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Analysis of the computerized activities included in Palestinian Mathematics textbooks

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Abstract

Purpose– The study aimed to analyze the standards of computerized activities included in mathematics textbooks based on international standards and indicators.

Design/methodology/approach–The researcher developed a tool (content analysis) to analyze these activities and verified its validity and reliability. This tool was then applied to a sample of mathematics textbooks.

Findings –The results revealed a significant gap between the expected standards and indicators and the actual standards and indicators found in the mathematics textbooks.

Originality/value – It is crucial to consider fundamental international standards in utilizing computer software in mathematics textbooks, including the design of mathematical tasks, posing mathematical questions, facilitating and simplifying mathematical discussions, and assessing student learning. Based on these findings, the researcher recommended a reassessment of the development of computerized activities in mathematics textbooks.

Keywords: Creative Thinking, Critical Thinking, Problem Solving, Standards and Indicators, Quality Assurance

Introduction

Human life has evolved through various stages, from ancient times to the agricultural and industrial ages, and now to the current digital era (Carayannis, E. G., et al., 2021). This era is characterized by the widespread availability of smart tools, devices, and the internet, which have evolved rapidly and unprecedentedly. This development requires us to respond to the challenges

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it has introduced, affecting all aspects of life, both positively and negatively. Consequently, it is essential to keep pace with these changes, particularly in the field of education, especially in teaching students. We must maximize the benefits of modern technologies, with computers, their applications, and the internet playing a crucial role in the teaching and learning process (Khamroev, R. A., 2021). Given that computers and their derivatives are accessible to everyone, including children, they should be utilized effectively in education. Mathematics, in particular, is a subject that stands to benefit significantly from computer applications, as students often face considerable difficulties in this subject, resulting in low achievement both globally and locally.

To achieve the educational benefits of computers in mathematics, activities and lessons must be designed using computer software and applications. These tools facilitate the learning process, saving time and effort. The culture of employing computers and their derivatives is widespread across all segments of society. The mathematics textbook is a primary source of learning in our educational system. Teachers rely on it to read the material, prepare lessons, develop annual, monthly, and daily plans, and evaluate them according to the textbook. Similarly, students and their parents use it to prepare for lessons and exams. Therefore, the design of the mathematics textbook must align with the current digital era (Calder, N., Jafri, M., & Guo, L., 2021).

Justifications for Using Computers in Teaching Mathematics

Teaching and learning mathematics rely on principles related to the multiple representations of mathematical concepts and ideas. This means representing a mathematical concept through real-life scenarios, images, illustrations, tables, graphs, and algebraic symbols, deepening students' understanding of the concept. As noted by Kaput (1991), NCTM (2000, 2014), and Ainsworth (1999), and NCTM (2014), using multiple representation methods in teaching mathematics leads to a deeper understanding, creative thinking, and the ability to solve mathematical problems flexibly. Computers and their software provide students with multiple representations of a single concept in an easy, simple, and quick manner. For instance, through the GeoGebra program, a function can be represented using graphs, tables, motion, and algebraic symbols. Dozens of examples can be shown in one minute, whereas traditional methods would require four class periods for ten examples.

In addition to providing multiple representations, numerous experimental studies have shown that students who learn with computers perform much better in mathematics tests than those who learn through traditional methods. Notable studies include those by Hwang et al. (2021) and Liburd et al. (2021). There are many other studies, both old and recent, supporting this.

Conversely, some studies and research have indicated that teaching mathematics with computers can weaken social and collaborative growth among students, as well as reduce interaction and the exchange of mathematical ideas. Studies such as those by Ran, H., et al. (2021) highlight these issues. However, this problem can be mitigated by designing computerized activities that encourage collaborative work, social interaction, and teamwork.

The Ministry of Education has revised the mathematics textbooks multiple times, and this development is ongoing. This revision process requires curriculum designers and developers to consider several dimensions, most notably the mathematical content, the nature of mathematical

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activities, and the methods used to engage with these activities. The researcher observed a decline in students' performance in mathematics tests, raising the question of whether this decline is due to the insufficient integration of mathematics with real-life contexts, such as the use of computers. This observation led the researcher to recognize a potential issue: the lack of connection between mathematics textbooks and the students' daily practices, particularly their interaction with smart devices like Smartphone and computers. Consequently, the researcher sought to conduct a structured and logical scientific study to explore the integration of computerized activities into mathematics textbooks.

Bråting, K., & Kilhamn, C.(2021) analyze the content of computer software recently included in Swedish mathematics textbooks , and reveals weak relationship between the software content and mathematical content. Gutiérrez, A., Jaime, A., & Gutiérrez, P.(2021) conducted a network analysis of the structure and contents of the teaching unit based on Van Hiele's levels of geometric thinking and cognitive levels of mathematical problem-solving, the analysis showed an interest in the networking between theories and the appropriateness of the educational unit, as the Van Hiele levels and the cognitive demand of the activities increase, meeting the needs of each student, from low achievers to mathematically gifted students.

Reda, N. M. A.(2021) analyze the content of computer software recently included in the official third-grade mathematics textbook, The researchers found that all systematic thinking skills were included but to varying degrees: the skill of perceiving systemic relationships (25%), the skill of system analysis (40%), the skill of system synthesis (17%), and the skill of system evaluation (18%).Meanwhile Birgin, O., & Uzun Yazıcı, K.(2021) determine the impact of using dynamic geometry software (GeoGebra) on eighth-grade students' conceptual understanding and retention of learning concerning linear equations and slope, the study results indicated that GeoGebra-supported instruction significantly improved eighth-grade students' conceptual understanding and retention of learning regarding linear equations and slope compared to traditional textbook-based instruction.

