

**Analysis of the content of some scientific theses used in teaching  
mathematics at the university level in light of twenty-first century  
skills**

**Researcher**

**Ahmed Ahmed Abdelaziz**

**Teaching Assistant – Mathematics Program Mathematics Department**

**Qatar University**

**2023**

## **Introduction:**

The rapid and successive developments witnessed in the current era represent challenges that are reflected in various aspects of life, which places educational systems before a great responsibility to work on preparing an individual capable of facing and overcoming these challenges, which calls for the necessity of empowering learners with some of the necessary skills to be able to participate effectively in life.

The twenty-first century is characterized by rapid and renewed scientific developments that have affected all areas of social, economic, political, cultural and scientific life, and have brought about rapid and astonishing changes in science and scientific knowledge, the technological and information revolution, and the expansion of global competition from trade to ideas that lead research, laboratories, factories and universities, which poses multiple challenges before us.

Our contemporary societies to deal with the data of this development and respond to its requirements, benefit from it, and keep up with it. The scientific developments we are experiencing today in various fields have left their mark on various aspects of life, including education. Educators called for the necessity of benefiting from the developments of science in advancing and developing educational work, and it was the means for educators to conduct the desired change is the school curriculum, including the knowledge, skills, attitudes, and values that are consistent with the characteristics of the learner. (Abdel-Al, 2019, p. 33)

(Abdel Qader, 2020, 680) referred to the skills of the century as “a set of professional requirements imposed by the variables of the twenty-first century on professional performance, such as higher thinking skills, solving problems in creative ways, and dealing with technological means that enable him to practice life and work skills in a way that qualifies him.” To be flexible and adapt to those

developments that have enabled many social relationships, which in turn imposes responsibility towards oneself and others, in order to better achieve learning outcomes among its students so that their abilities are in line with the requirements of the labor market and the requirements of life.

Educational issues currently focus on the requirements of the twenty-first century in educational outcomes, and their implications for educational processes. These requirements are identified in four main axes: developing standards and evaluation levels, developing the curriculum and education processes, while strengthening sustainable professional development processes and mechanisms, while strengthening, Work and learning environments, and these requirements were linked to a set of skills called “21st century skills,” which must be taken into account in the educational process, meaning including them in standards documents and learning outcomes, and including them in curricular elements in mathematics courses, taking into account the planning of professional development programs for mathematics teachers in light of Addressing twenty-first century skills. (Al-Shehri, 2021, p. 14)

It can also be said that twenty-first century skills are among the trends that have begun to receive widespread attention from educators, with the aim of supporting students during study and professional life in terms of mastering all knowledge and skills. These skills have begun to be advocated in all disciplines by the Partnership Foundation for Twenty-First Century Skills, which was established. Through a partnership between the Department of Education in the United States of America and a group of commercial institutions, including Microsoft, this partnership has now become one of the most important leaders in developing and teaching twenty-first century skills in the world, as the Twenty-first Century Skills Partnership Foundation has prepared a map showing how to integrate twenty-first century skills into curricula. Academic curricula, including mathematics curricula at various educational levels and in university education. (Abdul Hamid, 2019, p. 11)

The value of the university stage lies in the fact that it is one of the most important stages that determine the fate of learners, the end of the education stage, starting work, learning about ways and methods of earning, and joining jobs that enable them to live safely and face the demands of life. It also adds to the learner opportunities for personal growth and academic learning, and it is also like any stage that he goes through. The student faces some challenges and difficulties that put him outside the comfort zone and the routine he is accustomed to, and may create a state of confusion and psychological pressure for him, as the student enters the university stage bearing many new challenges, including: a different kind of study, new friends. , a different nature of learning, hopes, ambitions, visions, and perceptions that do not necessarily match reality, and all of this poses challenges and difficulties for them. (Al-Masaieed, 2020, p. 9)

