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Study of algebra integration and analysis in teaching mathematics and its applications

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ORIGINAL STUDY

Study of Algebra Integration and Analysis in Teaching Mathematics and its Applications

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Abstract

Algebra and analysis are considered the basic fundamentals in the mathematical field. Algebra deals with properties and relationships between numbers, variables, and functions. Algebra is considered a mathematical system that studies mathematical operations, mathematical relationships, and mathematical structures, while analysis focuses on studying limits, change, and integration Research goal is to expand and deepen students understand the mathematical concepts related to algebra and analysis, and the relationships and interactions between the various concepts are analyzed and described accurately, which helps students build a strong foundation for mathematical knowledge. The research relied on the descriptive analytical approach to determine the nature of the integration of algebra and analysis in teaching mathematics education and its applications. Research conclusions: A number of results, the most important are:

1) Improving understanding of basic mathematical concepts: Integrating algebra and analysis helps students understand basic mathematical concepts more deeply, by linking them together and presenting them in a logical, sequential manner.

2) Developing mathematical thinking skills: Integrating algebra and analysis helps students to develop mathematical thinking skills, like logical, analytical and abstract thinking.

3) Increase students' motivation to learn: The integration of algebra and analysis helps students increase their motivation to learn, by making learning more exciting and interesting.

Keywords: Algebra, Analysis, Mathematics education

1. Introduction

Mathematics education is considered a vital field in the field of education, as its teaching requires the use of an effective and appropriate methodology to enhance mathematical thinking and develop the mental skills of students, and one of the ways in which this can be achieved is by integrating algebra and analysis into teaching mathematics education, and integration is represented by integrating the concepts of algebra and analysis Mathematics together to enhance students' understanding and practical applications [1].

Algebra and analysis are both fundamental fundamentals in the mathematical field, and deal with properties and relationships between numbers, variables, and functions. Algebra is a mathematical system that studies mathematical operations, mathematical relationships, and mathematical structures, while analysis focuses on the study of limits and change thus, the integration of algebra and analysis into teaching mathematics education provides students with the opportunity to develop a comprehensive view of mathematical topics and expand their thinking abilities [2].

When algebra and analysis are integrated in the teaching of mathematics raising, algebraic and analytical concepts are presented in an interconnected and translator in a way from the fields [3].

In addition, the integration of algebra and analysis provides opportunities for the application of mathematical concepts in realistic contexts, and students

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can use algebra and analysis to solve practical problems, analyze data and take decisions based on mathematical evidence, and this practical application of algebra and analysis enhances deep understanding and assimilation of mathematical concepts and helps students apply in their lives Daily and in other areas of science.

In general, the integration of algebra and analysis into teaching mathematics education enhances students' mathematical and analytical thinking and contributes to the development of their thinking and analytical abilities, can help develop the ability to solve problems, critical thinking and innovation, and enhance the ability to deal with complex mathematical concepts [4].

In addition, it enhances Integrating Algebra and Analysis into Mathematics Education Teaching The connection between different mathematical concepts. A deeper understanding of algebra and analysis is built by exploring the relationships and interconnections between them. Students can see how algebraic concepts can be used to understand and describe analytic ideas, and how analytic concepts can be used to verify the validity and reasoning of algebra [5].

To create an effective learning environment for the integration of algebra and analysis into teaching mathematics education, teachers must provide opportunities for active interaction and collaboration among students. This can be achieved through the use of applied activities, research projects, and solving real-world problems that require the application of algebra and analysis. Appropriate educational resources and technology must be provided [6]. Information and communication to support students' learning and develop their skills in integrating algebra and analysis [7].

2. Research problem

Algebra and analysis are two of the most important branches of mathematics, as they are used in many scientific and technical fields. Teaching algebra and analysis in mathematics education and its applications is one of the challenges facing teachers, as it requires a deep understanding of these branches of mathematics and high communication and interactive skills [8].

Accordingly, the research problem is to determine how to integrate algebra and analysis in teaching mathematics education and its applications, in a way that achieves the goals. The desired educational level helps students understand these branches of mathematics and use them in solving problems.