On the other hand Adekunle, S. E., & Adepoju, S. A.(2021) evaluating the impact of a cooperative learning strategy on solving arithmetic problems among students in Nigeria by using computer software, they revealed that the use of a computer-based cooperative learning strategy was effective in enhancing students' academic performance in solving mathematical problems through the use of computer software.

Darragh, L., & Franke, N.(2021) explore mathematics education by focusing on the benefits of teaching and learning digital technologies through computer software in New Zealand mathematics textbooks, the survey results indicate that in an era of competitive academic achievement, schools face pressures to provide modern, high-tech, and balanced mathematics programs.

Abu Zeitoon,(2018) measure the effectiveness of computer software and its role in improving self-learning skills among elementary school students in mathematics and Arabic, from their teachers' perspectives. the results of the study showed the effectiveness of computerized software and its significant role in improving self-learning skills among students.

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While Jabr.(2007) examined the effect of employing computerized software on the academic achievement of seventh-grade students in school mathematics, the study results showed that students in the experimental groups outperformed those in the control groups in academic performance.

Abu Zaarour.(2003) investigated the impact of the Visual Basic software on the performance of seventh-grade students in mathematics. The researcher used the experimental research method. The results of the experiment showed that the experimental group improved in both immediate and delayed achievement compared to the control group

Abu Hashish, et al. (2010) examined the attitudes of managers and teachers in UNRWA schools towards interactive computer software. The results showed strong trends towards employing computerized software in teaching all subjects.

Abu Al-Hatal, et al. (2011) measured the effect of employing computerized software in teaching eighth-grade mathematics on the development of thinking in mathematics among eighth-grade students and their attitudes towards computer software. The study found improved performance of the experimental group compared to the control group in the test applied after the study, as well as in students' attitudes towards mathematics.

Al-Hassan, Ibrahim. (2004) examine the reality of using computer software in Saudi schools that are pioneers in this field from the perspective of teachers and supervisors, The study results indicated a lack of training for teachers on teaching using computerized software.

Theoretical background

Teaching and learning mathematics through computers provide teachers with the opportunity to employ various computerized programs. However, it is crucial to evaluate these programs carefully to ensure they support student learning. Dick & Hollebrands (2011) suggest that when selecting computers and their software, the following factors should be considered:

1. Alignment with Educational Objectives: Ensure that the software aligns with the learning objectives and educational goals.
2. Ease of Use: The software should be user-friendly and accessible to both teachers and students.
3. Support for Multiple Representations: The software should provide various ways to represent mathematical concepts, such as graphs, tables, and equations.
4. Facilitation of Interactive Learning: The software should support interactive learning experiences, enabling students to explore and experiment with mathematical ideas.
5. Assessment Capabilities: The software should include tools for assessing student understanding and progress.

Role of Computers in Teaching Mathematics

1. Does the computer clarify mathematical concepts for students?

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Yes, computers have the potential to clarify mathematical concepts by providing multiple representations and dynamic visualizations that are difficult to achieve through traditional methods. Programs like GeoGebra can illustrate mathematical functions through graphs, tables, and algebraic symbols, enabling students to explore and understand complex concepts interactively and visually. This allows for a deeper comprehension by showing the interconnections between different representations of the same mathematical idea (Dick & Hollebrands, 2011).

2. Are the questions posed suitable for all student levels?

   Effective use of computers in mathematics allows for the differentiation of questions to cater to various student levels. Adaptive learning software can present questions that adjust in difficulty based on the student's performance, ensuring that each student engages with material that is appropriately challenging. This adaptability helps in addressing the needs of both advanced students and those who require additional support, making the learning process more inclusive (Zbiek, Heid, Blume, & Dick, 2007).

3. Does the computer provide opportunities for students to construct mathematical concepts and encourage them to engage in mathematical reasoning and inference?

   Indeed, computers facilitate the construction of mathematical concepts and encourage mathematical reasoning and inference. Through interactive tools and simulations, students can manipulate variables and observe the effects in real-time, which promotes understanding and allows for hypothesis testing. This active engagement helps students to construct their knowledge and develop critical thinking skills in mathematics (Dick & Hollebrands, 2011).

4. Does the computer offer opportunities for students to think creatively, critically, and reflectively?

   Yes, computer technology fosters creative, critical, and reflective thinking in mathematics by allowing students to experiment with different scenarios, solve complex problems, and reflect on their learning processes. Interactive software often includes problem-solving tasks that require students to think outside the box, analyze patterns, and derive conclusions based on their explorations, which nurtures a deeper and more reflective understanding of mathematical concepts (Ibid).

Types of Computer Technology in Mathematics Education

Computer technology in mathematics education can be divided into two key categories:

1. Transmission Technologies: These are used for the presentation and communication of data and information, applicable across various subjects, not just mathematics. Examples include:
   - Presentation Slides: For visual display of mathematical content.

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- Projectors and Document Cameras: For showing physical documents or objects to the class.
- Social Media and Google Documents: For collaborative work and sharing mathematical ideas.
- Clickers and Educational Games: For interactive participation and engagement (Dick & Hollebrands, 2011).