(Zafar, 2020, p. 15) emphasizes that the university education stage is considered a major shift in their lives, given the importance this stage carries in building the learner's personality and developing the level of thinking and culture. Despite the importance of the university stage in students' lives, they face... It has many difficulties, and it shows that the problems lie in many forms, including economic, social, and personal, those related to the student or professor, and those related to the scientific subject. "It is possible that these challenges result from the loss of communication with friends and classmates in the secondary stage, which the student has become accustomed to it for a period of time. The university environment is a somewhat open environment compared to the school environment, especially single-sex schools, which give greater freedom and provide multiple options, and attendance and absence are in a certain percentage. The psychological factor also has an important role before the student enters the university stage, and comes in First and foremost is the shock of entering the university and getting to know the university community, the way of dealing at the university, as well as the method of study, as it is completely different from the stage of school education in which the student spends approximately 12 years studying, which makes him accustomed to the routine

and monotonous methods of the educational and pedagogical process in that period stage.

Mathematics represents the largest proportion of the development that occurs in various fields and fields to the point that it confirms that it is not possible to follow the movement of diverse and accelerating scientific changes that the world is experiencing without arming itself with the minimum mathematical concepts and skills that this matter requires. Therefore, school mathematics curricula must be developed in a way that eliminates the gap, Between what students learn in educational institutions and what students learn outside them, so that the learner realizes the extent of the benefit of learning mathematics in solving his problems and developing his abilities to make decisions regarding life situations. (Bondi, 2020, p7)

Believing in the importance of mathematics and its role in the life of the individual and society, some Arab countries have sought to pay attention to projects related to developing mathematics curricula. One of the most important of these projects was the “Project for Developing Mathematics and Natural Sciences Curricula in the Kingdom of Saudi Arabia,” as it is considered one of the pioneering educational and strategic projects that aims for comprehensive development To teach mathematics and science, relying on the translation and harmonization of international educational materials that have proven effective in improving education. The project is based on harmonizing distinguished international series for mathematics and natural science curricula (McGraw–Hill series for all levels of public education) (Al–Ruwais, Abdel Hamid, and Al–Shalhoub, 2021, p. 87).

Mathematics at the university level is also considered one of the pivotal subjects in educational systems, as it is directly linked to preparing the student for academic, professional and practical life. In light of life in the twenty–first century, educational institutions have adopted a set of skills that the university student must be able to master in learning outcomes for the possibility of life in the future,

the twenty-first century skills are considered an important input into the development of university mathematics curricula. They are also an input for evaluating and developing teaching performance, practices and activities, as we must move from traditional objectives to functional objectives linked to the requirements of the digital age, ensuring students' mastery of mathematical operations and building their capabilities, In mathematical reasoning, investigating mathematical relationships, employing logic and reasoning processes in solving everyday mathematical problems, and building mathematical knowledge that is characterized by a degree of creativity, while continuing to develop the mathematical mind. (Al-Balawi, 2019, p. 6)

Twenty-first century skills are considered a necessity for the mathematics teacher at the present time, as they are not limited to developing a set of teaching strategies for teaching mathematics, but rather are linked to modifying the paths of thinking of mathematics teachers, reconsidering the educational position, and moving from focusing on educational experiences to focusing on student participation, In planning and implementing teaching and learning, a teacher who possesses twenty-first century skills is able to include those skills in practical content, plan teaching, and employ traditional and digital resources and sources to enhance the development and measurement of twenty-first century skills among their students, ensuring their success in the future and ensuring that they possess the necessities of life Correctly. (Al-Bahrawi, 2020, p. 8)

(Al-Ajrami, 2020, p 10) explains that developing twenty-first century skills is centered on effective teaching, and effective teaching practices fall on the teacher, and these teaching practices are linked to moving from traditional strategies to teaching strategies that enhance research and investigation processes, and train students in cooperative work and positive participation, In educational situations, with communication, with developing motivation and confidence among students, and focusing on developing thinking skills according to various paths characterized by a high degree of flexibility.

