizing it, while the least practices were "asking questions".

In the General Framework for Science Standards for the Next Generation, the National Research Council (NRC, 2012) provided a detailed explanation for each of the scientific and engineering practices, and performance expectations according to the stage of study and learners are expected to practice it and engage in scientific and engineering practices that included all levels of education (K-12). They are identified in eight practices (NGSS, 2013b):

1. Asking Questions and Defining Problems

The practise of asking questions is the main motive of science and engineering as it develops habits of mind (NRC, 2012) and it is an important component of scientific culture, which contributes to making consumers and critics of knowledge, and it is not limited to scientists and engineers, but rather to all individuals despite their different interests, it is a daily practice that everyone does (Chin & Osborne, 2008).

Anderson (2003) has indicated that asking the question from the learner is the cornerstone of the educational process. Because it helps in identifying the problem, reflects what is going on in students' minds, develops their higher thinking skills, and developing self-confidence, and it also organizes the process of communication between students themselves, and between students and the teacher, so an atmosphere of competition prevails between students, and it encourages self-reliance, so this process achieves effective learning.

2. Developing and Using Models

(NGSS) describes the model as a tool for reasoning, used to represent phenomena and systems. Models are used in science to accomplish testable expectations and to develop explanations about natural phenomena (Osborne, 2014). In engineering, models and simulations help to analyze existing systems, explore modifications and design effective solutions to problems. Modelling can begin in the early stages in the form of concrete models such as a toy car, and then to be developed into more abstract representations of relationships, such as diagrams, maps, and other abstract models.

The aim of developing and using models is to enable students to expose scientific ideas, ask questions about the model, and search for information and data to modify the model so that they develop and adjust according to the new evidence they have, as well as employ the model in new situations to predict other new phenomena and processes (Krajcik & Merritt, 2012).

3. Planning and Carrying Out Investigations

Scientists design surveys to study scientific phenomena define procedures, data and variables, determine the conditions to be examined, and how the results will be recorded. The engineers plan to learn more about the problem to be solved, they collect data that helps them state design standards.

Wingert & Bell (2015) pointed out that students do not adhere to a specific way when planning and conducting an investigation, because the scientist and the engineer follow different ways to answer questions, test hypotheses. They set a plan to investigate problems from their local environment, and this deepens students' understanding of the role of science and scientists in solving world problems. Then students feel the true value of science and appreciate the efforts of scholars.

4. Interpreting Data Analyzing and Data

Scientists analyze and interpret data to generate evidence for scientific theories. the data is presented in a way that can reveal patterns and relationships that facilitate sending and sharing results with others in the form of tables, graphs, images, notes, maps, objects, or facts. Engineers analyze and interpret data to identify strengths and weaknesses and how they can be improved. Learners can organize data, graphs, and illustrations and share them with their peers.

5. Using Mathematics and Computational Thinking

Mathematics and computational thinking tools are essential in science and engineering research, as they help students understand scientific phenomena (NRC, 2012) and guide the interpretation of measurements (Osborne, 2014). Mathematics and computational thinking tools are important for communicating, making inferences and drawing conclusions from data. Sanford and Naidu (2017) stated that student' ability to develop and use mathematical models (graphs, graphs, and spreadsheets) reflects the students' ability to solve problems using the computer, which students must learn from the stage (K-12).

6. Build Interpretations and Design Solutions

Science tries to build interpretations that reflect the results of the research, while engineering design is an organized process for solving engineering problems based on scientific knowledge. The design of solutions depends on their feasibility and the use of criteria in the evaluation. Duschl and Osborn (2002) indicated engaging the students in practising the interpretation of natural phenomena deepens their understanding of the main ideas developed by science. Science is not only a body of facts but rather a social process through which knowledge is built and developed.

Consequently, students depend on these ideas or models or theories to explain different phenomena, and this leads to evolution and conceptual change in students' ideas and leads to a better understanding of what scientists are doing.

7. Engaging in Argument from Evidence

Scientists use logic and evidence to find the best explanation for the natural phenomenon. Engineers use it to generate the best possible solutions to a problem. Debates in engineering aims to find the best solutions or designs where engineers collaborate during design. engineers follow a structured methodology to compare multiple options for designs and ideas. theyrely on evidence after testing data, evaluating others' ideas and reviewing designs to choose the best option. Kuhn (2010) indicated that students practice debates when others participate in dialogue and debate, or to reach a unanimous decision, or consensus on scientific and social issues, answer questions, justify an opinion, or make a written or verbal decision. Argumentation also familiarizes students with the importance of listening, comparing, evaluating, testing design, finding solutions, and building models (NRC, 2012).