2. Mathematical Software: Specialized applications designed for performing various mathematical tasks, including:
   - Graphing Calculators: For plotting graphs and solving equations.
   - Dynamic Mathematical Environments: Such as GeoGebra, Sketchpad, Fathom, TinkerPlots, and FoilPlot, which allow for dynamic exploration of mathematical concepts, conducting calculations, and creating geometric and graphical representations. These tools help students explore mathematical patterns and enhance their understanding through interactive and visual means (Dick & Hollebrands, 2011, p. xii), as indicted in figure 1

Figure 1: (Adapted from (Dick & Hollebrands, 2011, p. xii). Relationship between types of computer software in mathematics education.

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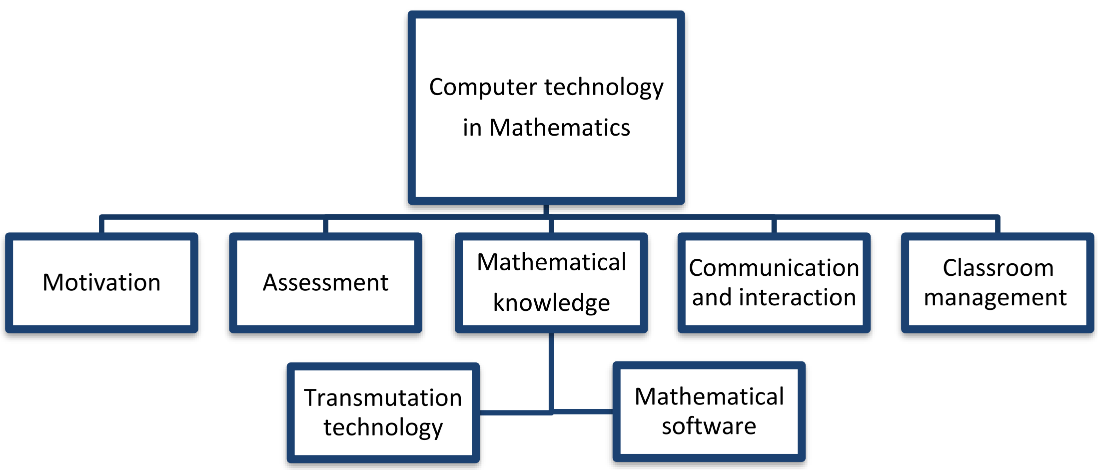

Example of Computer Integration in Mathematical Tasks

Computer technology enables effective solutions to problems that are challenging to address with traditional paper-and-pencil methods. For instance, in a geometry lesson, a teacher might ask students to investigate the behavior of a quadrilateral by moving one of its vertices using

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GeoGebra. This type of dynamic exploration is not feasible in a traditional classroom setting but is easily facilitated through computer software, allowing students to observe the impact of changes in real-time and gain insights into geometric properties (Zbiek, Heid, Blume, & Dick, 2007).

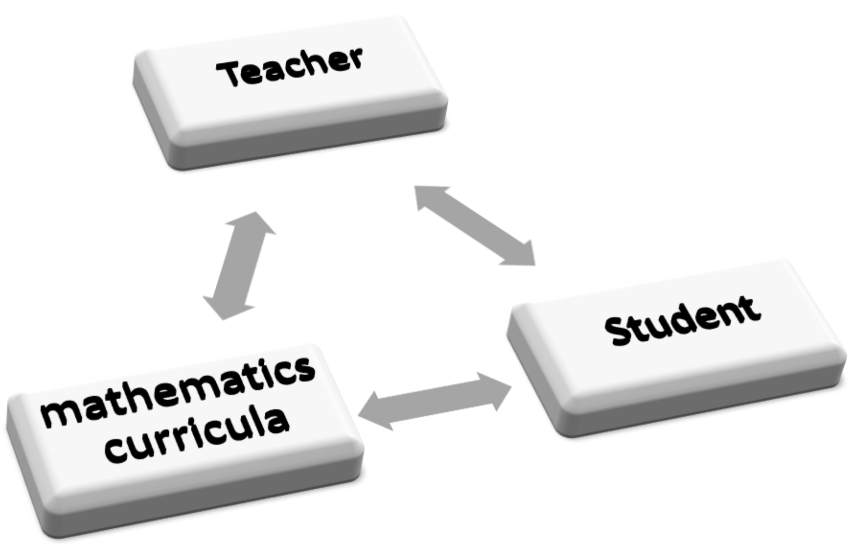
Teachers need to understand when to integrate computer use and when to rely on traditional methods. Computers are particularly beneficial for addressing questions that require justification ("why"), conjecture and generalization ("when"), results ("what happens"), and predicting consequences ("what if"). Well-designed computer activities can help students answer these types of questions accurately, efficiently, and with a high level of mathematical integrity.

Computers can provide teachers with unique opportunities to create engaging and thought-provoking mathematical tasks and questions. Therefore, the strength of computers in teaching and learning mathematics is not necessarily in the answers they provide but in the questions and tasks they allow teachers and students to pose (Hollebrands, K. F., & Lovett, J. N., 2016).