The research problem is summarized in the main question, which is:

3. What is the impact of integrating algebra and analysis in teaching mathematics education and its applications?

3.1. Research questions

- What are the benefits that can be achieved by integrating algebra and analysis in teaching mathematics education and its applications?
- What are the challenges that may face teaching mathematics education and its applications using algebra and analysis?
- What are the best approaches and methods that can be used to teach mathematics education and its applications using algebra and analysis?

4. Research hypotheses

4.1. Main hypothesis

The integration of algebra and analysis in teaching mathematics education and its applications contributes to improving students' understanding of mathematical concepts and their applications and can contribute to developing their mental and analytical skills, and enabling them to think critically and solve mathematical and practical problems in the contexts of daily life and other fields.

4.2. Hypotheses sub

4.2.1. The first sub-hypothesis

The benefits that can be achieved by integrating algebra and analysis in teaching mathematics education and its applications:

1. Enhancing critical and analytical thinking: Integrating algebra and analysis helps develop students' critical and analytical thinking skills, as they learn how to analyze mathematical problems and apply algebraic and analytical concepts to find solutions.
2. Developing mental skills: Learning algebra and analysis in mathematics education contributes to the development of basic mental skills such as critical thinking, concentration, logic, organization, creativity, and mathematical reasoning.
3. Deeper understanding of mathematical concepts: The integration of algebra and analysis helps enhance students' understanding of basic mathematical concepts and the relationships between them, which contributes to building a

strong foundation for understanding and progress in advanced areas of mathematics.
4. Practical Life Applications: Integration of algebra and analysis can help students understand and apply mathematical concepts in their daily life contexts and in other fields such as science, engineering, and economics.

4.2.2. The second sub-hypothesis

Challenges that may face teaching mathematics education and its applications using algebra and analysis:

1. Difficulty of concepts: Students may have difficulty understanding some advanced algebraic and analytical concepts, which requires simplifying explanations and using real-life examples and applications to illustrate them.
2. Lack of resources and technology: There may be a lack of educational and technological resources available to teach mathematics education effectively, which hinders the application of modern methods and techniques.
3. Assessment Challenges: It can be difficult to assess students' understanding and progress in integrated algebra and analysis in effective and fair ways, especially concerning non-computer skills and deep thinking.
4. Curriculum pressure: There may be time pressure to complete the prescribed curriculum, which restricts the opportunity to adequately promote the integration of algebra and analysis into mathematics education teaching.

4.2.3. The third sub-hypothesis

The best approaches and methods that can be used to teach mathematics education and its applications using algebra and analysis:

1. Employing real-life examples: Using real-life examples and applications in PE teaching can help students better understand concepts and see the relationship between mathematics and daily life.
2. Interaction and Collaboration: Encouraging students to actively participate in lessons and solve problems together can enhance their understanding of mathematical concepts and their applications.
3. Use of technology: The use of computer programs, interactive tools, and online resources can make teaching mathematics education more popular, interactive, and interesting for students.
4. Focus on practical skills: Encouraging students to apply algebraic and analytical concepts in solving practical problems and analyzing data enhances their practical understanding of mathematics and develops their mental skills.

5. The importance of the research

The importance of the research on the study of the integration of algebra and analysis in teaching mathematics education and its applications is evident in several points:

1. Improving student learning: Research into understanding how the integration of algebra and analysis into teaching mathematics education helps improve student learning, and research can highlight the best educational methods and practices that help students understand mathematical concepts and apply them in effective ways.
2. Curriculum development: Research can contribute to developing and improving curricula in the field of mathematics education, and by integrating algebra and analysis more into the curricula, students' thinking can be enhanced and problem-solving and mathematical analysis skills developed.
3. Enhancing educational competence: Research can help enhance teachers' competence in teaching mathematics education and its applications. By using the most effective methods and tools in integrating algebra and analysis, teachers can improve the quality of teaching and their impact on student learning.
4. Linking mathematics to practical life: Research can contribute to linking mathematics to practical life and practical applications, and students can see how mathematical concepts can be applied in the fields of science, engineering, economics, etc., which enhances their interest and understanding of mathematics and its practical value.
5. Achieving academic excellence: Research on the integration of algebra and analysis can help achieve academic excellence in the field of mathematics education, and through a better understanding of mathematical concepts and their applications, students can excel in their studies and achieve excellent academic results.

