The Degree of Inclusion of Twenty-First Century Skills in the Developed Science Textbook of the Eighth Grade in Jordan

درجة تضمين مهارات القرن الحادي والعشرين في كتاب العلوم المطوّر للصف الثامن الأساسي في الأردن

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Abstract

The study aimed to show the degree of inclusion of twenty-first century skills in the developed science textbook for the eighth grade, and it adopted the analytical-descriptive method. To achieve the objectives of the study, an instrument for analysing the content was developed. After the reliability and validity of the instrument were verified, the content analysis of the developed science textbook with its first and second parts for the eighth grade of the academic year 2021-2022 by the Ministry of Education in Jordan was conducted. The findings of the study showed that there were differences in the degree of inclusion of the twenty-first century skills in the developed science textbook of the eighth grade be-

tween moderate and low grades, where the "learning and innovation" skills came in first place with a moderate degree and a percentage of 45%, followed by "life and professional skills" with a low degree at a percentage of 30%, and in the last place came "media and information technology skills," with a low degree as well, at a percentage of 25%. Moreover, the findings also showed that the most frequently occurring skills in the content of the developed science textbook for the eighth grade were the skills of initiative and self-direction in the field of life and professional skills, with a mean of 29.5%, followed by the skills of culture of knowledge, communication, and technology in the field of media and information technology skills in second place with a percentage of 23%, and then the skill of critical thinking and problem-solving in the field of learning and innovation, with a mean of 22%. Finally, the content analysis finding did not show any repetition of each of the skills of media culture: flexibility, adaptation, social skills, and understanding of multiple cultures, productivity, responsibility, leadership and responsibility skills.

Keywords: Twenty-first Century Skills, Developed Science Textbook, Basic Eighth Grade

ملخص

هدفت الدراسة إلى الكشف عن درجة تضمين مهارات القرن الحادي والعشرين في كتاب العلوم المطوّر للصف الثامن الأساسي، واتبعت الدراسة المنهج الوصفي التحليلي، ولِتحقيق هدف الدراسة تم تطوير أداة لتحليل المحتوى، وبعد التحقق من صدقها وثباتها، تم إجراء تحليل المحتوى لكتاب العلوم المطور بجزأيه الأول والثاني للصف الثامن للعام الدراسي 2022/2021م من قبل وزارة التربية والتعليم في الأردن، وأظهرت نتائج الدراسة وجود فروق في درجة تضمين مهارات القرن الحادي والعشرين في كتاب العلوم المطور للصف الثامن ما بين الدرجة المتوسطة والمنخفضة، حيث جاءت مهارات "التعلم والابتكار" في المركز الأول بدرجة متوسطة وبنسبة بلغت (45%)، تليها "المهارات الحياتية والوظيفية" بدرجة منخفضة وبنسبة بلغت(30%)، وفي المرتبة الاخيرة جاءت "مهارات الإعلام وتكنولوجيا المعلومات" بدرجة منخفضة أيضاً وبنسبة بلغت (25%). كما أظهرت النتائج بأن أعلى المهارات تكراراً في محتوى كتاب العلوم المطور للصف الثامن كانت مهارة المبادرة والتوجيه الذاتي في مجال المهارات الحياتية والوظيفية بمتوسط حسابي بلغ (29.5%)، يليها في المرتبة الثانية مهارة ثقافة المعرفة والتواصل والتكنولوجيا في مجال مهارات الإعلام وتكنولوجيا المعلومات بمتوسط

حسابي بلغ (23%) ومن ثم مهارة التفكير الناقد وحل المشكلات في مجال التعلم والابتكار بمتوسط حسابي بلغ (22%)، هذا ولم تظهر نتائج التحليل للمحتوى أي تكرار لكل من مهارات الثقافة الاعلامية والمرونة والتكيف، والمهارات الاجتماعية وفهم الثقافات المتعددة، ومهارة الانتاجية والمسؤولية ومهارة القيادة والمسؤولية.

الكلمات المفتاحية: مهارات القرن الحادي والعشرين، كتاب العلوم المطور، الصف الثامن الأساسي.

Introduction

In light of the changes, technical and technological revolutions that the world witnesses in the twenty-first century, those who are interested in the educational field all over the world stand in one line to keep pace with changes and face challenges in the various educational, cultural, intellectual and values aspects through making continuous adjustments and developments in the educational curricula that suit these changes and the content, skills and new trends they contain.

One of the most important challenges we face in the twenty-first century regarding its philosophy, objectives, management and focusing through them on the scientific methodology and scientific research methods in a manner that keeps pace with rapid global developments. In order that the teacher is able to prepare a generation that can assimilate the developments of the era and adapt to them, and lead change towards growth and development, work should be done to develop the curricula and including them with skills and various knowledge, prepare and professionally develop the teacher of future to carry out teaching these curricula and achieve their objectives, as the teacher of the twenty-first century is no longer a transmitter of knowledge as it was before, but has become, a thinker, a director, a supervisor, a creator, and a communicator of values and culture, possessing various skills that enable him to implement modern teaching strategies and lead the educational situations effectively. Nowadays we observe the educational institutions interest all over the world of developing curricula and including them with the essential skills and knowledge, preparing and qualification of teachers to go with and apply the content of the developed curricula effectively focusing on the student as he is considered the focus of the educational process, and seek-

ing to acquire him the knowledge and skills included in the developed curricula content in a way that reflects positively on the educational outputs (Al-Khatatneh, 2022; Al-Momani, 2018).

The educational curriculum including knowledge, skills and attitudes is considered the educational method through which abilities, skills and positive attitudes are developed, habits are formed, morals are refined, and tendencies and attitudes are developed. Since the curriculum forms the vital axis of the educational process, it is essential to review its content continuously and work to develop it through reviewing processes of planning, implementation and evaluation related to it to ensure that it goes with and adapts to modern educational developments and trends. The modern curriculum should the fact of the society, its philosophy, the nature of learners, characteristics of their growth, help them to accept changes occurring in the society and adapt to them, consider the learners as the focus of the educational process and encourage them on self-learning, stimulate their motives to research and knowledge, collect information from their various sources and acquire them abilities and skills that enable them to adapt to life and take responsibility (Mohammed & Abdel Azim, 2018; Al-Turki & Al-Jabr, 2019).