Development of Mathematics Teaching Methods and Their Relation to Computers

The methods of teaching mathematics have evolved through several important stages. The first stage, referred to by researchers as the Didactic Triangle (Brousseau, 1989; Freudenthal, 1991; Steinbring, 2005), consists of the interaction that occurs between three main elements: the teacher, the student, and the mathematical content (mathematics curricula). It is called the Didactic Triangle because it forms the shape of a triangle, as shown in the Figure (2)

Figure 2: Adapted from (Brousseau, 1989),Relationship between interactions : teacher, student, and Mathematics curricula



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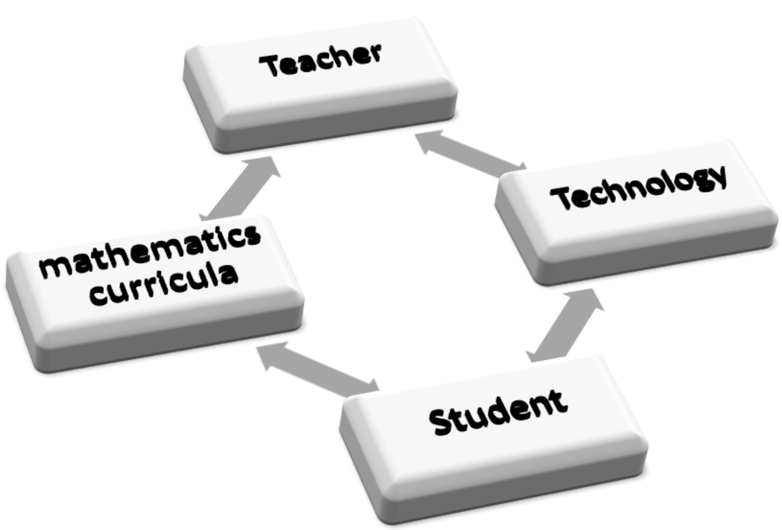
We observe that the teaching and learning process occurs through the interaction among all elements of the Didactic Triangle. For learning to take place, the teacher prepares lesson plans based on the prescribed mathematics textbooks, which include mathematical content in algebra, geometry, statistics and probability, measurement, and numbers and their operations. This mathematical content is dealt with through appropriate mathematical representations, communication, and reasoning, as well as critiquing arguments, attention to precision, problem-solving, and mathematical modeling (NCTM, 2000).

As for the students, they play a significant role in taking responsibility for their learning by carrying out activities in the mathematics textbooks, which the teacher supervises. The teacher provides them with feedback on their progress and achievement through various assessment methods, such as formative, diagnostic, and summative assessments (Kron, S., et al., 2021; Clements, D. H., et al., 2021).

The teacher has a major role in the success of students in learning mathematics, as they choose the important methods for teaching mathematics by selecting and implementing mathematical activities for themselves and the students, posing questions and problems to stimulate students' thinking, managing discussion strategies and lesson flow, and verifying students' learning by providing feedback on their progress toward achieving goals (Hollebrands, K., 2016).

It is noted from the previous Didactic Triangle that it lacks modernity and the developments of the 21st century. Therefore, many researchers in the field of mathematics education with computers have added a new dimension, namely, the computer or the use of technology. This new model is called the Didactic Tetrahedron (Tille, 1986; Olive et al., 2010; and Ruthven, 2012), as shown in the Figure (3)

Figure 3: (Adapted from(Tille, 1986) Relationship between interactions : teacher, student, Mathematics curricula, and technology



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Technological advancement in general, and specifically through computers, offers unique advantages for teachers, students, and mathematical content in handling mathematical issues with speed, accuracy, and efficiency. It saves time and effort at all educational levels for students, as representing information through computers provides students with understanding that leads to deep comprehension of complex concepts, such as solving algebraic problems with multiple variables, generating 2D and 3D graphs and shapes, and calculating statistical measures for very large datasets (Hegedus et al., 2017). Below is a detailed explanation of the interaction between the four elements.

Source: Author work

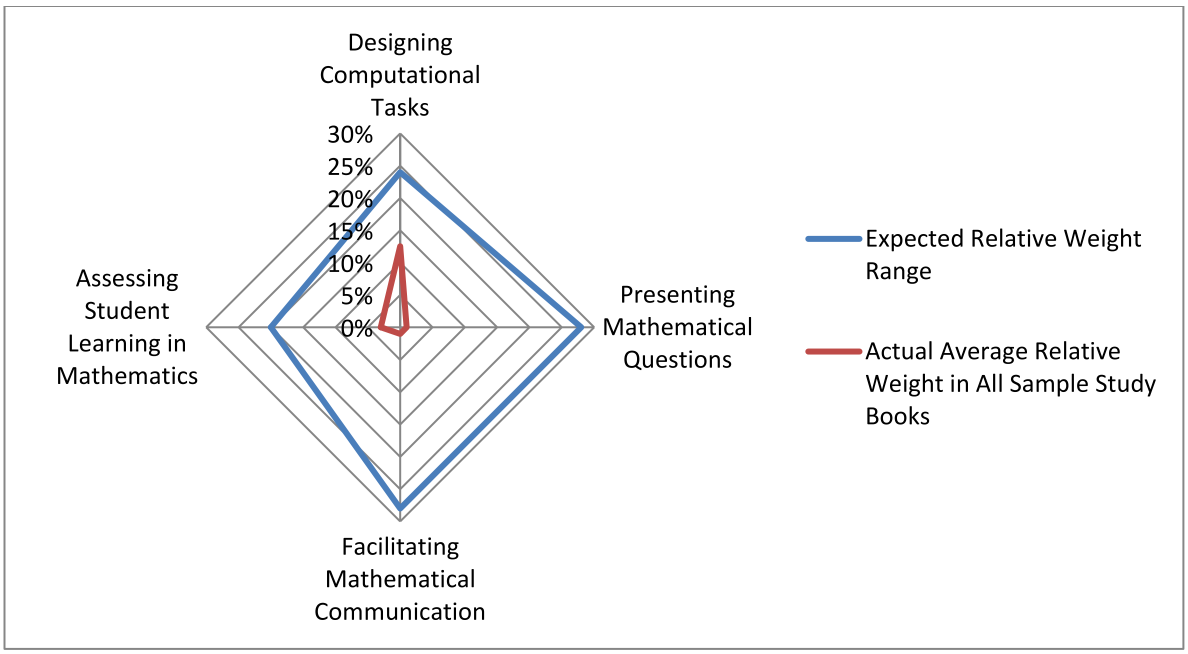

Figure (4) Source: Author work

In the above Figure (4), we will analyze the interaction between the teacher and the computer, between the students and the computer, and between the mathematical curriculum and the computer. These interactions help both teachers and students reflect on the use of computers in math lessons.