## **Research problem:**

Although education in the Arab world has made great leaps in various fields and multiple subjects for all levels of study, reports still indicate that there are major problems that education suffers from, and these problems are represented by the low quality of education and the lack of acquisition of the required skills in a world with an increasing degree of competition, And the low level of academic achievement and students' motivation to learn, and the low national rates in international achievement studies, as many education specialists agree among themselves that there is a deep gap between the skills that students learn in school, and those that they need in life and work in the era of knowledge flow, Our current curricula are no longer sufficient to prepare students for contemporary life in today's changing world, and after reviewing studies that focused on analyzing the work required by the labor market in the twenty-first century, and the skills that students acquired at university, it became clear that these current skills are no longer sufficient to prepare students, for life and work, and that students are currently facing difficulties in keeping up with business in the twenty-first century and that they are learning and preparing themselves for businesses that have disappeared or are likely to disappear in this century (National Research Council, 2022).

Hence the idea of the current research came by analyzing the content of some scientific theses that were concerned with teaching mathematics at the university level to identify the extent to which they include twenty-first century skills.

## **Research Questions:**

The researcher formulated the research problem in the following main question:

What 21st century skills need to be included in undergraduate mathematics courses?

It is divided into a group of the following sub-questions:

- To what extent do the messages used in teaching mathematics at the university level include twenty-first century skills?
- What is the image of the content analysis form for twenty-first century skills?
- What are the obstacles that prevent the inclusion of twenty-first century skills in mathematics content at the university level?

### **Research Aims:**

The current research aims to:

- Identifying the extent to which the messages used in teaching mathematics at the university level include twenty-first century skills.
- Identify the image of the content analysis form for twenty-first century skills.
- Revealing the obstacles that prevent the inclusion of twenty-first century skills in mathematics content at the university level

### **Research Importance:**

- The importance of the current research stems from the nature of the topic it addresses, which is identifying the twenty-first century skills that need to be included in mathematics curricula at the university level.
- The results of the current research may benefit administrators and undergraduate program planners in including 21st century skills in mathematics at the undergraduate level.
- The results of the current research may benefit student mathematics teachers in their acquisition of twenty-first century skills.



## **Research limitations: The current research was limited to:**

– **Objective limits:** Analyzing the content of some theses and scientific research related to teaching mathematics at the university level to determine the extent to which they include twenty-first century skills.

– **Time limits:** This research was completed in the academic year 2022–2023  
AD

## **Research Methodology:**

The current research relied on the descriptive analytical approach, which is the appropriate approach for the current research, by describing and analyzing some theses and scientific research that dealt with teaching mathematics at the university level in light of the skills of the twenty-first century.

## **The Research Sample:**

The research sample included (10) scientific theses and scientific research to determine the extent to which they include twenty-first century skills.

## **Search Terms:**

### **21st century skills:**

Al-Zahrani (2019) defines it as a set of necessary skills that mathematics teachers must have in order to keep pace with the requirements of life in the twenty-first century, and is reflected in improving activities related to the educational process.

And he knows it (Carolan, 2018). It is: a set of skills that the nature of life in the twenty-first century imposes on male and female university students, and they must be acquired practically, and the generalized must include: creativity and innovation, problem solving and critical thinking, communication and participation, information and media culture, information and communication

technology culture, adaptation and flexibility, and initiative. Self-direction, leadership and responsibility, productivity and accountability, social skills, and multicultural skills.”

It is defined procedurally as: a set of skills that must be included in mathematics teaching courses at the university level

### **Content analysis:**

(Rizk, 2020) defined it as one of the methods of scientific research that aims to objectively, systematically and quantitatively describe the apparent content of communication materials.

As Carolan knew him (2018)) A method and tool for objective, structured and quantitative description of the apparent content of communication and that it is used to depict the social, economic and political conditions existing in society.

It is defined procedurally as: quantitatively analyzing some theses and scientific research in light of some twenty-first century skills.

### **Theoretical framework:**

The theoretical framework included presenting a group of theses and scientific research that dealt with teaching mathematics in its various branches at the university level, and then analyzing the content of these studies in light of twenty-first century skills and presenting a summary of the most important results reached by these studies, reviewing the most important obstacles that hinder the inclusion of first century skills. Twenty in university mathematics courses.