In general, it can be said that the research on the integration of Algebra and analysis in teaching mathematics education and its applications contribute to improving student learning, developing curricula, enhancing educational efficiency, linking mathematics to practical life, and achieving academic excellence in mathematics education.

6. Research objectives

The research objectives on studying the integration of algebra and analysis in teaching mathematics education and its applications include the following:

1. A deeper understanding of mathematical concepts: The research aims to expand and deepen students' understanding of mathematical concepts related to algebra and analysis, and the relationships and interactions between different concepts are carefully analyzed and described, which helps students build a strong foundation of mathematical knowledge.
2. Application of mathematical concepts in practical contexts: The research aims to clarify how mathematical concepts are applied in practical contexts and applications. This may include the application of algebra and analysis in the natural sciences, engineering, economics, and other applied fields. The practical value of mathematical concepts and how to use them in solving problems is explained. Realistic problems.
3. Enhancing problem-solving skills: The research aims to enhance students' problem-solving skills using integrated algebra and analysis. Students' abilities in critical and analytical thinking are developed, and the application of mathematical concepts in solving complex issues. The research encourages creative thinking and expands the ability to make logical decisions.
4. Improving educational methods: The research aims to improve the educational methods and practices used in teaching mathematics education. The best ways to present mathematical concepts related to algebra and analysis in interesting and inspiring ways are explored. The focus is on student interaction and promoting active interaction and self-learning.
5. Development of educational resources: The research aims to develop innovative and effective educational resources for teaching the integration of algebra and analysis in mathematics education. These resources may include updated textbooks, educational computer programs, visual educational materials, and interactive activities. These resources aim to enhance students' understanding and independent learning.

7. Research methodology

Applying the descriptive analytical approach in studying the integration of algebra and analysis in teaching mathematics education requires performing the following steps:

- Defining objectives: The specific objectives of the study are determined, such as improving students' understanding of mathematical concepts related to algebra and analysis, enhancing their problem-solving skills, and applying the concepts of Mathematics in practical contexts [9].
- Analysis of the current curriculum: The current curriculum used in teaching mathematics education is analyzed and the mathematical concepts related to algebra and analysis that are covered are determined, and the strong and weak points of the current curriculum are identified [10,16].
- Identification of basic concepts: The basic concepts are identified in algebra and analysis, which must be taught accurately and comprehensively. This includes concepts such as calculus, algebraic and analytical functions, derivative and numerical integration, etc [11].
- Designing study units: Study units are designed that focus on the integration of algebra and analysis. These units should include interactive and applied activities that help students understand and apply mathematical concepts. Examples and applied problems from real life can be used to enhance understanding and interest.
- Student assessment: Students are evaluated Students progress in understanding and applying mathematical concepts related to algebra and analysis, and various assessments such as tests, homework and projects are used to evaluate students' mathematical skills and knowledge.
- Data analysis and evaluation: Data collected from the evaluations are analyzed to evaluate the effectiveness of the descriptive-analytical approach in teaching the integration of algebra and analysis, and the Strong points and points that can be improved to enhance student learning.
- Continuous improvement: The results of evaluation and analysis are used to improve the curriculum and develop teaching methods, and the curriculum must be adapted and modified based on needs and challenges faced by students.

8. Procedural research terms

- Algebra: It is a branch of mathematics that studies relationships and mathematical operations using symbols and variables. Algebra is concerned with expressing mathematical relationships, solving equations and equations, and manipulating sports expressions [12].
- Analysis: refers to another branch of mathematics, which deals with theories and concepts

related to continuous change and changes. The analysis is concerned with understanding the real numbers, continuous dependencies, differentiation, complementarity, rapprochement and borders [13].
- Integration: refers to a mathematical process aimed at calculating spaces, sizes and gradual changes in mathematics. Integration includes the process of calculating the space under a specific curve or calculating the volumetric group of 3D shapes [14].
- Mathematics raising: indicates the field of education that focuses on mathematics education and learning. Teaching mathematics aims to develop mathematical skills, and critical and analytical thinking among students and develop their understanding of mathematical concepts and their ability to apply them in practical life [15].