1. ***Interaction between the Mathematical Curriculum and the Computer:***

   This interaction is characterized by the very high accuracy in representing and modeling mathematics through the computer, as computational methods provide us with very precise and reliable mathematical facts and concepts, with minimal error, while manual representation has a higher margin of error and may not display the desired mathematical behavior (Dick, 2008). One aspect of this interaction is the computer's efficiency in executing mathematical tasks effectively, efficiently, quickly, accurately, and

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proficiently. Likewise, the computer performs what the student and teacher think and program in a logical and organized manner, whereas manual work in carrying out complex mathematical tasks may take longer (Pea, 1985). Finally, the computer represents, models, and simulates mathematics in a way suitable for students and teachers, while this might not be achievable without the computer (Goldin & Kaput, 1995).

The previous paragraph does not mean eliminating manual work in mathematics or reducing mathematical anxiety among students; rather, the type of activity and mathematical task determines the appropriate means for its execution in line with developing students' mathematical thinking. The computer is a tool, not an end in itself. For example, simple tasks like multiplication facts, factoring algebraic expressions, or calculating the arithmetic mean for small data sets should not require the use of a computer or calculator (Namkung, J. M., et al., 2019).

2. *Interaction between the Teacher and the Computer:*

The interaction between the teacher and the computer involves several important aspects, such as using it as an aid for presentations through slides or displaying scenes and images. Additionally, teachers can use the computer to assign students to conduct competitions and games with educational objectives related to the lesson's goal. More importantly, it addresses whether the computer is accessible to both teachers and students and if there are network connections for mathematical sites (Dick, T. P., & Hollebrands, K. F., 2011).

3. *Interaction between Students and the Computer:*

The interaction between students and the computer includes two very important aspects. The first is direct interaction with the computer through the execution of mathematical tasks, and the second is the students' reactions after receiving immediate feedback from the computer on their progress in completing the mathematical tasks. All of this is related to whether students have access to computers or not (Del Cerro et al., 2021).

Research aims and questions

The study aims to identify the elements of computerized activities that should be included in mathematics textbooks according to recent research and scientific studies. Subsequently, the study aims to develop a tool for analyzing these elements in Palestinian mathematics textbooks and assess the extent of their inclusion.

Thus, this study aims to answer the main research question:

What are the elements of computerized activities included in Palestinian mathematics textbooks?

From this main question, two sub-questions arise:

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1. What are the elements of computerized activities that should be included in mathematics textbooks?
2. To what extent are computerized activities incorporated in Palestinian mathematics textbooks?

From the previous discussion and based on the theoretical framework by researchers (Stein & Smith, 1998), the elements of computer-based activities included in mathematics textbooks can be formulated and developed by considering the following essential aspects: designing mathematical tasks, posing mathematical questions, facilitating mathematical discussions, and assessing student learning. Below is a detailed presentation of the indicators for each of these fundamentals according to Table (1).

Table (1). Mathematical Activity and Its Availability Indicators

Mathematical Activity	**Availability Indicator**
Designing Computer-Based Tasks	The computer-based task includes cognitive objectives.
The computer-based task includes psychomotor objectives.	
The computer-based task includes affective objectives.	
The computer-based task supports interaction among students.	
The computer-based task includes reinforcement for students.	
The computer-based task has clear procedures for students.	
Posing Mathematical Questions	The computer-based task encourages the teacher to ask new questions to students.
The computer-based task poses questions that stimulate students' thinking.	
The computer-based task poses questions that are psychologically and logically sequential for students.	
The computer-based task encourages the skill of question-posing among students themselves.	
The computer-based task poses questions that involve giving and discussing opinions.	
The computer-based task includes questions that require students to bring new ideas.	
The computer-based task poses reflective questions.	
Facilitating Mathematical Communication	The computer-based task allows students to solve questions in multiple ways.
The computer-based task encourages students to discuss and express their ideas.	

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The computer-based task considers individual differences among students in terms of time (each student at their own pace).	
The computer-based task takes into account students' learning styles (auditory, visual, kinesthetic).	
The computer-based task provides dialogue between students and teachers.	
Assessing Students' Learning in Mathematics	The computer-based task provides feedback to students on their achievement.
The computer-based task encourages students to engage in self-assessment.	
The computer-based task helps measure what students have learned in the lesson.	
The computer-based task helps determine students' progress.	
The computer-based task encourages formative assessment.	
The computer-based task encourages summative assessment.	
The computer-based task provides feedback to the teacher on students' performance.	

Source: Author work

Methodology

Design

The researcher employed the descriptive approach, which Al-Harbi (2016, p. 145) defined as "a specific set of procedures conducted in an integrated manner to describe a scientific, educational, or academic phenomenon by relying on the collection, classification, and analysis of data to derive its implications and reach conclusions." The researcher believes that this approach is the most suitable, as most previous studies have used this method.