### **First: Twenty-first century skills: concept and importance:**

Twenty-first century skills are the outcomes of research work in many educational, social, and economic fields. They are directly linked to the nature of the twenty-first century and its requirements. Therefore, the Partnership for the Twenty-First Century in the United States of America has identified a set of skills

to ensure students' success in academic, professional, social, and personal life. It includes creative thinking skills, problem solving, teaching, research and communication skills, technological skills including communication, information technology, information culture and media culture, leadership skills, social responsibility, independence and self-direction skills (Foster & Perotti, M 2019).

The skills of the twenty-first century stem from the nature of life in light of the digital world, which characterizes life at the present time, and this life requires that educational outcomes be characterized by a set of necessary qualities, the most important of which are: digital citizenship, the ability to do engineering design, and productivity in thinking, problem solving, and processing. Cash for data and information. (Fakiat, 2021, p 15)

Carolan (2018: p19) explains that twenty-first century skills stem from the idea of complementarity and interoperability between different fields of knowledge, as they must be included directly and explicitly in the curriculum matrix and not limited to the hidden curriculum in developing these skills, and this idea is consistent with the nature of school mathematics. And its developed curricula, which include a set of mathematical operations, including mathematical connections, which enhance the student's understanding of the interconnection between conceptual mathematical knowledge and procedural mathematical knowledge, It also enhances the university student's understanding of the mathematical interconnection between the fields of mathematics (numbers and operations on them, geometry and measurement, algebra, statistics, and probability). It also enhances the student's understanding of the interconnection between mathematics and the rest of the fields of knowledge through mathematical issues and problems, and the university student's understanding of the interconnection between university mathematics and life situations.

### **Classification of 21st century skills:**

(Al-Zahrani, 2019, p 30) classified these skills into three categories:

### **Learning and creativity skills:**

These are skills that distinguish students who are preparing for life and work in the twenty-first century from others, the skills included in this group are considered responsible for developing students' abilities for professional and personal success in the current century, this group consists of the following main skills: critical thinking and problem-solving skills. Communication and cooperation skills, innovation and creativity skills.

### **Digital culture skills:**

In order to access, analyses, manage, evaluate and use information appropriately, twenty-first century students need to possess a set of functional and important thinking skills related to information, media and technology. This set consists of the following main skills: information literacy skills, media literacy skills, and information and communication culture skills.

### **Life and career skills:**

It is intended to develop a person's skills to become a self-directed, independent learner and a workforce capable of adapting to change, managing projects, taking responsibility, leading others and reaching results, This group consists of the following main skills: flexibility and adaptation, initiative and self-direction, the skill of social interaction and interaction, Multicultural, productivity and accountability skills, leadership and responsibility.

There is a group of other skills called the Successful Learning Framework Skills for the Twenty-First Century, the most important of which are the following: (Sawafta, 2021):

- Strategies for teaching and learning and innovation skills, including: problem solving, brainstorming, thinking maps, six hats, mind maps, the Cort program to teach thinking, brain-based learning, cooperative learning, project-based learning, competitive learning, and discussion.

- Strategies for teaching and learning life and adaptation skills: including project-based learning, cooperative learning, participatory learning, cognitive mapping, inquiry, exploration, and role-playing.
- Strategies for teaching and learning information, media, and technology skills: including cognitive trips via the web, simulation, investigation, exploration, electronic maps, electronic collaborative learning, electronic discussion, and electronic brainstorming.

**Second: Content analysis: concept and historical development:**

(Al Casey, 2020) emphasized that content analysis is (a research method applied in order to reach a purposeful and organized quantitative description of the content of the communication style) because it emphasizes the following characteristics:

- Content analysis is not conducted for the purpose of quantitatively quantifying the unit of analysis, but rather goes beyond it to try to achieve a specific goal.
- – It is limited to describing what is apparent and what a person explicitly said or wrote only without resorting to its interpretation.
- – He did not specify one method of communication alone, but the researcher can apply it to any written or photographic communication material.
- – It depends on systematic repetitive monitoring of the chosen unit of analysis.