To achieve the above, it was necessary to determine the competences and skills that should be included in these curricula, especially the science ones, and develop their teaching methods to keep pace with recent developments in the current era, enable every teacher and student to acquire these skills, concentrate on making students the center of the educational process, and encourage them to self-learn, in order to reach qualitative outputs from these curricula that ensure achieving the future goals and visions of education. The most prominent of these skills are the twenty-first century ones, which attracted attention through the partnership association of the twenty-first century skills that determined which ones the learner should have in the twenty-first century and ways of including them in curricula so that students can adapt to modern developments. Based on this, a framework of education has been addressed that suits the requirements of the twenty-first century, known as "the partner-

ship of education of the twenty-first century", as shown in figure1. (Battelle for kids, 2019).

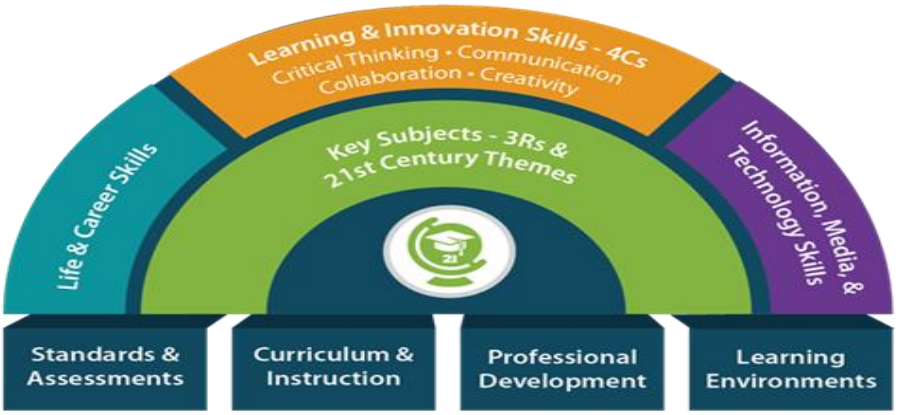

Figure (1): Partnership for the 21st century skills.

It is clear from the previous figure that the required skills of learners in the twenty-first century, in addition to the support systems needed for learning outcomes of 21st century, as these skills have been divided into three areas which were life and work skills including "flexibility, ability to adapt, productivity, responsibility, taking initiative, self-direction, leadership, and social skills", learning and innovation skills including "creativity and innovation, critical thinking, problem-solving, cooperation, and communication skills" and information, media, and technology skills including "information culture, media culture, multimedia, and technological knowledge culture skills (ICT)" (Al-Khatatneh,2022 ; Al-Omari, 2020; Battelle for kids, 2019).

The partnership directions have benefited the twenty-first century skills in science curricula by The National Science Teaching Association-NSTA through including these skills in the science textbook content and concentrating on developing them by including skills of science, scientific inquiry, problem-solving, critical thinking, and technological design, increasing students' understanding of scientific concepts, providing them with opportunities to apply the twenty-first century skills, involving them

in solving complex problems, becoming cooperative and taking responsibility of their learning (Haja, 2018; Yunes, 2016).

The partnership for the 21st century skills confirms that the process of learning and teaching must be occurred in an environment that imposes teaching the study subjects through examples from the real world not in abstract one as it is now in most schools and universities, work to use accurate and reliable means to assess learners' mastery of twenty-first century skills, provide creative teaching methods that integrate the use of technology, scientific investigation, problem-solving approaches, and higher-order thinking skills. This partnership also aspires to blend theses skills to fill the gap between school, work and daily life. National Science Teaching Association –NSTA presented a set of essential recommendations to achieve the quality of science teaching and support the twenty-first century skills to include curricula, teaching methods, teacher preparation programs and professional development, and confirms that the quality of science teaching and the twenty-first century skills can support each others when science leaders seek to integrate the twenty-first century skills in parallel with teaching the good science, teaching science should agree with the national standards of scientific education and the standards of scientific culture, work to support curricula based on induction and encourage learning science and the twenty- first century skills and give an opportunities through teaching to give various chances to practice induction and build scientific interpretations like lab experiments (Al-Ashqar, 2021; Al-Mughrabi, 2021).

The science teachers' possession to the twenty-first-century skills , their awareness of the importance of these developing skills among students, the ability to employ these skills and use these techniques in an innovative way to meet certain needs of learning in addition to use various strategic teaching and evaluation that consider individual differences among students while they learn science and create environments support the differentiated learning will help the students to acquire these skills, enable them achieve positive scientific educational results that embody the twenty-first century knowledge and skills and achieve continuous education to them, and this could be achieved through presence of devel-

oped curricula that consider the requirements of era, make balance between quality and quantity and the depth of science topics and focus on the twenty-first century skills and experiences including scientific and social topics and natural phenomena in science in addition to real practical experiences support their learning science and push them to scientific induction and experimental design such as labs and field trips (Al-Shahri, 2021; Haja, 2018).

To verify the extent of inclusion of science curricula for the twenty-first skills and achieve the partnership goals, it was necessary to conduct an evaluation process periodically on science textbooks developed based on circumstances and changes to ensure the extent to which these textbooks include practical applications and practices of the twenty-first skills. This task necessitates conducting continuous analysis processes on the textbooks to ensure their inclusion percentage of the essential skills of students at each stage, as well as determining the strengths and weaknesses of these textbooks based on the available areas of these skills (Al-Mansour, 2018; Al-Turki & Al-Jabr, 2019).

The content analysis process is considered one of the organized methods that contributes to identifying the degree of content observance for standards, principles and components which is built upon them far away from subjectivity and randomness, addressing weaknesses and supporting strengths in the textbook, in order to meet the learner's cognitive, social and emotional needs (Mohammed & Abdel Azim, 2018; Melhim, 2019).

Several definitions of the concept of content analysis have appeared, the most prominent of which was Adi's definition of content analysis (Adi, 2019) which defines it as a research style that follows a systematic methodology that deals with parts of the content in a balanced manner in order to measure and evaluate them. There is another definition by Oppliger and Davis (2016) which defines it as an evaluation of the textbooks in order to assess their effectiveness in conveying educational information.