9. Previous studies

1. **[Rahma Fawzi Mahmoud Fahim, 2022]** [14].

This research aimed to identify the algebraic thinking skills necessary for students in the second cycle of basic education to teach mathematics.

The research tools include: Preparing a list of forced thinking skills for second -grade middle school students.

9.1. Search results resulted in

- The results of the study resulted in identifying the need to develop the skills of forced thinking among students of basic education, as it helps to face difficulty and absorb algebra appropriately.
- The skills included in the list help solve various algebraic problems.

2. **[Rabab Muhammad al-Mursi Diaspora, 2009]** [13].

This research aims to identify the extent to which standard levels of mathematics are available in the content of mathematics textbooks in Egypt in the second cycle of basic education, as presented by the Ministry of Education in light of the national standards for education. The curriculum was Descriptive and analytical, which is based on analyzing the current situation of mathematics books in the primary cycle due to its suitability to the nature of this research. Mathematics books in the second cycle of basic education for grades [7–9] were analyzed in light of the national standards for education in Egypt [standard levels of mathematics].

The idea was chosen as a unit for analyzing mathematics books in this research due to its suitability to the nature of the current research. The analysis focused on the textual context [verbal in content, including verbal and symbolic problems expressed in pictures and shapes, test problems, and exercises. Indexes and summaries found in some books were excluded from the analysis process].

9.2. The following results were reached

The results indicated that the standards for constructing the mathematics curriculum for grades [7,9] in the second cycle of basic education are met with a large degree of standards indicators for these fields - with a high degree representing 66.6% and above - in my book The first grade of middle school, with a small score in the current curriculum - as a low score represents less than 33.3 - in the books of the second and third grade of middle school, and therefore the topics of this content should be reconsidered and built to include topics directly related to the national standards in these grades.

3. **[Jihad Kazem Nasrallah, 2019]** [17].

A study was conducted on challenges and difficulties in learning mathematics, highlighting modern trends in the field of mathematics study, and the methodology requires the systematic analysis of the concepts related to the subject and dividing it into several points. Focus on the most important terms, such as defining mathematics and defining the difficulties of mathematics learning, and the theoretical framework guarantees major branches of mathematics such as house engineering, account, vacuum engineering, analytical engineering, triangles account, differentiation, complementarity, analysis, possibilities, and statistics.

The study also addressed the difficulties and obstacles that may face the process of learning mathematics, including factors related to students such as sensory, social, mental, and emotional problems, and lack of motivation to learn mathematics, as well as factors related to teachers and the educational system.

The study also revealed strategies to overcome difficulties in learning mathematics, such as learning Positive teaching, direct teaching, aloud learning, and individual learning, and pointed out the importance of using games in teaching mathematics and adopting discovery learning strategies, problem-solving strategies, and inductive teaching.

The study also touched on modern technologies in teaching mathematics and modern trends in teaching and learning mathematics, such as community mathematics and the development of mathematical strength and dexterity. Mathematics.

The study concluded by pointing out the lack of sufficient interest on the part of families and society in searching for and applying new ways to attract students towards studying mathematics. It also stressed the importance of increasing research and studies on learning problems and seeking solutions to the difficulties facing the learning process.

4. **[Yousry Ahmed Al-Haddad, 2005]** [11].

The study reached several important results, including the following:

The results showed that the easy skills in mathematics have a specific order, with the comprehension skill coming in first place, and the memorizing and remembering skill in fourth place.

For simple skills, the comparison skill ranked tenth, the classification skill ranked third, and the ranking skill ranked fourteenth.

Regarding intermediate skills, the deduction skill ranked eighth, the induction skill ranked sixth, the application skill ranked fifth, and the problem-solving skill ranked twelfth.

Based on these results, it can be recommended to develop the content of mathematics for the third preparatory grade in the Kingdom of Bahrain. Which focuses on developing easy, simple, and intermediate skills in a balanced manner, and providing educational and training activities that help students develop their abilities in comprehension, memorization, and memory, as well as in comparison, classification and arrangement, deduction and induction, application and problem-solving.

There can also be an argument for analyzing the content of the mathematics book for the third preparatory stage makes improvements to the existing paragraphs, making sure to provide practical and analytical exercises and examples that help students apply their mathematical skills and enhance their critical and creative thinking.