The population and sample

The population and sample of the study the research population in this study represents all Palestinian mathematics textbooks approved from the first grade to the twelfth grade of the academic year 2020/2021. As for the study sample, it consisted of mathematics textbooks for the tenth and eleventh grades, deliberately chosen due to their inclusion of computer software, which constitutes six units in the sample books. The remaining books do not contain such software. The following is a description of the study sample according to Table (2) Software included in the textbooks of the study sample

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Instrument

The study tool consisted of an analysis card that includes four main axes:

1. Design of Digital Tasks (containing 6 indicators),
2. Asking Mathematical Questions (containing 7 indicators),
3. Facilitating and Promoting Mathematical Communication (containing 6 indicators),
4. Evaluating Students' Learning in Mathematics (containing 7 indicators).

The researcher developed this tool by utilizing previous studies.

Validity of the Instrument

Al-Agha (1997, p. 118) defines validity as "the degree to which the tool fulfills the purpose for which it was designed and measures according to the specified purpose or objective." To verify the validity of the tool, it was presented in its initial form to a group of five judges. They were asked to modify, delete, or add content according to the study's objectives and their practical opinions. All developmental remarks by the judges were taken into account, thus ensuring the tool enjoys validity as confirmed by the judges[1].

Reliability of the Instrument

The researcher used modern trends in calculating the reliability of the analysis tool as per Hwang, S., Yeo, S., & Son, T. (2021). The frequencies of the four axes were filled through the presence indicators by the researcher and a cooperating educational supervisor over several stages. They analyzed sequences and series units, conic sections, limits, and continuity for the eleventh grade in both scientific and industrial streams from the second semester of 2021.

The software was independently analyzed by two analysts, and Holsti's coefficient (Agresti, 2018) was calculated with a value of 0.77. The analysts then discussed to resolve points of discrepancy and disagreement. The previous three units were re-analyzed along with two new units from the same book, which were the units on mathematical logic and equations and inequalities. This analysis was conducted independently, and Holsti's coefficient was calculated again, resulting in a value of 0.80, reflecting a high level of agreement between the analysts (Agresti, 2018). Subsequently, all remaining units were analyzed independently by both analysts, including the unit on exponents and logarithms from the 10th-grade book for the first semester, and the final Holsti's coefficient was 0.82. This indicates a high reliability of the tool for applying it in the content analysis of computer software.

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Data analysis

After verifying the validity and reliability of the analysis tool in its final form, which includes four axes, each with its own indicators, the researcher inventoried the books containing computerized software. Then, these books were carefully read, and the information was extracted according to the extraction sheet on two separate occasions. Additionally, the mathematics supervisor was tasked with analyzing and auditing to ensure accuracy in the analysis process. The final reliability coefficient was 0.82, which is a high and reliable value for completing the study**.**

Statistical Methods

Based on previous studies, the researcher employed frequency tables and percentages, as well as Holsti's formula for calculating the reliability of the tool.

Findings, Discussion and conclusion

Answering the First Question

After implementing the study procedures, the researcher addressed the first question: "What are the elements of computerized activities that should be included in mathematics books?" The answer to this question was derived from the theoretical framework of studies, research, conferences, and books reviewed by the researcher. This led to the formulation of an answer in a list comprising four main axes, each with its own indicators, as follows:

1. **First Axis: Design of Computerized Tasks** (Relative Weight: 24%)
    - The computerized task includes cognitive objectives.
    - The computerized task includes psychomotor objectives.
    - The computerized task includes affective objectives.
    - The computerized task supports student interaction.
    - The computerized task includes reinforcement for students.
    - The computerized task includes clear procedures for students.
2. **Second Axis: Posing Mathematical Questions** (Relative Weight: 28%)
    - The computerized task encourages the teacher to pose new questions to students.
    - The computerized task poses questions that stimulate students' thinking.
    - The computerized task poses questions in a psychologically and logically sequential manner for students.
    - The computerized task encourages the skill of asking questions among students.
    - The computerized task poses questions that involve expressing and discussing opinions.
    - The computerized task includes questions that require students to provide new insights.
    - The computerized task poses reflective questions.
3. **Third Axis: Promoting Diverse Problem-Solving Approaches** (Relative Weight: 20%)
    - The computerized task allows students to solve questions in different ways.

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- The computerized task encourages students to discuss and express their ideas.
- The computerized task considers individual differences in students' timing.
- The computerized task considers students' learning styles (auditory, visual, kinesthetic).
- The computerized task facilitates dialogue between students and teachers.

4. **Fourth Axis: Assessing Students' Learning in Mathematics** (Relative Weight: 28%)
   - The computerized task provides feedback on students' achievement.
   - The computerized task encourages students in self-assessment.
   - The computerized task helps measure what students have learned in the lesson.
   - The computerized task helps determine students' progress levels.
   - The computerized task encourages formative assessment.
   - The computerized task encourages summative assessment.
   - The computerized task provides feedback to the teacher on students' performance.

Conclusion: The first and fourth axes each had the highest relative weight of 28%, indicating their significant role in the educational process, including planning and assessment, while not underestimating the value of the other axe, as shown in table (1), and table (2).