The significance of content analysis in the field of education lies in determining the degree of content influence in achieving educational outputs as it is an instrument to do so, revealing strengths to be promoted and weaknesses to be corrected, and thus providing authors of books with information on what they should do to develop and revise curricula and work to promote the textbook to be more active in achieving its goals through analyzing results. In addition, it helps teachers organize the educational material so as to facilitate the daily and semester planning in a scientific manner away from randomness, prepare suitable educational aids, select proper teaching methods, facilitate teachers' tasks in building suitable evaluation aids based on strong scientific principles, identify concepts, information, basis, facts, and laws included in the content and help supervisors evaluate outputs of the teaching-learning process based on a clear and proper basis of the content (Mohammed & Abdel Azim, 2018).

Recently, science curricula received wide attention all over the world, and efforts were made to reform them in order to keep pace with the developments and requirements of the times. Jordan showed a great deal of attention in developing science curricula, as the Ministry of Education adopted what is known as the "Collins Series" in science curricula and worked to translate, align and apply them to all educational public stages. They concentrated while developing science textbooks on employing the skills of the twenty-first century in them, providing individuals with these skills like effective communication, various thinking skills, using modern technology and openness to different human cultures to reach qualitative educational outputs (National Center for curriculum development, 2020).

Based on the above, the current study aimed to analyze the newly developed science textbook for the eighth grade in 2021–2022 to reveal the degree of its inclusion of the twenty-first century skills since this textbook was recently developed and no previous analytical studies have been conducted on it because it is new. After reviewing the studies related to content analysis and the degree of its inclusion of the twenty-first century skills, many studies related to this field were found, one of them

was a study by Abu Saleem (2022), which aimed to reveal the degree of inclusion of the twenty-first century skills in the content of a developed physics textbook for the tenth grade in Jordan in 2020–2021. The study adopted the descriptive analytical method of analyzing the content of a physics textbook using the card of content analysis, including the twenty-first century skills suggested to be included by experts in the physics book for the tenth grade consists of 45 indicators, which were distributed into three dimensions: learning and innovation, digital culture, profession and life. The content analysis revealed that the degree of inclusion of twenty-first century skills in the tenth grade physics textbook was moderate, with the dimension of learning and innovation skills coming at first with a percentage of 51.37%, followed by the dimension of profession and life skills with a percentage of 34.11%, and the dimension of digital literacy skills coming in last with a percentage of 14.52%.

Al-Khatatneh (2022) carried out a study aimed to investigate the degree of inclusion of 21st-century skills in mathematics for the sixth grade in Jordan. To achieve this objective, the researcher used the descriptive-analytical method by analyzing the mathematics content for the sixth grade in Jordan based on an analysis card according to 21st century skills. The study results showed that the degree of inclusion of 21st century skills was very low in general, as it has reached only 28.55%, and the results found a discrepancy in the degree of inclusion of the main skills. The skills of critical thinking and problem solving were highly embedded. The degree of inclusion in creativity and innovation skills was moderate, and the skills of informational, communications, and media literacy came in with a low percentage. The rest of the skills (including collaboration and teamwork skills, computer and technology literacy skills, career and self-directed learning skills, and cross-cultural skills) score very low.

A study by Al-Mughrabi (2021) aimed to assess the extent to which 21st century skills were included in ninth-grade biology textbook in Jordan for the academic year 2020/2021.The researcher adopted the analytical descriptive technique represented the content analysis method. The sample consisted of the 9th grade Biology textbook for both first and second semesters, A content analysis card was created and enhanced to

include the primary and sub-skills of the twenty-first century, as well as to validate its psychometric characteristics, validity and reliability. The findings revealed that the degree of inclusion for the 21st century major and sub-skills for the 9th Grade Biology textbook in the first and second semesters was low. Biology textbook was poor in the first and second semesters, and none of these primary or sub-skills surpassed the 40% mark. The findings also showed that the key skill emphasized in the book was critical thinking and problem solving by (38.9%), including the sub-skills. Both parts of the book were permissible from any productive talents and questioning with 0% outcomes. Despite the low inclusion of all other sub-skills, the ability to make judgements and decisions received the greatest proportion of all sub-skills.

Al-Rubaie & Al-Saadi (2021) conducted a study aimed to identify the extent to which the science book for the sixth grade of primary school in Iraq included the skills of the twenty-first century. The researchers adopted the descriptive analytical method represented by the content analysis method, where the science book content for the sixth grade was analysed, and the researchers prepared a content analysis tool that was done and it was built in light of the twenty-first century skills. The results showed that the twenty-first century skills that must be available in the science book for the sixth grade of elementary school consist of nine main skills: skills of critical thinking and problem solving, communication and cooperation, innovation and creativity, the culture of computing and information technology, flexibility and adaptation, initiative and self-direction, social skills and cultural understanding Multiplicity, productivity, accountability, leadership and responsibility. The variation in the availability of twenty-first century skills in the science book for the sixth grade of primary school, where the skills of critical thinking and problem solving got the highest rate (33.0%), while the initiative and self-direction skills came in the second highest rate (13.06%), and productivity skills got Accountability is ranked third at a rate (12.84%), the percentage of availability of innovation and creativity skills (11.96%), communication and cooperation skills (11.29%), computing and information technology culture skills (4.4%), flexibility and adaptation skills

(3.67%), social skills and understanding multiculturalism (3.65%) and leadership skills and responsibility (5.98%).

Al-Ashqar (2021) conducted a descriptive analytical study aimed to identify the inclusion degree of the twenty-first century skills in the developed chemic textbooks for the tenth grade to achieve Jordan's vision of 2025. To achieve the study objective, the content analysis instrument was built, and after its reliability, validity and content analysis were verified, the results showed that the inclusion degree of the twenty-first century skills in the developed chemic textbooks for the tenth grade was low in general with am availability percentage as a whole was (9.96%), the availability percentage of learning and creativity skills was (16.56%), while the availability percentage of life and professional skills was (310.39%) and availability percentage of information technology and media skills was (2.92%), which were low percentages.