8. Obtaining, Evaluating, and Communicating Information

Linguistic or written communication is one of the basic practices of science because it requires scholars to accurately describe their observations, clarify their ideas, and logically support their arguments. in science and engineering, learners must be able to convey their findings clearly and convincingly, either orally or written (articles, seminars, Lectures) or by using graphs, tables, designing models, equations, to evaluate the validity of the information from these sources, and to combine this information with the results that they reached. Bybee (2011) says that science cannot advance if scientists are unable to convey their findings and learn from one another. So assessing and transferring the information are very essential elements to teach science as they disseminate the knowledge throughout the world (NRC, 2012).

To include these eight scientific and engineering practices, learners must notice a natural phenomenon, which leads them to ask questions or expose these students to a realistic problem in society in order to define the problem accurately. learners begin to search for an explanation of the phenomenon and look for a solution to the problem through tools that help them collect information. Thecollecteddata is then analyzed, and the learners formulate evidence based on the data that they use in thinking or presenting arguments to defend their design, and finally, learners engage in a full discussion to demonstrate the interpretation of the phenomenon based on their observations or define criteria for a successful solution, and specifically, students must be skilledin "understanding scientific explanations", "creating scientific evidence", "thinking about scientific knowledge", and "productively participating in Science" (Huff & Yager, 2016). The addition of the engineering dimension in teaching science attracts students' interest and engaging them with science topics through the undertaking of structured practices that ultimately lead them to design solutions to human problems, which is the first step in the way of properly applying engineering and technology in the community, (Senider, 2012). Situational learning increases students' practice in science and engineering, specifically in the practice of "developing models and building interpretations" (Inkinen, et al, 2020).

Also, engaging in science practices helps students to understand how scientific knowledge develops, examining models and embodying the real world of knowledge while engaging in engineering practices helps students to understand the work of engineers, to make a deep understanding of knowledge, and to link science with engineering, which is reflected in the interest of students and their curiosity, as it leads to confronting real problems in life (Ezz El-Din, 2018). The study of (Kuhn, Arvidson, Lesperannce & Corprew, 2017) confirmed that students' involvement in scientific and engineering practices (investigation, data analysis, and argumentation) increased their understanding of science and improved their ability to present the argument available to them. Reiser, Berland and Kenyon (2013) indicated that some scientific and engineering practices (analyzing and interpreting data, engaging in issues of eliciting evidence) are practices related to investigation that requires the student to perform an analysis or interpretation of the data, and the researchers indicated that the integration of the three dimensions in the standards are only a way to reach to the supreme goal of teaching science globally, which is to reach to solutions to human problems, and these practices lead the student to make the interpretation of events that link scientific theory with practical observation, test hypotheses and then elicit the appropriate interpretation.

Regarding thestudies that examined the degree of inclusion of scientific and engineering practices in the content ofscience books, the study of Al-Ahmad and Al-Buqami (2017) revealed the extent to which the content of the physics book for the second stage included scientific and engineering practices but the content was in a low percentage (16.35%). This finding is consistent with the findings of Al-Rabiaan and Al Hamamah (2017), which revealed a low rate of inclusion of scientific and engineering practices in the content of the science book for the first grade, intermediate, that was at (24.3%), and in the study of Al-Otaibi and Al-Jabr (2017), all indicators of scientific and engineering practices in energy units in all analyzed books were low or not available. Al-Khalidi's study (2019) revealed the percentage of including scientific and engineering practices in science books for the intermediate level is low at (31.2%), in a similar vein, the study of Al-Jabr (2019) revealed the percentage of inclusion of scientific and engineering practices inthe science textbook for the second grade of an average at (34.10%), which is also low percentage.

By reviewing literature and previous studies, it is obvious that the students' and teachers' involvement in scientific and engineering practices was low, and that the percentage of their inclusion in the content of science books was low, and this calls for more studies to search for the extent to which scientific and engineering practices are included in science books, and to motivate students and teachers to employ them in science books, teaching process, and working to prepare the future generation for the 21st century.

Statement of the Problem

The textbook is the official document of the curriculum, and the most important educational source for the student and teacher, and it is the actual means to achieve the objectives of the educational process, especially as it includes knowledge, skill and scientific values, so it must be chosen very carefully to achieve the desired educational goals, therefore The designing of this book requires highly qualified specialists to be in accordance with global standards, and the fulfilment of the requirements of international trends such as TIMSS tests, especially since the second intermediate grade is the approved stage for providing international tests TIMSS.