5. **[Hanan Abdullah Ahmed Rizk, 2017]** [12].

The study focuses on the effectiveness of the Mathematics Teaching Skills Clinic in improving the use of some effective teaching skills for female teachers. The study was implemented on a sample of 15 female student teachers in the mathematics major at the College of Education at Umm Al-Qura University in Makkah Al-Mukarramah. Preparing a mathematics teaching skills clinic, which included educational references and electronic and paper resources to enhance effective teaching in mathematics, and used tools such as problem-solving, brainstorming, multiple intelligence, and working in groups.

An experimental approach and a quasi-experimental design with one group were used, and effective teaching skills for mathematics were evaluated using a scale, it was developed by the researcher, and its validity and reliability were verified. The researcher used the T-test and the Eat Square scale to determine the size of the effect and its significance.

The results showed that there were statistically significant differences between the performance of female student teachers before and after their training in the Mathematics Teaching Skills Clinic, and the differences indicate an improvement in the use of effective teaching skills after implementing the clinic. The researcher concluded the importance of adopting an effective mathematics teaching skills clinic as a training model for female student teachers in pre-service professional preparation programs.

The study recommends implementing effective mathematics teaching skills clinics as a training model for female mathematics teachers before they begin their service and stresses the importance of providing appropriate educational and technical resources to enhance effective teaching in mathematics, such as the use of problem-solving, brainstorming, and cooperative learning.

6. **[Rae Carbonell, Philippe S Jan, 2016]** [4].

This study explores the integration of mathematics concepts into science teaching, and emphasizes the diverse science nature of learning, where concepts learned in one discipline can be applied to other categories of study, and conducted a lesson study to learn how to ensure Integration into science lessons, including careful planning, observation and analysis of research into the integration of mathematics and science.

Unified the study related to this matter; recommended research rigor suggests development suggestions. By integrating mathematics into science education, teachers can understand everything related to the subject of healthcare for a more comprehensive, comprehensive experience.

9.3. Benefit from previous studies:

Previous studies have benefited from algebra integration and analysis in teaching mathematics

education and their applications in several aspects. Among these benefits:

1. Explaining the relationship between algebra and analysis: Previous studies contributed to clarifying the relationship between algebra and analysis and how they can be completed in teaching mathematics education, and these studies have shown that algebra can be the basis for mathematical analysis and that analysis can enhance the understanding of algebra and its applications.
2. Developing effective educational strategies: Previous studies have contributed to developing effective educational strategies for algebra integration and analysis in teaching mathematics education, and educational activities and materials have been developed that enhance students understanding of compulsory and analytical concepts and their application in real contexts.
3. Promote deep and analytical thinking: Previous studies contributed to promoting deep and analytical thinking among students through algebra integration and analysis in teaching mathematics education. These studies have shown that the integration of algebra and analysis can help students better understand mathematical relationships and expand their capabilities in analytical thinking.
4. Enhancing practical applications: Previous studies have contributed to enhancing practical applications of algebra and analysis in teaching mathematics education. Practical activities and projects have been designed that allow students to use algebraic and analytical concepts in solving real-life problems and practical challenges.
5. In general, previous studies on the integration of algebra and analysis in teaching mathematics education and its applications enhance students' understanding and mathematical skills and enhance their mental and analytical development. These studies provide strong foundations for effective teaching in this field and support the development of curricula and educational practices related to algebra and analysis in mathematics education.

9.4. Theoretical framework

The concept of studying the integration of algebra and analysis:

Algebra is a branch of mathematics that focuses on the study of mathematical relationships and structures using symbols and variables. Algebra uses number theory, equations, functions, matrices, and other algebraic structures to solve problems and analyze mathematical models. Algebra is used in many fields such as engineering mathematics, physics, computer science, data science, economics, statistics, engineering, and many other fields [9].

Algebra constitutes one of the basic branches of mathematics, along with mathematical geometry, mathematical analysis, number theory, permutations, and combinatorics. Algebra is concerned with the study of algebraic structures and the symmetries between them, relationships, and quantities. Algebra is considered essential in understanding and analyzing many mathematical concepts and is used in many other fields. Like physics, computer science, economics, engineering, etc., algebra provides tools and concepts for studying mathematical relationships and structures in general and contributes to the development of mathematical logic and critical thinking.