Al-Shahri (2021) conducted a study aimed at showing the level of inclusion of the skills of the twenty-first century in the textbooks of the intermediate stage in Saudi Arabia. The study adopted the descriptive method through content analysis. To achieve the objective of the study, an instrument of analysis was used which consisted of seven major skills and sixty-two sub-skills based on the partnership of the twenty-first century. The study was applied to a stratified random sample representing 60 textbooks from ten study curricula. The results showed that the whole percentage of the level of inclusion in all the textbooks was 50%, followed by communication and media skills with a percentage of 28%, then the profession and self-learning with a percentage of 7%, cooperation and work with a team and leadership with a percentage of 6%, computing and information technology skills with a percentage of 5%, creativity and innovation skills with a percentage of (4%) and understanding of various cultures with a percentage of 1%. The results also revealed statistically significant differences at 0.05 in the level of inclusion of creativity and innovation skill and the level of inclusion of profession and self-learning skill in the science textbook, and in the level of inclusion of critical thinking and problem solving skill in the mathematics textbook, due to the variable of specialization.

A study by Al-Shahrani and Al-Mahfouz (2020) aimed to evaluate the content of science curricula in the intermediate stage in Saudi Arabia in light of the skills of the twenty-first century. The study sample consisted of six study units in science textbooks for the intermediate stage. To achieve the objective of the study, an analysis instrument was prepared, which was a card of content analysis based on the skills of the twenty-first century. The study findings revealed that learning and innovation skills in science curricula at the intermediate level were available to a lesser extent. The science curriculum for the intermediate first and third grades did not include digital literacy, but it did include it in the curriculum for the intermediate second grade. The results also revealed a lack of life and career skills in the intermediate stage science curricula.

A study by Al-Omari (2020) aimed to identify the extent of the inclusion of the skills of the twenty-first century in the physics textbooks for the basic stage in Jordan. The study sample consisted of the physics textbook for the ninth grade in its first and second parts. To achieve the objective of the study, an analysis instrument was prepared, which was a card of content analysis that included the 21st century's major and subskills. The results of the analysis showed that the degree of inclusion of the skills of the twenty-first century in the physics book was low in general for all major skills except critical thinking and problem solving, which appeared at a high percentage. The results also showed a decline in degrees of sub-skills for most of the twenty-first century ones, lack of a number of sub-skills represented in media analysis, carrying out innovations, innovating media products, project management, leading others and being responsible for others.

Al-Turky and Al-Jabr (2019) conducted a study aimed at showing the level of skills of the twenty-first century included in the physics textbook (1) in the secondary stage in Saudi Arabia. The study adopted the descriptive analytical method by using a content analysis card instrument consisting of (22) indicators in three dimensions (learning and innovations, digital literacy, professions, and life). After the reliability and validity of the instrument were verified, it was applied to the physics textbook (1) of the secondary stage. The results showed that the level of in-

clusion of the twenty-first century skills in the physics textbook (1) varied between high and low, where the level of inclusion of the first dimension "learning and innovation" was high with a percentage of (38.98%), while the level of inclusion of the second dimension, "digital literacy skills", and the third dimension, "profession and life skills", was low. Based on this, it was recommended that activities and educational attitudes should be built to improve the second and third skills and integrate them into the content of the physics textbook to contribute to preparing the first-year secondary students for life, work and facing challenges in the twenty-first century.

Haja (2018) investigated the extent of the inclusion of science textbooks at the basic stage for grades (7-9) in Palestine for the major and sub-skills of the twenty-first century. To achieve the study's goal, an analysis instrument that was a content analysis of textbooks and their inclusion of skills for the twenty-first century was developed. The study results revealed the low inclusion of science in the twenty-first century's major and sub-skills, and they didn't include other skills such as use of technology, take initiative, self-orientation, leadership and responsibility.

Al-Mansour (2018) conducted a study aimed at identifying the degree of inclusion of the twenty-first century skills in the content of science textbooks of basic education in Jordan. The study adopted the descriptive method represented in the content analysis of science textbooks. The study sample consisted of all subjects in the content of science textbooks for the fifth, sixth and seventh grades. To achieve the objective of the study, an analysis card was developed, including a list of the twenty-first century analysis skills suggested to be included in the science textbooks, which consisted of (43) indicators distributed into three major dimensions of the skills: learning and innovation, digital literacy, profession and life. The findings revealed that the twenty-first century skills were included to a moderate degree in basic stage science textbooks, learning and innovation skills were first with a high inclusion degree, followed by profession and life skills in the second place with a moderate inclusion degree and digital literacy skills in the last place with a low inclusion degree.

Sabhi (2016) conducted a study aimed at identifying the extent of the inclusion of the twenty-first century skills in the developed science textbook of the moderate first grade in Saudi Arabia. The study sample consisted of the developed textbooks of the moderate first grade of (1436-1437 H) and they were six. To achieve its objective, the study adopted the descriptive method, and the content analysis form was used, which included (52) indicators distributed into seven dimensions: skills of critical thinking, problem solving, innovation, creativity, cooperation, teamwork, leadership, understanding multiple cultures, literacy of communication, information and media, literacy of computing, information technology, communication, profession and self-learning. The findings revealed a decrease in the percentage of developed science textbooks included in twenty-first skills, with a percentage of (22.86%), while the percentage of textbooks dealing with some life skills reached (0%).

Through the previous studies, it is clear that there is a kind of agreement among them in terms of the goal and method, where they aimed to analyze the content of textbooks and the curriculum, and all of them adopted the analytical descriptive approach, and the tool represented by the content analysis card to analyze the content of textbooks and reveal the degree of their inclusion of the twenty-first century skills. All the previous studies also aimed to analyze the science and physics textbooks except for the study of Al-Khatatneh (2022) which aimed to analyze the math's textbook. As for the results, they showed that the degree of including twenty-first century skills in the content of the analyzed books ranged between medium and weak, as the results of the study of Al-Mughrabi (2021), Al-Shahrani and Al-Mahfouz (2020), Haja (2018) and Subhi (2016) showed a low inclusion of the twenty-first century skills in science books for the basic and intermediate stages, and the study results of Al-Khatatneh (2022) showed that the degree of the inclusion of twenty-first century skills in mathematic book for the sixth grade was very low, while the studies varied in their spatial limits and the educational stage where the textbooks were chosen from it which was the basic or secondary, as the study results by Abu Saleem (2022) and Al-Mansour (2018) indicated that the inclusion of twenty-first century skills in the

content of science and physics books for the intermediate stage came to a moderate degree. As for the study's results of Al-Ashqar (2021), Al-Rubaie & Al-Saadi (2012) and Al-Omari (2020), they showed lowness of the degree of inclusion of the content of physics, chemic and science textbooks of the basic and secondary stages to the twenty-first century skills except for the critical thinking and problem-solving dimension in the study of Al-Omari, and learning and innovation dimension in the study of Al-Turki and Al-Jabr where the inclusion degree was high.