The observer of the state of general education finds deficiencies in the process of providing the information and skills needed by the labour market in the 21st century. Therefore, it is imperative to create an organizational structure for the content of scientific books that is concerned with international standards and their dimensions, the most important of which are scientific and engineering practices, which would develop students 'abilities to realistically apply science and engineering. This would prepare student scientifically and enable him to achieve creative learning outcomes. Therefore, many countries sought to rebuild and organize the content of scientific books in order to keep in harmony with international scientific standards.

In light of the above, the study problem can be identified in the following main question: "To what extent the scientific and engineering practices are included in the content of the science book for the second intermediate grade in the Kingdom of Saudi Arabia?"

Therefore, the study aims to identify the extent to which the science book for the second intermediate grade in the Kingdom of Saudi Arabia includes scientific and engineering practices.

Importance of the Study

The importance of the study lies in providing realistic evidence about the extent to which the science book for the second grade includes an intermediate level of scientific and engineering practices, especially since this class is important for its students' participation in the Test of International Trends (TIMSS).

Study Limitations

The topic and time limits of the study were represented in analyzing the content of the science book for the second intermediate grade in the Kingdom of Saudi Arabia (1442 AH edition) in light of the inclusion of scientific and engineering practices.

Terminology of Study

Scientific and engineering practices: the students are expected to have a piece of knowledge aboutto understand scientific and engineering ideas through the practice of scientific inquiry. Scientific inquiry describes the behavior of scientists, and engineering practices. It describes the work of the engineer in designing and building scientific models and includes (asking questions and identifying the problem, developing and using models, planning and conducting the investigation, analyzing data and its interpretation, use of mathematics and computational thinking, building interpretations and designing solutions, engaging in evidence-based arguments, obtaining, evaluating and communicating information (NRC, 2012).

Methodology

The descriptive and analytical approach was used in this study to describe and collect data related to the study question. The study population consisted of an intermediate science book for the second grade with its first and second parts, without the experiments book and the teacher's book.

1. Validity and Reliability of the Tool

On the performance expectations announced by the National Council (NRC, 2012). It was finalized from eight dimensions of scientific and engineering practices and (22) performance indicators for all practices. The validity of the analysis card was verified by adopting the apparent validity, and its stability was verified by calculating the percentage of agreement between analysts using the Holste equation, and the overall reliability coefficient was (88%).

2. Analysis Procedures

The analysis card for the subject of the study was designed and judged. The statement was adopted as the unit of content analysis, which is "any small unit with meaning in the content of the book. , tables and related comments, experiences attached to the content, performance appraisal activities, application of skill, introductory experiments, brochures and real-life investigation.

Judgments were made on the level of including scientific and engineering practices in the science textbook for the second intermediate grade, according to the percentage (0 - less than 25%) very low, from (25% to less than 50%), low, from (50% to less than 75%). Medium, from (75% to 100%), high.

Finding

To answer the study's question, the content of the book was analyzed according to the study's analysis card, where each dimension of the scientific and engineering practices was analyzed according to the dimension indicators. Table (1) shows the frequency of each indicator and the dimension and the percentage of each of them in all scientific and engineering practices.

Table 1.

Frequency and percentage of all dimensions and indicators of scientific and engineering practices in the content of the science book for the second intermediate grade