**Trends about the nature of the concept of content analysis:**

There is a difference in some of the determinants of the definition of content analysis, through which the definition trends can be classified into two basic directions: (Aslan, 2019).

- **The first trend:** It is the descriptive trend in content analysis, which occurred during the period of inception, and continued after that, and from

it some researchers in Egypt borrowed the definition, especially in sociology research.

– **The second trend:** It is the inferential trend in analysis that goes beyond simply describing the content to coming up with inferences about the elements of the media process and the implied or latent meanings in the content, which appeared at the end of the fifties.

### **Steps for content analysis method:**

This approach to education began when Western curricula were transferred to Arab disciplines. Some consider it a method, others see it as a tool, and some say it is a method. Rather, this went beyond disagreement about its steps and method. Some of them classify it as content analysis, and some of them, when talking about the steps of content analysis, mention the steps of the documentary approach, but the intended methodological steps in the content analysis approach that are specific to it are as follows: (Hajjah, 2018)

– Classification of the researched contents: It is the most important step in content analysis because it is a direct reflection of the problem to be studied.

– Analysis of units of analysis: There are five basic units of analysis: (word, topic, character, single, standard or time unit). The word: the researcher makes a quantitative inventory of a specific word that has its intellectual, political, or educational significance. The subject: It is either one or more sentences that confirm a certain political, social, economic, or educational concept. Personality: means a quantitative enumeration of specific characteristics and traits that define a particular personality, whether that personality is a specific person, a group of people, or a community of societies. The word: it is the unit that The source is used to convey meanings and ideas, the standard or time unit: for example, the researcher makes a quantitative estimate of the length of the article or the number of its pages or sections, or a quantitative estimate of the duration of discussion in it through the media.

- Designing the analysis form: This is the form that the researcher designs to empty the content of each source if enumerated, so that his relationship with the source of that content ends after that. The analysis form contains (primary data – content categories – analysis units – notes).
- Designing transcription tables: The researcher transcribes information from the analysis forms quantitatively.
- Transcribing the content of each document into its own form.
- Applying the necessary statistical treatments, including descriptive and analytical.

### **Third: Content analysis of some scientific theses used in teaching mathematics:**

In this topic, the researcher analyzed the content of some recent scientific dissertations and research that dealt with teaching mathematics and twenty-first century skills to identify the extent to which student teachers specializing in mathematics possess twenty-first century skills. The following is a presentation of these studies from most recent to oldest:

**Study (Fakiat, 2022)** The study aimed to: reveal reality Practices Teaching To my teachers mathematics in a light skills Century atheistic Twenty in Thinking in teaching Research Mathematics in Schools south Hebron, To highlight Role Teachers in refine Their talents And keep up Renewal and evolution, And it has I posed the study Many from Questions Which He was Most notable QuestionWhat? Bezel Use my teacher mathematics For class The tenth Academic For skills Century the one Twenty in Thinking in teaching Research mathematics in Schools South Hebron, and the study relied on the quasi-experimental method. And it has I reached out the study to several results He was from Most notably: There is difference Self indication Statistic when level Significance 0.05 estimates my teacher mathematics For practices Teaching (reality Practices– Requirements) for teachers mathematics in Thinking in

teaching Research mathematics Differently Sex Favor Male, no There is difference Self indication Statistic when level Significance 0.05 in Estimates my teacher mathematics For practices Teaching (reality practices , requirements) To my teachers mathematics in Thinking in teaching Research mathematics Differently qualification Scientific, it has I recommend researcher With several Recommendations He was from The most important of which is : integration skills Century the one Twenty within Courses Regulations Teacher preparation before And during Service . And identify needs my teacher mathematics Training in a light skills Century atheistic twenty, To be done in Its light fee Development plans Professional For teachers To develop Their performance