The current study has benefited from previous studies, such as the study of each of Al-Ashqar (2021), Al-Omari (2020), Sabhi (2019), Haja (2018), Al-Turki and Al-Jabr (2019) in preparing the analysis instrument and related indicators, in addition to enhancing the theoretical framework related to analysis of the content of science books and twenty-first century skill.

What distinguishes this study from others is its selection of the content of a modern and developed textbook by the Ministry of Education, which is the developed science book for the eighth grade, to verify the degree of its inclusion of twenty-first century skills and to benefit from the results of this study for the purposes of modification and development of this textbook in its current experimental version since the skills of the twenty-first century are so important for students of the basic stage in general, and students of the upper basic stage, such as the eighth grade, in particular, based on its relevance for them in future professions and the labor market.

Study problem and questions

The study problem was formed as a result of the researchers' experiences in the field of science curricula in Jordan and their informing of the various international series related to science textbooks of the basic stage, agreements and disagreements between them in terms of scientific content and the degree of its inclusion of scientific skills and attitudes, in addition to their review of previous studies related to this topic, as some of these studies such as the studies of (Al-Mughrabi, 2021; Al-Omari, 2020; Haja, 2018; Sabhi, 2016) indicated that the degree of inclusion of Sci-

ence, biology and physics textbooks of the basic stage to twenty-first century skills was low, and there was an imbalance in presenting these skills to the scientific content of theses textbooks.

In light of the changes that occurred to science textbooks in Jordan starting from 2019-2021, coincident with emergence and spread of Covid-19 pandemic represented in the development of science textbooks in successive stages depending on Collins series, their translation, adaptation and application to all stages of public education and inclusion of various skills, the most prominent of them were the twenty-first century skills to contribute in raising the learners' efficacy and prepare them to face the problems they exposed to in their practical life, it was necessary to analyze the content of these developed books in order evaluate them and reveal their attention and take into account the notes and recommendations mentioned in the previous studies about their degree of inclusion to the essential skills among students including the twenty-first century skills.

So, this study came to reveal the degree of inclusion of the twenty-first century skills in the science textbook of the eighth grade with its two parts the first and second as it is considered the last integrated textbook to be taught in the basic stage which was developed starting from 2021-2022 as a trial copy, and the extent of balance in presenting these skills in the scientific content of this textbook. This study, coincided with starting to teach this textbook to students, may contribute to identifying strengths and weaknesses in this textbook in terms of its inclusion to the twenty-first century skills and its balance in presenting these skills inside the content in order to check the quality of development and improvement occurred to it by the authoring team.

The study problem can be determined by answering the following questions:

1. What is the degree of availability of twenty-first century skills dimensions in the developed science textbook of the eighth grade in Jordan?

2. What is the degree of inclusion of twenty-first century skills in the developed science textbook of the eighth grade in Jordan?

Study objectives

This study aimed to:

– identify the degree of availability of the fields of twenty-first century skills in the developed science textbook in Jordan for the eighth grade.

– identify the degree of inclusion of the twenty-first century skills in the developed science textbook in Jordan for the eighth grade.

Importance of the study

Importance of the study concerning the theoretical and practical side appears as follows:

Theoretical importance

The theoretical importance of the study emerges in that it may contribute to enriching the literature review with new knowledge and results related to the concept and importance of providing learners with twenty-first century skills, analyzing the content of the textbook and what it includes in terms of procedures and steps, which in their presence and adoption, could be an addition to the literature review and related studies.

Practical importance

The practical importance of the study lies in that it may benefit the designers and developers of science textbooks in general, and the newly developed eighth grade science book in Jordan in particular, and all those who are interested in the field of content analysis to realize the mechanism of it and how to identify weaknesses and strengths in these developed textbooks through the analysis process and its extent of inclusion of the twenty-first century skills based on the new direction in developing the science textbooks and take into account these results and recommendations for the goal of modification and development to these textbooks,

as content analysis is one of the most important methods to depended on to evaluate the developed books.

Terminological and procedural definitions

Twenty-first century skills: Partnership for twenty-first century skills defines them as a set of essential skills for success and work in the twenty-first century such as skills of learning and innovation, media and information technology and life and professional's skills (Battelle for kids, 2019).They are procedurally defined as a set of skills that students need for learning, work, innovation, life and the optimal use of technology, information and related media to achieve success in the twenty-first century. These skills are included in the instrument of content analysis prepared by the two researchers, and they are divided into three dimensions: learning and innovation, media and information technology and life and professional skills.

Content analysis: They are procedurally defined as the comprehensive degrees of the developed science textbook of the eighth grade to twenty-first century skills mentioned in the analytical instrument prepared by the two researchers which are represented in three dimensions: skills of learning and innovation represented in (critical thinking, problem solving, communication, cooperation, innovation and creativity), skills of media and information technology represented in (information literacy, media literacy, information and communication literacy skills) and life and professional skills represented in (skills of flexibility, adaptation, take initiative, self-direction, social skills, understand multicultures, productive skills, accountability, leadership and responsibility).

Study limits and limitations

The study limits lie in the following:

Spatial limits: The study restricted to the recently developed science textbook for the eighth grade in Jordan in the academic year 2021-2022.

Time limits: The current study was conducted in the first semester of 2022-2023.

Objective limits: The study restricted to twenty –first century skills included in the developed science textbook for the eighth grade with its first and second parts prepared by the national center for developing the curriculum and began to be taught at the beginning of 2021-2022.