Exercise:	Indicators	Frequency	Percentage	Frequency	cumulative percentage
Ask questions and identify problems	Ask questions that require adequate evidence to answer / or determine the relationship between variables / explain the data set.	6	3.2	20	10.8
	Ask questions that can be studied in the classroom, the outdoor environment, and public facilities with the available materials, and determine a hypothesis based on scientific observations and principles.	7	3.8		
	Define a design problem that can be solved through the development of a tool, process, or system that includes multiple criteria and limitations.	7	3.8		
develop and use the models	Developing or building a model to show relationships between variables / or describe phenomena / or to predict.	2	1.1	5	2.7
	Developing a model to describe unobservable mechanisms, or to test ideas about natural phenomena.	3	1.6		
planning and implementing the survey	Plan a survey (individual, group, collaborative), determine the experiment variables and their tools and record the necessary data to support the results.	9	4.8	42	22.6
	Conducting a survey / or reviewing an experimental design to extract the data to serve as scientific evidence for the investigation.	33	17.7		
Analyze and interpret data	Using data / or interpreting graphical presentations (tables and charts) to determine linear and non-linear relationships, temporal and spatial, ... etc.	6	3.2	9	4.8
	Apply the concepts of statistics and probability, and analyse data (MEASUREMENT ERROR).	0	0.00		
	Analyse and interpret data to determine similarities and differences in results.	3	1.6		
Use mathematics and computational thinking	Using digital tools (computer) to analyze mathematical data.	0	0.00	37	19.9
	Use mathematical representation to describe / or support a scientific conclusion and design solutions.	12	6.5		
	Create algorithms to solve a problem, or apply mathematical operations (percentage and basic operations) to problem-solving.	25	13.4		
	Use mathematical concepts to solve an engineering design problem.	0	0.00		
Build interpretations and design solutions	Building scientific interpretation based on valid scientific evidence (including students' own experiences).	5	2.7	22	11.8
	Building scientific explanation using models or interpreting qualitatively / quantitatively to explore relationships between variables describing the phenomenon.	6	3.2		
	Application of ideas or design testing/participation in the implementation and improvement of a design project.	11	5.9		
Engage in evidence-based controversy	Compare and criticize an argument on the subject of learning and verify its proof evidence.	0	0.00	0	0
	Managing critical and constructive discussion and dialogue, whether oral or written, to prove or disprove an argument.	0	0.00		
	Presenting an oral or written argument that supports or disproves (the functioning of a particular device or system) and declare a statement whether the technology meets the working standards or not.	0	0.00		
Obtaining, evaluating and communicating information	Read scientific critical texts that have been selected for use in the classroom to identify central ideas / or obtain information to describe a phenomenon, whether qualitative, quantitative, or technical information.	17	9.1	51	27.4
	Collecting, reading and synthesizing scientific and technical information from multiple reliable sources, evaluating it, and disseminating it in written form or form of presentations.	34	18.2		
	Total	186	100%	186	100%

Table (1) shows the level of inclusion of scientific and engineering practices and their indicators in the content of the science book for the second intermediate grade, as it came with total frequency (186). Whereas, the "survey planning and implementation" practice ranked second with a very low inclusion rate of (22.6%). As for the practice of “using mathematics and computational thinking,” it ranked third with a very low rate at (19.9%), while the practice “building interpretations and designing solutions” ranked fourth with a very low rate at (11.8%), and the practice “asking questions and identifying problems” came un the fifth place with a very low rate of (10.8%), the practice of “analyzing and interpreting data” came in the sixth place with a very low rate of (4.8%). As for the practice of "developing and using models", it ranked seventh with a very low rate at(2.7%), and the practice of "engaging in evidence-based debate" came in the eighth and last rankings with a rate of 0%.

Discussion

The results of the analysis showed a clear variation in the level of inclusion of scientific and engineering practices, as well as the percentage of inclusion of indicators for the same practices, although the percentage of inclusion of all practices came in the (very low level) of inclusion, and thus it is consistent with the results of previous studies for both the Ahmad and Buqami (2017). Al-Rabian and Al-Hamama (2017), Al-Otaibi and al-Jabr (2017), Al-Khalidi (2019), and Al-Jabr (2019). Thislow inclusion rate might ascribe to the fact that Saudi science books follow the McGraw-Hill series of books and these books are built-in light of the NSES standards, which differ in their construction from the next generation science standards NGSS, as the new standards aim to develop a coherent understanding for all different sciences such as humanities and applied sciences in addition to technical and engineering sciences. it also provides an opportunity for continuous learning to look at the applications of science and its effects on thesociety and the nature of human research in order to develop an awareness of the scientific and engineering functions. this can be achieved by focusing on a specific set of key ideas and concepts that allow the achievement of deep learning of knowledge through scientific and engineering practices.

Looking at the results of analyzing the indicators of scientific and engineering practices. The researchers found that the practice of “obtaining, assessing and communicating information” included a low level as the percentage reached (27.4%). Best practices represent availability in the content of the book under analysis, and this indicates the content’s interest in providing students with ways to obtain information from reliable sources and dealing with it with credibility and how to communicate it to other students, and this was shown in the folds of the content by inviting the student to search online sources on a topic and write an essay on it, and talk about the topic in front of his classmates, as well as invite the student to make pamphlets and wall stickers. This result is consistent with the studies of Al-Jabr (2019) and Al-Khalidi (2019) regarding the low rate of inclusion of this practice in the content of science books.

The result of including the practice of "survey planning and implementation", it came at a very low rate of (22.6%), and its presence was represented in the group of experiments that achieve directed investigation, that is, the student conducts a survey / or reviews an experimental design to elicit the data to serve as scientific evidence to achieve the investigation, In a few topics in the book’s content, it dealt with a free investigation, which requires setting up a plan for investigation individually (individual, group, collaborative), identifying experiment variables and tools, and recording the necessary data to support the results, noting that the book’s content contains a special page entitled (Real-life Inquiry). This result is consistent with the studiesof Al-Ahmad and Al-Buqami (2017), Al-Rabian and Al-Hamamah (2017), Al-Otaibi and Al-Jabr (2017), Al-Khalidi (2019) and Al-Jabr (2019), which all confirmed the low percentage of including this practice in the content of the books analyzed.