**Study (Sawafta, 2021 )** : A goal search to Reveal on effectiveness program My training Document to my style Learning Mixed And gamification In acquisition Knowledge And application skills Century the one Twenty I have my teacher mathematics , And I followed the study Semi-curriculum experimental, And it was composed the sample from ( 28 ) A teacher from Student teachers Mathematics major, and to achieve Goals the study It was completed building program Training and preparation a test Cognitive, card note, And revealed the study on Existence difference D Statistically between middle grades Teachers in The two applications Tribal And the distance for every From a card Note And the test cognitive, Back Favor the program Training, The results also demonstrated the weak application of twenty-first century skills among the student teachers in the study sample

**Study (Al-Shehri, 2021)** aimed the study to evaluation Practices my teacher mathematics Teaching In middle school in a light skills Century atheistic And the twenty. And I was baptized the study On the descriptive analytical method And I was baptized Study on Preparation poll, Be from (35) Single in Fields : Planning Teaching in a light Skills of the century atheistic twenty, administration Practices Learning Safiya, to implement Teaching in a light Skills of the century atheistic twenty, calendar the performance For students And teachers in a light skills Century Twenty one, Obstacles development Practices Teaching in



a light skills Century atheistic twenty, And it formed a sample the study from (35) from my teacher And my supervisor mathematics In middle school And it showed results the study that degree level Practices Teaching I have Mathematics teachers By stage Medium in a light skills Century atheistic Twenty She came To a moderate degree As General.

**Study (Khadir , 2020 )** : aimed the study to Identify on Bezel to have Students to divide mathematics in Colleges Education For the skills of the century The one twenty, And it has used the study Curriculum Descriptive , And takot a sample search from ( 200 ) student And a student from Students The fourth stage in to divide mathematics in college Education / Science And Puretha – Ibn Al–Haytham With a reality ( 88) students And ( 112 ) student, And it was Most important The results are to have Students to divide mathematics in college Education For skills Century the one Twenty in the rate of ( 54.8% ) where indicate This is amazing The ratio To own them To limit Acceptable For skills Century Twenty–first Don Their maturity level Perfection The represented B ( 80% ) According to what She pointed out mechanism Studies The study also recommended the necessity of working to provide students with various skills such as innovation, creativity, and life skills that help students deal with the requirements of life.

**Study (Al–Ajrami, 2020)** The study aimed to develop skills Female students Parameters – who They study in college Education At the university Al–Azhar With specialization Basic education – design the games Educational in My material the sciences And mathematics on road program My training Dish on group Selected random Regular composed from (30) student female teacher, And I used it Tools The following : card note, And test Cognitive The study also relied on the quasi–experimental method to test the validity of the hypotheses the study Existence difference D all over from Card Note And to test Cognitive Return To apply the program, Recommended the study Necessarily training Female students the teachers For a stage the basic education on Recruitment games Educational

in teaching, And application this the program Training on Bezel Wider in Phase Educational Other.

**Study (Abdel Hamid, 2019)** aimed the study building program Proposal existing on skills Century atheistic twenty, And measure its effectiveness in development the performance Teaching I have a sample Number of them (59) from the students Teachers Mathematics major Totally Education university brown child In Libya. And I was baptized the study on Curriculum Experimental Based on an experimental group one, And she was adopted the study skills Century atheistic Twenty in the program The proposal, And it was translated to group from Practices Teaching maybe Develop and measure it, And it showed results The study is effective the program The proposal in development fields the performance Teaching I have the students, Recommended Study is necessary adoption entrance skills Century atheistic Twenty in Programs Preparation And training Student teachers With a purpose development Their practice Teaching

**Study ( Al-Ghamdi, 2019)** aimed the study to study needs Training And challenges that Facing Parameters Mathematics in a light Milestones Century atheistic twenty, And I was baptized the study on Curriculum Descriptive and analytical, and formed a sample the study from ( 252 ) from Parameters mathematics For all Stages Educational In the city of Riyadh, And it showed results the study that degree Need Parameters mathematics in skills 21st century She came In degrees High and medium, as I showed results the study non Existence Self-differences indication Statistic between Responses Parameters mathematics My condolences For variables stage Educational and qualification scientific, And specialization, And number Years Experience