The generalization of the study results is limited in light of the content instrument developed by the two researchers and their psychometric properties, where it adopted twenty-first century skills as analysis categories, and it adopted the item and sentence as content units.

Study methodology

The study adopted the descriptive analytical method.

Study sample

The study sample consisted of the developed science textbook for the eighth grade with its two first and second parts of 2021-2022.

Study instrument

In order to collect data to achieve the purposes of the study, the twenty-first century skills were adopted as categories for analysis and the paragraph and sentence were adopted as units for content analysis. Based on this, a content analysis tool was developed including twenty-first century skills and the related indicators by referring to Partnership for 21st Century Skills and related studies such as the studies of Al-Shahrani and Al-Mahfouz (2020), Al-Omari (2020), Haja (2018), Sabhi (2016) and Shalabi (2014) to analyze the developed science textbook for the eighth grade with its two parts, the first and second. As these skills were classified into three dimensions (learning and innovation, media and information technology skills, life and professional skills) included (11) major skills and every major skill has a lot of sub-indicators as shown in table (1).

Table (1): Distribution of dimensions of content analysis instrument and the major Twenty-first century skills.

Dimensions	Major Skills	Number of sub-indicators
Learning and innovation skills	creativity and innovation critical thinking and problem solving communication and cooperation	4 9 6
Media and information technology skills	information literacy media literacy knowledge literacy, communication and technology	3 4 6
Life and pro-fessional skills	Flexibility and adaptation Initiative and self-direction Social skills and understand multi cultures Productivity and accountability Leadership and responsibility	4 7 5 4 5
Total	**11**	**57**

Instrument Validity

To ensure the extent of validity of the study instrument to be analyzed and measured accurately, it was presented to a number of educational arbitrators and specialists in curricula and teaching in order to take their observations and suggestions into account in terms of the importance of items related to the instrument, their suitability to the stage, linguistic formulation correctness and accuracy to ensure the validity of the instrument. In light of those observations, the necessary adjustments such as deletion and amendment were done until the questionnaire reached the final image which consisted of (3) major dimensions including (11) major skills as shown in table (1).

Reliability of the study instrument

Content analysis of the developed science textbook of the eighth grade was conducted by analysts specialized in science curricula and

their teaching methods. According to the coefficient of agreement between the two analyzes using Holsti equation to extract the stability coefficient and calculate the percentage of agreement between the analysts from the stability of the analysis process, where its value reached (0.95) which indicates that the study instrument is suitable for the purposes of the current study, and to judge the arithmetic frequency related to the availability of twenty-first century skills in the developed science textbook, cut-off degrees were used as shown in table (2).

Table (2) Cut-off degrees on the availability of twenty-first century Skills in the developed science textbook of the eighth grade

Percentage		Degree of availability
From	To	
0%	30%	Available with a low degree
30%more than	70%	Available with moderate degree
70%more than	100%	Available with a high degree

Study Methodology

To achieve the study objectives, the following steps were taken:

- Dentifying the analysis sample which is the developed science textbook for the eighth grade of 2021-2022 consisted of two parts.
- The analysis categories were represented in the main list of the twenty-first century skills which were (11) skills linked to (57) sub-indicators.
- A paragraph and word were adopted as units for content analysis which have contents associated with the twenty-first century skills.
- Preparing content analysis instrument including the twenty-first century main skills and their indicators by referring to some relayed studies such as the studies of Al-Shahrani and Al-Mahfouz (2020), Al- Omari (2020), Haja (2018) and Sabhi (2016).
- Checking the validity and reliability of the analysis instrument.

- Explaining the mechanism of analysis to the analyzers of the developed science textbook content for the eighth grade.
- Conducting the proper analysis to determine the twenty-first century skills included in the developed science textbook for the eighth grade with its first and second parts of 2021-2022 by two analyzers holding the same qualification in science curricula and their teaching methods to reach the highest degree of confidence and validity in analyzing the textbook content.
- Reaching the results related to analysis and calculating averages of frequencies, their percentages and interpreting them.

Statistical Procedures

- To answer the first question, the frequencies and their means were extracted between analyzers and percentages of dimensions of twenty –first century skills mentioned in the content analysis instrument.
- To answer the second question, frequencies of analyzers, their means and percentages of the major skills mentioned in the content analysis instrument and for every related indicator based on the distribution mentioned in the analysis instrument were extracted. In addition, Holsti equation was calculated to check reliability and agreement between the analyzers on the analysis instrument.

Study results

Results related to the first question: What is the degree of availability of twenty-first century skills dimensions in the developed science textbook for the eighth grade in Jordan? To answer this question, content analysis of the developed science textbook for the eighth grade was conducted with its two parts the first and second by analyzers in the same specialization based on the analysis instrument developed by the two researchers to achieve more confidence and validity. After that, the frequencies and percentages of twenty-first century skills mentioned in the developed science textbook for the eighth grade and the number of agreement points between the analyzers and reliability correlations of the

science textbook of the major skills of the eighth grade were calculated, and table (3) shows this

Table (3): Frequencies and percentages of twenty-first century skills included in the developed science textbook of the Eighth Grade, the number of points between the analyzers and reliability correlations according to Holsti method.

	Creativity & Innovation	Critical Thinking	Communication & cooperation	Information Literacy	Media Literacy	Literacy of knowledge, Communication & Technology	Flexibility & Adaptation	Initiative & self-direction	Social Skills & Understand Multi Cultures	Productivity & Accountability	Leadership & Responsibility	Total
First Analyzer	157.5	183.5	29.5	22.5	0	192.5	3	256	2	3	1	850.5
Second Analyzer	170.5	194	30	19.5	0	198.5	2	249	1	3.5	0	868
Agreement Points	157.5	183.5	29	19.5	0	192.5	2	249	1	3	0	837
Reliability Correlation	92%	95%	97%	87%	0%	97%	67%	97%	50%	86%	0%	%96

It is noted from the results of table (3) that the reliability values of the whole score reached (0.96), and the reliability values of dimensions were suitable to this study. After that, every indicator of a major skill in the book content was calculated. Frequencies, average of frequencies and percentage were calculated according to the results of analyzers' analysis for every dimension of twenty-first century skills and their inclusion extent in the developed science textbook for the eighth grade based on the prepared analysis instrument, and table (4) shows the results of this analysis.