The term algebra has spread recently and has become widely resonant among educators and those interested in teaching school mathematics. This is due to their firm belief that algebra is the basic gateway to understanding mathematics at higher educational levels, and they even consider it a transit gateway that enables us to understand the world surrounding us and its various phenomena. Algebra is a powerful tool for critical thinking and problem-solving, and contributes to the development of mathematical reasoning and deep analysis. By understanding and internalizing the concepts of algebra, students can build a strong foundation for exploring other mathematical fields and their applications in many areas of life [6].

According to Stein, algebra in the past was understood as the process of calculation using symbols and letters rather than numbers. It was considered that the abundance of symbols and the lack of words reflected the strength of the algebraic content. In schools, algebra books focused on three main aspects: arithmetic operations using letters, and solving equations.

In the twentieth century, algebra developed into an abstract algebra with multiple applications [1]. Algebra became the language of mathematics and the key to technological progress. Therefore, it now requires attention to teaching algebra and highlighting its role in the development of other fields. Algebra is essential in understanding many mathematical and scientific concepts, and supports critical thinking and problem solving. It can also open new doors for practical applications in many fields such as engineering, computer science, economics, and natural sciences.

According to Werri Nagy-Dioscorus [2011], the importance of algebra lies in the fact that it is a mathematical structure that links various branches of mathematical knowledge. Algebra is distinguished from the rest of the branches of mathematics and other natural sciences by several features, and it investigates these features to reach a specific type of thinking that has various forms. Algebra focuses on abstract concepts that distinguish it from classical arithmetic.

Algebra is not only limited to the implementation of mathematical operations, but also works to explore relationships, symmetries, and algebraic structures in mathematical issues and equations, algebra contributes to developing critical and analytical thinking, and allows the representation of complex interactions and sports models in a simpler and more understanding way, in addition, algebra allows the use of symbols and variables To express mathematical relationships in general and analyze them in different ways [16].

Smith, John, and Gomion note that algebra is part of school mathematics, and it aims to develop students' skills in using symbols, shapes, and fees to build and describe the relationships between information and unknown quantities and mathematically translate them, and algebra is also linked to the ability of students to identify mathematical symbols, read and write expressions and amounts Algebra, the use of mathematical relationships in describing and interpreting life situations, and the study of algebra also includes functions that represent mathematical relationships with specific characteristics and are used to describe and predict situations, and algebra is related to many algorithms that students must master [5].

Specific properties are used to describe and predict situations, and associated with this are many algorithms that students must master. According to Shehata Abdullah, algebra is taught in schools in traditional ways that rely on listing algebraic rules and training students to solve some mechanical exercises without deep understanding, and thus Grammar, traditional teaching methods in algebra lack the development of any kind of thinking, especially algebraic thinking that is more relevant to the subject.

Nowadays, the focus is not only on the knowledge itself but also on how this knowledge is accessed, produced, applied, and employed in solving Problems in practical life. This requires adopting educational methods that encourage students to think critically, explore algebraic ideas, and apply them in realistic contexts. Instead of focusing on mechanics and repetition, students' understanding of algebraic concepts must be enhanced and their abilities to think algebraically and solve problems related to reality must be enhanced [15].

9.5. The concept of analysis:

Analysis [in the language] has many meanings, the most important of which are:

"Solve": means untangling something complicated or dismantling it to understand or fix it, and it is also used in the meaning of "solving the problem" and the like.

"Untie the knot": means untangling a particular complex or problem, and it is also used in the sense of "reducing it to its components" or "disassembling it."

"Analysis": refers to analyzing the linguistic sentence, which is the process of analyzing the sentence into its parts and determining the function of each part in the sentence [7].

Qamar al-Din stated: The analysis expands on the matter from the total to the partial until the signs of the matter or its relationships or function with the other are known [2].

Analysis in any form of the type of study being conducted is a way of looking and thinking about the systematic thinking of something to determine the relationship of one part to another [8].

From the above different meanings regarding analysis, I conclude that analysis is a thinking activity to describe the subject into parts or components so that the characteristics or signs of each part, their relationships to each other, and the function of each complete part are known.