**Study ( Abdel-Al's 2019)** aimed the study to building And measure effectiveness program Enhanced With tools Web 2 in development Some skills Century atheistic Twenty I have a sample Number of them ( 40 ) Asking And a student With an oath mathematics Education Division Basic Totally Education university eye sun, And I was baptized the study on Curriculum Experimental group One Experimental, And I focused the study on Skills : Cooperation And

sharing, Thinking Critic and solution the problems, the culture information technology , And culture technology the information and communication, And it showed Results effectiveness the program in development some skills Century atheistic Twenty I have Student teachers specialty Mathematics

**The study (Aslan, 2019)** aimed The study is investigative Possibility employment And effectiveness Strategies Teaching Effective in skills development Century atheistic twenty, And I was baptized the study on Curriculum Descriptive from during follow number (33) from the students Generalized specialty mathematics in university Aq Saray In Turkey, and follow them in lessons Field In schools, And I was baptized the study on style the interview closed with discussion a sample the study To collect Data . And it showed results the study that Teaching Effective necessarily leads to acquisition skills Century atheistic Twenty Provided Consideration Teachers activities and practices Planning teaching, And formulation questions, And constructive Environments stimulating, And design Educational activities With participation Students

## **Summary of search results**

### **The search results yielded**

- Weak possession of student teachers in the Colleges of Education, Mathematics Division, of the twenty–first century skills, which are: learning and creativity skills – digital culture skills – life and profession skills
- There is no statistically significant difference between males and females in their acquisition of twenty–first century skills, which are learning and creativity skills – digital culture skills – life and career skills.
- There are few studies that address the development of mathematics teachers’ performance and their professional development during service

## Recommendations

- To merge skills Century the one Twenty within Courses Regulations Teacher preparation beforeandduring the service .
- Determine needs my teacher mathematics Training in a light skills Century atheistic Twenty
- Fee Development plans Professional For teachers to developTheir performance

## List of references

- Aslan, S. (2019). Is Learning by Teaching Effective in Gaining 21st Century Skills the Views of Pre-Service Science Teachers. Educational Sciences: Theory & Practice, 15(6), 1441–1457. <https://doi.org/10.12738/estp.2016.1.0019>
- Al-Shalhoub, Samar Abdel Aziz (2021): A project to develop mathematics and natural science curricula in the Kingdom of Saudi Arabia – between reality and aspiration, the Eleventh Conference of the Mathematics Educational Association, the reality of teaching and learning mathematics – problems –Future solutions and visions – Ain Shams University, Dar Al-Diyafa, pp. 87 107
- Abdel Hamid, Salim (2019): effectiveness program Proposal existing on skills Century atheistic Twenty in development the performance Teaching I have a sample from the students Teachers Mathematics major Totally Education University Master's thesis brown child In Libya
- Abdel Qader, Maha ( 2020): Redirecting teacher professional development in light of twenty-first century skills, Journal of the Faculty of Education, Al-Azhar University
- Abdel-Al, Mohamed Sayed Ahmed (2019): The effectiveness of a program enhanced with Web 2 tools in developing the twenty-first century skills of students who are mathematics teachers at the College of Education, Journal of Mathematics Pedagogies, Egyptian Society for Mathematics Pedagogies, pp. 214–269.6(21)
- Abdel-Al, Mohamed Sayed Ahmed Abdo (1018): The effectiveness of a program enhanced with web tools 2 in developing the twenty-first century skills of students who are mathematics teachers at the College of Education. 169–214 ,(6)Journal of Mathematics Education, 21
- Al Kasi, Abdullah Ali and Azzam, Mahmoud Ramadan (2018): The level of ability of students at King Khalid University studying science to possess practical experimentation skills in light of the requirements of twenty-first

century education: an evaluative study, Education and Psychology Thesis, King Saud University – Saudi Society for Educational Sciences And Psychology, Riyadh, No. 60, pp . 91–116