Table (4): Mean of number of frequencies and percentages of dimensions related to twenty- first century skills and their inclusion extent in the developed science textbook of the Eighth Grade.

Dimension	Mean of frequencies in science textbook	Percentage	Extent of Inclusion
Learning and Innovation	766	45%	Moderate
Media and Information Technology Skills	433	25%	Low
Life and Professional Skills	521	30%	Low
Total	**1720**	**100%**	

It is noted from the results of table (4) that learning and innovation skills were in the first place with a moderate degree and a percentage of (45%), followed by life and professional skills with a low degree and a percentage of (30%) and in the last place media and information technology came with a low degree as well with a percentage of (25%).

Results related to the second question: What is the degree of inclusion of twenty-first century skills in the developed science textbook for the eighth grade in Jordan? To answer this question, the developed science textbook for the eighth grade with its first and second parts was analyzed by two analyzers specialized in science curricula and their teaching methods using the developed analysis instrument, then frequencies and percentages of every major skill related to twenty-first century skills were calculated in the first and second parts in the developed science textbook based on the developed analysis instrument that reached (11) skills distributed to three dimensions: (learning and innovation skill, media and information technology skills, life and professional skills).

The major skills included a number of sub-indicators for each one. Table (5) shows the major skills for each dimension, number of their frequencies and means to the analyzers, their percentages and sum of their

frequencies means in the first and second parts of the developed science textbook based on the analysis results.

Table (5): Frequencies and percentages of twenty-first century major skills included in the science textbook of the first and second parts.

Major skill	Number of indications	Arbitrators	Frequencies of first part	Frequencies of second part	Sum of means of both parts	Percentage of sub-skill
Creativity and Innovation	4	First arbitrator	130	185	328	19%
		Second arbitrator	143	198		
		Mean	136.5	191.5		
Critical Thinking and Problem Solving	9	First arbitrator	161	207	378	22%
		Second arbitrator	173	215		
		Mean	167	211		
Communication and Cooperation	6	First arbitrator	22	38	60	4%
		Second arbitrator	24	36		
		Mean	23	37		
Information literacy	3	First arbitrator	20	25	42	2%
		Second arbitrator	19	20		
		Mean	19.5	22.5		
Media Literacy	4	First arbitrator	0	0	0	0%
		Second arbitrator	0	0		
		Mean	0	0		

…continue table (5)

Major skill	Number of indications	Arbitrators	Frequencies of first part	Frequencies of second part	Sum of means of both parts	Percentage of sub-skill
Media, Communication and Technology Literacy	6	First arbitrator	192	193	391	23%
		Second arbitrators	194	203		
		Mean	193	198		
Flexibility and Adaptation	4	First arbitrator	3	3	5	0%
		Second arbitrator	2	2		
		Mean	2.5	2.5		
Initiative and Self-direction	7	First arbitrator	214	284	505	29.5%
		Second arbitrator	223	289		
		Mean	218.5	286.5		
Social Skills and Understand Multi Cultures	5	First arbitrator	2	2	3	0%
		Second arbitrator	2	0		
		Mean	2	1		
Productivity and Accountability	4	First arbitrator	6	0	6.5	0.5%
		Second arbitrator	7	0		
		Mean	6.5	0		
Leadership and Responsibility	5	First arbitrator	1	0	15	0%
		Second arbitrator	2	0		
		Mean	1.5	0		
Total	**57**		**770**	**950**	**100%**	**1720**

It is noted from table (5) that mean of frequencies of the first part of arbitrators reached (770), while for the second part it reached (950), where it is shown in the table the increase of number of frequencies of skills mentioned in the second part compared to the first one.

Results discussion

The results discussion related to the first question: What is the degree of availability of twenty-first century skills dimensions in the developed science textbook for the eighth grade in Jordan? It is clear from the results mentioned in table (4) concerning the degree of availability of the twenty-first century dimensions of skills in the developed textbook for the eighth grade that the dimension of "learning and innovation" skills came in the first place with a moderate degree and a percentage of (45%), followed by the dimension of "life and professional" skills with a low degree and a percentage of (30%) and in the last place came the dimension of "media and information technology" skills with also a low degree and a percentage of (25%).

This result may due to the concentration of those who are responsible for authoring the developed science textbooks adopted by the ministry on processes of science, thinking skills with their types and problem solving classified under learning and innovation skill more than concentrating on skills related to leadership, responsibility, self-direction and social skills which belong to life and professional skills, as the inclusion of this skill came with a low degree, which requires more attention to these skills by the developers of science textbooks for the eighth grade.

Based on the results of analysis, it was clear that there was a lack in inclusion of skills related to media, information and information technology literacy in the content of the developed science textbook of the eighth grade which belong to media and information technology skills as they came with a low degree knowing, that these skills are considered among the important skills of twenty-first century skills in the current era which should be concentrated on and included in the developed science textbooks content. This result agrees with the study results of Al-Shahrani and Al-Mahfouz (2020), Haja (2018). Sabhi (2016) and Shalabi

(2014) which indicated the lowness of inclusion of twenty-first century skills in science textbooks of the basic and intermediate stages.

The results discussion related to the second question: What is the degree of inclusion of twenty-first century skills in the developed science textbook for the eighth grade in Jordan? Table (5) shows that the mean of the frequencies of the first part skills of the arbitrators was (770), in the second part, it was (950), and it is clear that the number of frequencies mentioned in the second part were increased compared to the first part. The reason may due to that the number of units of the second part of the textbook was five compared to four units in the first part, which may indicate a type of convergence of number of frequencies between the two parts.