As for the practice of "using mathematics and computational thinking", it ranked third with a very low percentage (19.9%). This practice refers to the use of mathematics in solving problems, representing data and analyzing it. The presence of this practice in the content of the book under analysis was achieved through the presence of what is known as "Mathematics application" in which the student applies mathematical operations (percentage, basic operations). theyrepresentthe analysis data in a specific graph, while in the content does not include that the student must performdata analysis using the computer or using mathematics to solve a problem related to engineering design, and this what the next generation science standards focus on is the student's exercise of the role of the scientist (researching the phenomena of the problem) and the engineer (designing an appropriate solution to the problem). This result is consistent with the results of the studies of Al-Ahmad and

Al-Buqami (2017), Al-Rabiaan and Al-Hamamah (2017), Al_Jabr (2019) and Al-Khalidi (2019).

While the practice "building interpretations and designing solutions" ranked fourth with a very low rate at(11.8%). This practice refers to the application of scientific knowledge in the form of a physical model that helps to provide logical explanations to understand the scientific phenomenon. It included in some content units when the student designs the experiment himself/herself, which is often found at the end of the lessons offered when the student participates in designing something to solve a problem.

The practice of "asking questions and identifying the problem" was ranked fifth at a very low rate at (10.8%). This practice refers to the student's practice of the behaviour of scientists and the engineer’s design to solve the problem. It appeared in the book’s content in the form of questions related to the information of the proposed lesson, which in the always can be studied within the semester, determining the relationship between the variables, and identifying the problem in the proposed design in the book. According to the Standards of Science (NGSS), this practice aims to develop students' ability to ask questions, not to be instructed by the teacher, and to have an opportunity to enable studentsto identify the problem from available lessons in Science Book.

In the sixth order came the practice of "analyzing and interpreting data" with a very low inclusion percentage as (4.8%). It was included in the content of the book in some units in the form of data/charts and graphic presentations so that the student would interpret these data and identify similarities and differences in their results. However, the content of the book did not order the student to apply the concepts of statistics, probabilities, and the statement (measurement error), and this may be due to the nature of the book's topics, which were mostly topics in biology and chemistry, and these topics did not show data that need statistical analysis.

Regarding the practice of "developing and using models", it ranked seventh with a very low rate of (2.7%). The NGSS believes that models are a tool for thinking that allows the student to improve his/her perception and understanding of the phenomenon under investigation, and lead to a deeper understanding of science and enhance thinking. Models vary to be in the form of a conceptual or physical model, or mathematical representations, or a simulation model. İt has been found that this practice is included in the content in the form of graphs and images that help to explain the phenomenon under investigation, but it did not reach to computer simulation models.

the practice of "engaging in evidence-based controversy " came in the eighth and last order by 0%, which did not appear in the content of the book, this may be attributed to the topics of the book itself that did not deal with controversial topics based on scientific arguments, and the content of the book did not address statements or situations that orderthe student to criticize an argument, support or refute the work of a specific device or system, and thus the absence of this practice in the content of the book, knowing that this practice helps students to discuss and manage the dialogue that would help students to make decisions and evaluate solutions (Kuhn, 2010).

Conclusion

In general, the content of the book included all practices at a very lowlevel, and the percentage of inclusion for the practice of "engaging in evidence-based debate" was absent. This may be due to the nature of the Science Book that lists scientific information for the student in the form of consecutive paragraphs, as the book is rich in the density of written information that it requires little practical effort from the student, as the information required from the book is read in the presence of several initial investigative experiments, and few experiments with content, and in most of these experiments it is directed inquiry, and the book did not deal with all science topics in an equal proportion, as it was mostly from science topics Biology, which is characterized by the nature of mere memorization. In addition to various topics (at a lesser extent) in physics, chemistry and environmental sciences, and this may be because the construction of science books in Saudi Arabia relies on the McGraw-Hill series of books that adopt the standards of scientific education (NSES).

Recommendations

1. Restructuring of Science Books according to New Science Standards (NGSS) that incorporate science and engineering practices.
2. Training science teachers on how to enablestudents to apply scientific and engineering practices.

Suggestions

1. Study the evaluation and development of science book content in light of the New Science Standards (NGSS).
2. Provide a proposed visualization of New Science Standards (NGSS) in science book content.

Refernces

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