- Al-Ajrami, Abeer (2020): The effectiveness of a training program to develop the skills of designing educational games in science and mathematics among female student teachers majoring in basic education at Al-Azhar University, Master's thesis, Al-Azhar University, Gaza – Palestine
- Al-Bahrawi, Fathi Mabrouk (2020): Professional performance standards necessary for student teachers in light of the twenty-first century skills, Arab .Studies in Education and Psychology: Arab Educators Association, no. 63, pp 484–435.
- Al-Balawi, Awatef Faleh (2019): A vision for a proposed training program to develop some twenty-first century skills among primary school mathematics teachers in the city of Tabuk, Arab Studies in Education and Psychology, Arab .Educators Association, No. 107, 387–433
- Al-Ghamdi, Mai Bint Saad (2019): Training needs and challenges facing mathematics teachers in light of the skills of the twenty-first century teacher, Journal of the Faculty of Education, Tanta University, 70(2), pp . 468–529
- Al-Masaieed, Turki Fahd (2020): Challenges of preparing and qualifying teachers in light of twenty-first century skills, World of Education: Arab Foundation for Scientific Consultation and Human Resources Development, 18 ,(57),9–1
- Al-Shehri, Mana Ali Muhammad (2021): Evaluating the teaching practices of middle school mathematics teachers in light of twenty-first century skills, (86) ,Educational Journal, Sohag University, June issue, Part 3
- Al-Zahrani, Abdul Aziz Othman ( 2019): A proposed vision for developing the teaching practices of mathematics teachers in light of twenty-first century skills, Umm Al-Qura University Journal of Educational and Psychological .1–47 ,(1) Sciences, 11

- Bondi, J. (2020). Curriculum Development: A Guide to Practice. New York : Prentice Hall, available online At: [http://www.amazon.com/Curriculum-Development-Guide-Practice-6th/ dp /01308](http://www.amazon.com/Curriculum-Development-Guide-Practice-6th/dp/01308)
- Carolan, C. (2018). An Informal Assessment of Twenty-First-Century Skills
- Faqiyat , Ayman Ibrahim (2022): The reality of teaching practices for mathematics teachers in light of the twenty-first century skills in thinking about teaching mathematics in schools in South Hebron, Journal of the Palestinian Educators Association for Arts, Educational and Psychological Studies, Volume, Issue 5 , pp . 106-130 ,2
- Foster, J., & Perotti, M. (2019). Improve Instructional Practices & Develop 21 Century Skills with Data. Techniques: Connecting Education & Careers Developed Through Hidden Curriculum in Theater Studies. Theater Research <http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=131546163> in Canada, 39 (1), 80-82. Retrieved from
- Hajjah, Hakam Ramadan (2018): The extent to which science textbooks for the upper basic stage include twenty-first century skills, Educational Science Studies, University of Jordan, Deanship of Scientific Research, vol. 45, no. 3, pp. 163-178
- Khudair, Nebras (2022): Twenty-first century skills among students of the Mathematics Department in the College of Education, Journal of Arts, Literature, Humanities and Social Sciences, September 58 issue
- National Research Council (2022). Adding it up: Helping children learn mathematics. Washington, DC the National Academies Press <https://doi.org/10.17226/9822> .
- Rizk, Fatima Mustafa Muhammad (2020): Using the integrativeSTEM approach to learning science in developing twenty-first century skills and decision-making skills among first-year students in colleges of education, Arab Studies in Education and Psychology – Saudi Arabia, (62). pp . 79-128

- Sawafta , Muhammad (2021): The effectiveness of a training program based on the two methods of blended learning and gamification in acquiring knowledge and applying twenty-first century teaching skills among mathematics teachers in the basic education stage, Journal of Educational and Psychological Sciences, Volume 5, No. 15
- Zafar, Abdul Razzaq Ahmed ( 2020): The effectiveness of a proposed training program to provide mathematics teachers with mathematical problem-solving strategies on developing the ability to solve problems, mathematical thinking, and the attitude towards mathematics among their students in the city of Arar, PhD dissertation, College of Education, Umm Al-Qura University