As for the percentage of frequencies of skills, the initiative and self-direction skill in the dimension of life and professional skills came in the first place with a percentage of (29.5%), followed by literacy of knowledge, communication and technology in the second place in the dimension of media and information technology skill with a percentage of (23%), then critical thinking and problem solving in the dimension of learning and innovation which came in the third place with a percentage of (22%), while skills of literacy of media, flexibility, adaptation, social skills, understand multi cultures, productivity, responsibility and leadership came in the last place as no frequency appear in the content of the developed science textbook of the eighth grade, where this may due to lack of attention to balance in inclusion of dimensions of twenty-first century skills in the content of science textbook for the eighth grade in general, and concentrating on specific skills related to innovation, learning, technology and critical thinking only, in addition to lack of concentration on including the rest of skills related to the dimension of life and professional skills and those related to media and information technology skills where their frequency came with a low degree. This result agrees with the results of study of Al-Shahrani and Al-Mahfouz (2020), Haja (2018), Sabhi (2016) and Shalabi (2014) that indicated the lowness of inclusion of twenty-first century skills in the science textbooks of the basic and intermediate stages.

Conclusion

The Studies on content analysis seek to identify the strengths and weaknesses of textbooks as part of the curriculum to come up with a perception of the quality of the content of these books and their impact on the targeted students and their compatibility with the objectives of the educational system. In the current study, an analysis of the content of the developed science textbook for the eighth grade was conducted in light of the skills it includes of the twenty-first century. The results of the analysis showed that there is a weakness in the degree of inclusion of these skills in the content, as the percentage of the total inclusion of twenty-first century skills in the book reached 33%, which represents the least average degree according to the grading approved in this study. The highest inclusion in the content was learning and innovation skills with a medium degree, followed by a low degree of life and profession skills, media skills and information technology. This result requires the developers of this book to review the consideration of the content in terms of its inclusion of twenty-first century skills, and to amend it in the light of the results that have been reached.

Study recommendations

In light of the results, the two researchers recommended the following:

- Review the content of the developed science textbook for the eighth grade as it should include all twenty-first century skills specially those related to the dimension of media and information technology skills.
- Adopt twenty-first century skills as a major requirement in the general framework of Jordanian curricula of all developed books by the National Center for Curriculum Development.
- Conduct more descriptive analytical studies and comparative ones related to inclusion of twenty-first century skills in Jordanian developed curricula in general, and provide National Center for Curricu-

lum Development with results related to them and their most prominent recommendations.

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References

– Abu Saleem, Tariq. (2022). *The inclusion degree of the developed physics textbook of tenth grade of 2020/2021 of twenty-first century skills.* Unpublished M.A. thesis, Al-Bait University, Jordan.

– Adi, H. (2019). Content Analysis of students Book When English Rings A Bell: *Journal of English Language Teaching*.8 (1), 49-59.

– Al-Ashqar, Nadia. (2021). The degree to which twenty-first century skills are included in the chemistry textbook developed for the tenth grade basic to achieve Jordan's vision 2025, *Journal of Ibn Rushd University in the Netherlands*, 2021(43), 262-293.

– Al-Khatatneh, S. K. (2022). Inclusion of 21st Century Skills in Mathematics Textbook for the sixth grade in Jordan. *Journal of Positive School Psychology*, 6(8), 1339-1356.

- Al-Mansour, Areen Suleiman (2018). *The degree of inclusion of science textbooks of the basic stage of education in Jordan of twenty-first skills*. Unpublished M.A. thesis, Al-Bait University, Jordan.
- Al-Momani, Jehad. (2018). The Challenges of the Twenty-First Century Faced by Science Teachers in Public Schools in Ajloun Governorate, *Journal of Al-Quds Open University for Research and Studies*, (43), 186-197.
- Al-Mughrabi, A. M. (2021). Inclusion of 21st Century Skills in Biology Textbook for the ninth grade. *Ilkogretim Online*, 20(5).
- Al-Omari, Wisal. (2020). Inclusion of twenty-first century skills in physics textbooks of the upper basic stage in Jordan: an analytical study. *Jordanian Journal in Educational Sciences*, 16(4), 4610475.
- Al-Rubaie, S. & AL-Saadi, Y. (2021). The extent to which the 6th grade science textbook includes 21st century skills. *Turkish Journal of Computer and Mathematics Education (TURCOMAT),* 12(11), 358-368.
- Al-Shahrani, Badriya. & Mahfouz, Mohammed. (2020). Evaluation of the content of science curricula in the intermediate stage in light of the twenty-first century skills. *Educational Journal*, (72), 418-468.
- Al-Shahri, Abdel Rahman Ali. (2021). The level of inclusion of twenty-first century skills in school textbooks in the intermediate stage. *Journal of Educational Sciences in King Saud University, 33(2), 307-333.*
- Al-Turki, Kholoud. & Al-Jabr, Jabr. (2019). Twenty-first skills included in physics textbook (1) in the secondary stage in Saudi Arabia. *Journal of Educational Sciences in King Saud University*, 3(24), 1-69.
- Battelle for kids. (2019). *P21's Frameworks for 21st Century Learning*. https://www.battelleforkids.org/networks/p21/frameworks-resources, Retrieved 13 January 2023

- Haja, Hakam. (2018). The inclusion extent of science textbooks of the upper basic stage of twenty-first century skills. *Studies - Educational Sciences*, 45(3), 163-178.
- Melhim, Amani Mohammed. (2019). *The degree of availability of twenty-first century skills in the technology textbook of the upper basic stage and the students' possession degree of those skills*. Unpublished M.A. thesis, Al-Najah National University, Palestine.
- Mohammed, Wael. & Abdel Azim, Reem. (2018). *Analysis of content in Human sciences*. Amman: Dar Al-Massira.
- National Center for Curriculum Development. (2020). *The general framework of Jordanian curricula.* National Center for Curricula publishing, Amman: Jordan.
- Oppliger, P. A. & Davis, A. (2016). Portrayals of bullying: a content analysis of picture books for preschooler. *Early Childhood Education Journal*, 44(5), 515-526.
- Sabhi, Nisreen bint Hassan. (2016). The inclusion extent of twenty-first century skills in the developed science textbook of intermediate first grade in Saudi Arabia, *Journal of Educational Sciences,* 1(1), 9-44.
- Yunes, Idris. (2016). Evaluation of Geography curriculum in the general secondary stage in light of the twenty-first century skills. *Journal of the Educational Society for Social Studies*, (76), 63-92.