Table (2) 11th Grade: Scientific and Industrial Track / Second Semester

Unit Name	Lesson Number	Page Number in Book	Software Used	Educational Objectives
Sequences and Series	Second	39	Microsoft Mathematics	- Find the sum of a series (2 objectives)
	Second	40	Microsoft Mathematics	- Find the sum of a series (1 objective)
	Fourth	47	Microsoft Mathematics	- Find the sum of a series (1 objective)
				- Verify the correctness of the solution (1 objective)
	Sixth	56	Microsoft Mathematics	- Find the sum of a series (1 objective)
				- Verify the correctness of the solution (1 objective)
Conic Sections	Third	80	Microsoft Mathematics and GeoGebra	- Representation of conic sections
				- Choose one of the software for representation
Limit and continuity	Second	92, 93	Microsoft Mathematics	- Find the limit of a polynomial function (4 objectives)
				- Instructions and guidance for the software
				- Verify the answer (5

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				objectives)
	Third	99	Microsoft Mathematics	- Verify the limit of a rational function
	Fourth	102	Microsoft Mathematics	- Find the limit of a polynomial function (4 objectives)
				- Verify the answer (4 objectives)

Source: Author work

Table (2) continue

Unit Name	**Lesson Number**	**Page Number in Book**	**Software Used**	**Educational Objectives**
Mathematical Logic	Innovative Idea		Microsoft Mathematics	- Find the correct value for mathematical expressions
				- Solve open sentences (2 objectives)
				- Instructions and guidance for the software
Equations and Inequalities	Innovative Idea	115	Microsoft Mathematics	- Design a computer program using any programming language to solve linear equations in 3 variables
	3-6	114	GeoGebra	- Plot a quadratic and absolute value equation to determine their intersection points

Table (2) continue

10th Grade: Scientific and Industrial Track / First Semester

Unit Name	**Exercise Type**	**Page Number in Book**	**Software Used**	**Educational Objectives**
Exponential and Logarithms	General Exercises	76	GeoGebra	- Calculate time in an electric circuit
	General Exercises	77	GeoGebra	- Plot logarithmic functions (6 objectives)
				- Plot exponential functions
				- Instructions and guidance for the software

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Source: Author work

Answering the Second Question

To answer the second question of this study, which asks: What is the extent of incorporating computational activities in Palestinian mathematics textbooks? The researcher developed the analysis tool according to the theoretical framework of previous studies. Then, the researcher analyzed the units that contain only computerized software and arrived at the following results:

First: Eleventh Grade: Scientific and Industrial / Second Semester 2021

Table (3)

Mathematical Activity	Availability Index	Frequency	Percentage
Designing Computerized Tasks	The computerized task includes cognitive objectives	4	14%
	The computerized task includes psychomotor objectives	4	14%
	The computerized task includes affective objectives	0	0%
	The computerized task supports interaction among students	4	14%
	The computerized task includes student reinforcement	4	14%
	The computerized task includes clear procedures for students	4	14%
Presenting Mathematical Questions	The computerized task encourages teachers to pose new questions to students	0	0%
	The computerized task presents questions that stimulate thinking in students	0	0%
	The computerized task presents psychologically and logically sequenced questions to students	0	0%
	The computerized task encourages students' questioning skills	0	0%
	The computerized task presents questions involving opinion expression and discussion	0	0%
	The computerized task includes questions that require students to come up with new ideas	0	0%
	The computerized task presents questions with a reflective nature	1	3%
Facilitating and Easing Mathematical	The computerized task allows students to solve questions in various ways	0	0%

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Communication			
	The computerized task encourages student discussion and expression of their ideas	0	0%
	The computerized task considers individual differences among students according to time (each student according to their suitable time)	0	0%
	The computerized task considers students' learning styles (auditory, visual, kinesthetic)	0	0%
	The computerized task facilitates dialogue between students and teachers	0	0%
Evaluating Students' Learning in Mathematics	The computerized task provides feedback to students on their progress	0	0%
	The computerized task encourages students to engage in self-assessment	0	0%
	The computerized task helps measure what students have learned in the lesson	0	0%
	The computerized task helps determine students' progress levels	0	0%
	The computerized task encourages formative assessment	4	14%
	The computerized task encourages summative assessment	0	0%
	The computerized task provides feedback to teachers about students' performance	4	14%
	Source: Author work	29	100%

Table (3) below shows the results of the analysis for the eleventh grade in the scientific and industrial branches for the second semester of the 2021 academic year.

From the table above, it is evident that the rate of designing computer tasks reached 9.33%, while the rate of presenting mathematical questions was 0.4%, which is less than 1%. Additionally, the rate of facilitating communication was 0%, indicating its absence in this book. The rate of assessing students' learning in mathematics was 4%. All these percentages indicate a lack of attention to the standards of employing computer software in this book.

Second Grade 11: Scientific and Industrial / First Semester Table (4) below presents the results of the analysis of Grade 11 for the practical and industrial branches for the academic year 2021 for the first semester

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Table (4).

Mathematical Activity	Availability Indicator	Frequency	Percentage
Computerized Task Design	Computerized task includes cognitive goals	3	14%
	Computerized task includes psychomotor goals	3	14%
	Computerized task includes affective goals	0	0%
	Task supports interaction among students	3	14%
	Task includes student empowerment	0	0%
	Task includes clear instructions for students	3	14%
Mathematical Questioning	Task encourages teachers to ask new questions to students	0	0%
	Task poses thought-provoking questions to students	0	0%
	Task poses sequentially logical questions to students	0	0%
	Task encourages student-to-student questioning skills	0	0%
	Task poses questions involving opinion expression and discussion	0	0%
	Task includes questions that require students to think critically	0	0%
	Task poses questions of a reflective nature	0	0%
Facilitation and Ease of Mathematical Communication	Task allows students to solve questions in different ways	0	0%
	Task encourages student discussion and expression of ideas	0	0%
	Task considers individual differences among students regarding time (each student according to their suitable time)	3	14%
	Task considers students' learning styles (auditory, visual, kinesthetic)	0	0%
	Task provides dialogue between students and teachers	0	0%
Assessment of Student Learning in Mathematics	Task provides feedback to students on their progress	0	0%
	Task encourages students for self-assessment	0	0%
	Task helps measure what students have learned in the lesson	0	0%

