



International Conference on Computing, Artificial Intelligence and Information Systems

Hosted Online from Warsaw, Poland

Date: 11th June, 2026

Website: <https://econferencia.com>

TEACHING SCHOOL ALGEBRA LESSONS USING COMPUTER ALGEBRA SYSTEMS

Saidakhmedov Eldor Islomovich

Teacher, Department of Information Technologies

Denov Institute of Entrepreneurship and Pedagogy

Email: techmespeaker@gmail.com

Uralov Bahrom Bobomurod ugli

Student, Denov Institute of Entrepreneurship and Pedagogy

Email: bahromuralov3@gmail.com

Abstract

This article analyzes the pedagogical opportunities of using Computer Algebra Systems (CAS) in teaching algebra in general secondary schools. The use of CAS tools in solving algebraic problems, studying functions, and mathematical modeling processes is discussed as a means of developing students' mathematical competencies. In addition, the methodological aspects of integrating computer algebra systems into the school algebra curriculum and the advantages of this approach are examined.

Keywords: algebra, computer algebra systems, CAS, mathematics education, GeoGebra, Maple, Mathematica, mathematical competence, information technologies.



International Conference on Computing, Artificial Intelligence and Information Systems

Hosted Online from Warsaw, Poland

Date: 11th June, 2026

Website: <https://econferencia.com>

Introduction

Today, digitalization of the education system and the introduction of modern information and communication technologies into the educational process have become one of the urgent tasks. In particular, the use of innovative software tools in teaching mathematics contributes to improving the effectiveness of students' learning outcomes. Algebra is an important component of school mathematics, covering topics such as equations, inequalities, functions, transformation of expressions, and mathematical modeling. The use of computer algebra systems in teaching these topics enables the automation of complex calculations, visualization of graphs, and development of students' research skills.

Research Purpose

The purpose of this study is to develop methodological foundations for organizing school algebra lessons with the help of computer algebra systems and to determine their impact on students' mathematical preparation.

The Role of Computer Algebra Systems in Education

Computer Algebra Systems are software tools designed to perform analytical operations on mathematical expressions. They provide opportunities for algebraic calculations, solving equations, differentiation and integration, graph plotting, and statistical data processing.

The following CAS tools are widely used in education:

- GeoGebra
- Maple
- Mathematica
- Maxima
- MATLAB Symbolic Math Toolbox



International Conference on Computing, Artificial Intelligence and Information Systems

Hosted Online from Warsaw, Poland

Date: 11th June, 2026

Website: <https://econferencia.com>

Using these programs, students can gain a deeper understanding of mathematical concepts and have opportunities for visual analysis of results.

Methodology of Using CAS in Algebra Lessons

1. Simplification of Algebraic Expressions

Computer algebra systems visually demonstrate the processes of multiplying, simplifying, and factorizing polynomials. This facilitates understanding of formulas.

2. Solving Equations

Students are provided with opportunities to solve linear, quadratic, and higher-degree equations using different methods and compare results. They learn to analyze multiple solution methods for a single problem.

3. Studying Functions

Constructing function graphs and observing their properties under changing parameters enhance students' analytical thinking skills.

4. Organizing Research Activities

Students can independently conduct mathematical experiments, test hypotheses, and draw conclusions. This contributes to the development of research competencies.

Advantages of CAS Technologies

The use of computer algebra systems provides the following advantages:

- increases students' interest in algebra;
- reduces the time spent on complex calculations;
- enables visualization of mathematical objects;
- develops independent learning skills;
- promotes research and creative thinking;
- improves students' digital competencies.



International Conference on Computing, Artificial Intelligence and Information Systems

Hosted Online from Warsaw, Poland

Date: 11th June, 2026

Website: <https://econferencia.com>

However, some challenges may arise in implementing computer algebra systems in practice:

- insufficient technical equipment in schools;
- varying levels of teachers' preparedness in working with CAS;
- lack of sufficient methodological recommendations in curricula;
- possible weakening of calculation skills due to improper use of software tools.

Therefore, CAS tools should be used as didactic tools complementing traditional teaching methods.

Analysis shows that the purposeful use of computer algebra systems in algebra lessons increases students' cognitive activity, helps them consciously understand mathematical concepts, and develops creative approaches to problem-solving. In particular, CAS tools demonstrate high effectiveness in studying functions and investigating equations.

Conclusion

Organizing school algebra lessons using computer algebra systems is one of the promising directions for modernizing mathematics education. CAS technologies provide opportunities to develop students' mathematical competencies, individualize the learning process, and improve educational effectiveness. In the future, developing methodological recommendations for integrating these tools into educational programs and improving teachers' digital competencies will be of great importance.



International Conference on Computing, Artificial Intelligence and Information Systems

Hosted Online from Warsaw, Poland

Date: 11th June, 2026

Website: <https://econferencia.com>

References

1. Buchberger B. Computer Algebra and Education. – Linz: Johannes Kepler University, 2021.
2. Pierce R., Stacey K. Teaching Mathematics with CAS: Innovations and Challenges. Mathematics Education Research Journal, 2020.
3. Hohenwarter M., Lavicza Z. The Strength of GeoGebra in Mathematics Education. International Journal for Technology in Mathematics Education, 2022.
4. Ismoilov A., Mamatov S. Use of Information Technologies in Teaching Mathematics. – Tashkent: O‘qituvchi, 2023.
5. State Educational Standards and Mathematics Curriculum for General Secondary Education of the Republic of Uzbekistan. – Tashkent, 2024.