9.6. Types of Analysis:

a] Descriptive Analysis: According to Erawan, descriptive analysis is defined as a process that aims to describe or explain something as it is, without making an evaluation or interpretation.

b] Comparative Analysis: Comparative analysis is used to compare two or more variables to understand the differences between them, this requires analyzing the common and different characteristics and features between variables, and it can be used in several fields such as social sciences, economics, and natural sciences [3].

1. A good method must meet several important criteria, including:
2. Sensitivity: The method must be able to accurately determine concentrations of small compounds.

3. Accuracy: Using the method produces nearly identical analytical results when measurements are repeated.
4. Accuracy: The method can produce an average value that is very close to the true value of the sample.
5. Selectivity: The method should be able to measure some compounds without significant influence from the presence of other compounds.
6. Robustness: Analysis results must not be affected by any change in solvent composition or changes in ambient conditions.
7. Process: The method must be easy to implement and does not require large resources of time and money.

9.7. The importance of studying the integration of algebra and analysis in teaching mathematics education:

The calculus course is part of a series of calculus courses offered free of charge by Edraak on their website. This course covers the basics in the field of calculus, and includes an explanation of the use of algebra in teaching mathematics and logarithms, and deals with the laws and foundations of calculus, and the concept of linear and quadratic conjunction and the differences between them.

In addition, the course also addresses the topic of intervals on real numbers and how to determine the domain and range of a graph determine the association rule and calculate its value. Emphasis is also placed on the distinction between association and relationship, and the characteristics of association in this context [10].

Calculus is widely used in practical and daily life applications, and among the importance of this science is that it has contributed to the derivation of many important physical laws, in addition, it contributes to determining physical values such as speed, acceleration, calculating distance, and changes in physical quantities.

Therefore, calculus is considered one of the most important branches of mathematics that is usually taught as a university requirement for most students according to their specializations. It is also taught in the curricula for high school students [tawjihi], due to its great importance in understanding and analyzing physical phenomena and practical applications.

We usually find the word differentiation associated with the word integration because of its interference in practical applications to provide accurate mathematical explanations. This science is concerned with studying limits, continuity, infinite series, calculating integrals in mathematics, deriving equations, algebraic terms, linear conjugation, quadratic conjugation, all of that and more. You will learn about it through the course [Calculus].

The researcher believes that through the integration of algebra and analysis in teaching mathematics education, the connection between algebraic and analytical concepts and their applications in different fields is strengthened. Examples of its applications can be mentioned as follows:

1. Solving equations and equations: Algebra and analysis are used in mathematics education to solve mathematical equations and equations. Students can use algebraic and analytical concepts to solve equations involving variables and direct the solutions in precise ways.
2. Study models and calculus: Students can use algebraic and analytical concepts to study mathematical models and analyze their changes through calculus. This allows them to better understand mathematical relationships and apply them to solving real problems.
3. Statistics and Probability: Algebra and analysis are used in mathematics education to study statistics and probability. Students can use algebraic and analytical concepts to analyze data, calculate probabilities, and interpret results.
4. Engineering and Computer Science: Students can use algebraic and analytical concepts in mathematics education to solve engineering problems and design mathematical models in fields such as engineering and computer science.

10. Research results

The research results showed that the integration of algebra and analysis in teaching mathematics education and its applications has many benefits, the most important of which are:

- Improving understanding of basic mathematical concepts: Integrating algebra and analysis helps students understand basic mathematical concepts more deeply, by linking them to each other and presenting them in a logical, sequential manner.
- Developing mathematical thinking skills: Integrating algebra and analysis helps students develop mathematical thinking skills, such as logical, analytical, and abstract thinking.
- Increasing students' motivation to learn: Integrating algebra and analysis helps students increase their motivation to learn, by making Learning is more exciting and exciting.

10.1. Research recommendations

Based on the research results, the study recommends the following:

- The need to prepare teachers on how to integrate algebra and analysis in teaching mathematics education and its applications.
- The need to provide the necessary educational resources to integrate algebra and analysis in teaching mathematics education and its applications.
- The need to conduct more Studies on the integration of algebra and analysis in teaching mathematics education and its applications.

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