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	Task helps determine students' progress level	0	0%
	Task encourages formative assessment	3	14%
	Task encourages summative assessment	3	14%
	Task provides feedback to teachers about students' performance	0	0%
	Source: Author work	21	100%

From the table above, it is evident that the rate of designing computational tasks reached 9.33%, while the rate of presenting mathematical questions reached 0%. The rate of facilitating communication was 2.8%, indicating its absence in this book. The rate of assessing students' learning in mathematics was 7%. All these percentages indicate a lack of attention to the standards of employing computational software in this book.

Thirdly, Tenth Grade: Scientific and Industrial / First Semester

Table (5).

Mathematical Activity	Availability Index	Frequency	Percentage
Designing Computational Tasks	The computational task includes cognitive objectives	4	25%
	The computational task includes affective objectives	4	25%
	The computational task includes psychomotor objectives	0	0%
	The computational task supports interaction among students	4	25%
	The computational task includes student enhancement	0	0%
	The computational task includes clear procedures for students	4	25%
Presenting Mathematical Questions	The computational task encourages the teacher to ask new questions to students	0	0%
	The computational task presents questions that stimulate thinking among students	0	0%
	The computational task presents psychologically and logically sequential questions to students	0	0%
	The computational task encourages students to ask questions themselves	0	0%
	The computational task presents questions that involve expressing and discussing	0	0%

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	opinions		
	The computational task includes questions that require students to come up with something new	0	0%
	The computational task presents questions of a reflective nature	0	0%
Facilitating Mathematical Communication	The computational task allows students to solve questions in several different ways	0	0%
	The computational task encourages students to discuss and express their ideas	0	0%
	The computational task considers individual differences among students according to time (each student according to their suitable time)	0	0%
	The computational task considers students' learning styles (auditory, visual, kinesthetic)	0	0%
	The computational task provides dialogue between students and teachers	0	0%
Assessing Students' Learning in Mathematics	The computational task provides feedback to students on their progress	0	0%
	The computational task encourages students for self-assessment	0	0%
	The computational task helps in measuring what students have learned in the lesson	0	0%
	The computational task helps in determining the level of students' progress	0	0%
	The computational task encourages formative assessment	0	0%
	The computational task encourages summative assessment	0	0%
	The computational task provides feedback to the teacher about students' performance	0	0%
	Source: Author work	16	100%

Table (5) below presents the results of the analysis of the Tenth Grade for the practical and industrial branches for the academic year 2021, First Semester.

From the table above, it is evident that the rate of designing computational tasks reached 16 %, while the rate of presenting mathematical questions was 0%. Similarly, the rate of facilitating communication was 0%, indicating its absence in this book. The rate of assessing students' learning in mathematics was also

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0%. All these percentages indicate a lack of attention to the standards of employing computational software in this book.

Summary of Analysis Results Here is a summary of the study results, comparing the actual and expected relative weights, as in Table (6), followed by the accompanying graphical representation:

Table (6).

Mathematical Activity	**Expected Relative Weight Range**	**Actual Average Relative Weight in All Sample Study Books**
Designing Computational Tasks	24%	12.55%
Presenting Mathematical Questions	28%	1%
Facilitating Mathematical Communication	28%	1%
Assessing Student Learning in Mathematics	20%	3%

General Conclusion

Table (6), and figure (4) summaries these results

The analysis above highlights the significant gap between the expected relative weight according to modern trends in integrating computer software into mathematics textbooks on one hand, and the reality in mathematics textbooks that include computer software on the other hand. The total actual indicators amount to 17.55% compared to the expected 100%. Additionally, there is a significant gap between the reality and the expected in the design of computerized tasks, where the reality is at 12.55% while the expected is 24%, meaning the actual percentage falls in the middle of the expected indicators. This leads to students' weakness in this field. There is also a very large gap between the reality and the expected in presenting mathematical questions in computer software, estimated at 27% in favor of the expected.

There is a significant gap in facilitating mathematical communication between students, teachers, and content, estimated at 27%, leading to a lack of communication between the parties involved in the educational learning process. There is also a gap in assessing students' learning through computer software in mathematics textbooks, where the reality of the gap reaches 17%, which does not give us a clear picture of the extent of students' progress in acquiring mathematical concepts and knowledge.

In conclusion, there is a very significant weakness in considering the employment of computer software standards in mathematics textbooks, which have been recently developed. This situation contradicts the direction of the Ministry of Education towards digitizing curricula. The results of

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this study are consistent with the results of the studies by Bråting, K., & Kilhamn, C. (2021) and Gutiérrez, A., Jaime, A., & Gutiérrez, P. (2021).

The recommendations of the study are as follows:

- It is necessary to bridge the gap between reality and expectation in the design of computerized tasks.
- It is essential to bridge the gap between reality and expectation in presenting mathematical questions.
- There is a need to bridge the gap between reality and expectation in facilitating mathematical communication.
- It is crucial to bridge the gap between reality and expectation in evaluating students' learning in mathematics.
- All mathematics textbooks should include tasks and computer software in line with modern trends in teaching and curriculum development in mathematics.

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