

How Information Technology helps in development of creative and critical thinking on the example of mathematics education

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Introduction

The title of section is „Digital Society and Information Technology”, so let's define Digital Society.

In different sources we can find many different definitions of Digital Society. Let's take two of them:

Introduction

„A modern, progressive society that is formed as a result of the adoption and integration of information and communication technologies (ICT) at home, work, education and recreation, and supported by advanced telecommunications and wireless connectivity systems and solutions.”

Source:

<https://www.igi-global.com/dictionary/importance-of-digital-literacy-and-hindrance-brought-about-by-digital-divide/65667>

Published in Chapter: Internet of Things and Big Data-Driven Data Analysis Services for Third Parties: Business Models, New Ventures, and Potential Horizons; From: Strategic Innovations and Interdisciplinary Perspectives in Telecommunications and Networking

Introduction

„Refers to society in which digital technologies are widely used to respond to different individual, community and social challenges.“

Source:

<https://www.igi-global.com/dictionary/importance-of-digital-literacy-and-hindranc-e-brought-about-by-digital-divide/65667>

Published in Chapter: Ageing and Health in the Digital Society: Challenges and Opportunities; From: Exploring the Role of ICTs in Healthy Aging

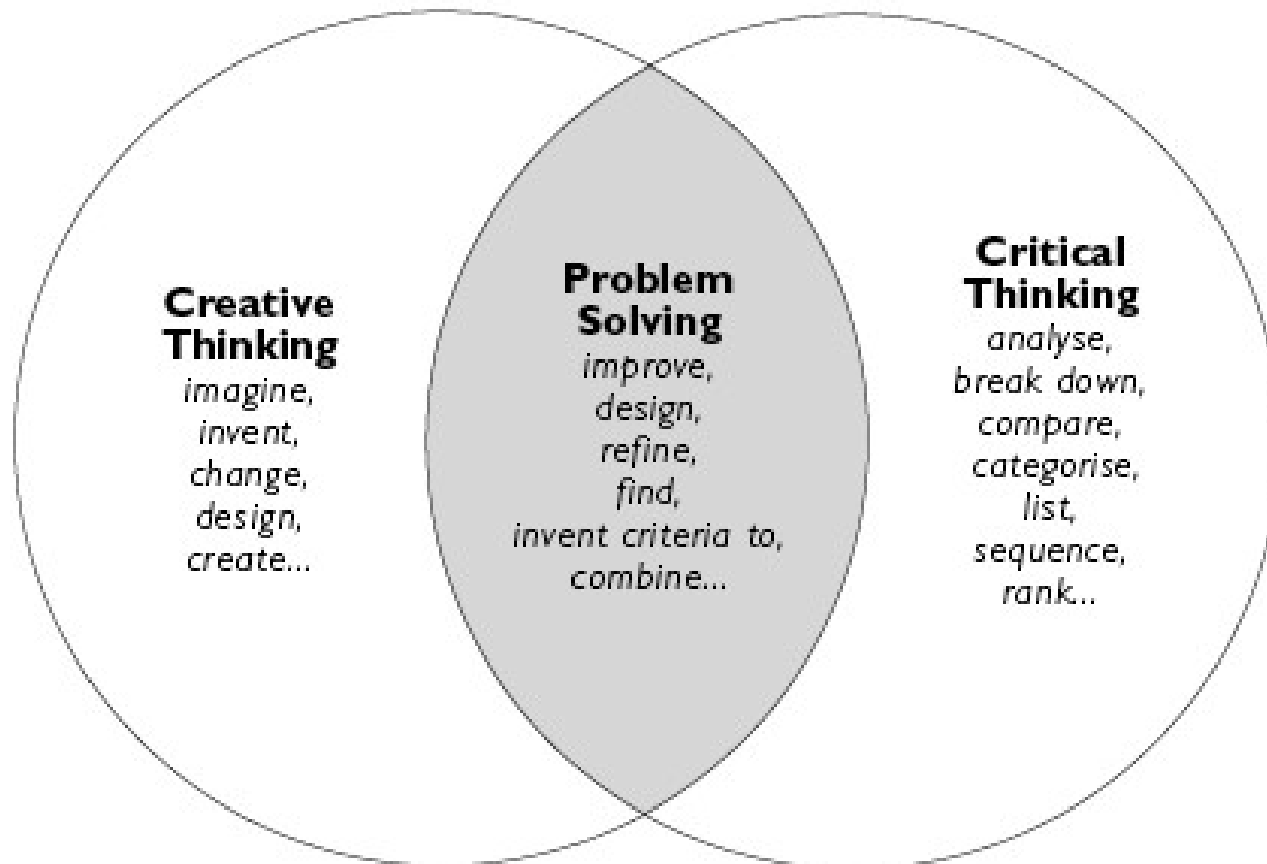
Individual, community and social challenges – what they require?

„21st century skills, sometimes referred to as 21st century competencies, is a complex term which encompasses skills that may be required to be successful in learning, in the workplace and to live effectively in the 21st century.

Although frameworks and definitions of 21st century skills exist, **most refer to the same list of competences which includes collaboration, communication, ICT, creativity, critical thinking and problem solving.**”

- we can read at *Supporting the Development of 21 st Century Skills through ICT* by Cathy Lewin, Sarah McNicol from Manchester Metropolitan University, UK

What does creative thinking mean? What does critical thinking mean?



<https://br.pinterest.com/pin/318489004883050770/>

What is the role of mathematics education here?

Creative and critical thinking can be developed very effectively in mathematics education, especially if students learn mathematical concepts not from books, but formulate them themselves in the course of research work.

Formulation of mathematical concepts requires building strategies for problem solving, productive thinking, making hypotheses, verifying hypotheses, analysing, synthesizing, running simulations, concluding, accuracy, perseverance, etc., which is all that makes up creative thinking and critical approach to the results of activities.

What is the role of ICT here?

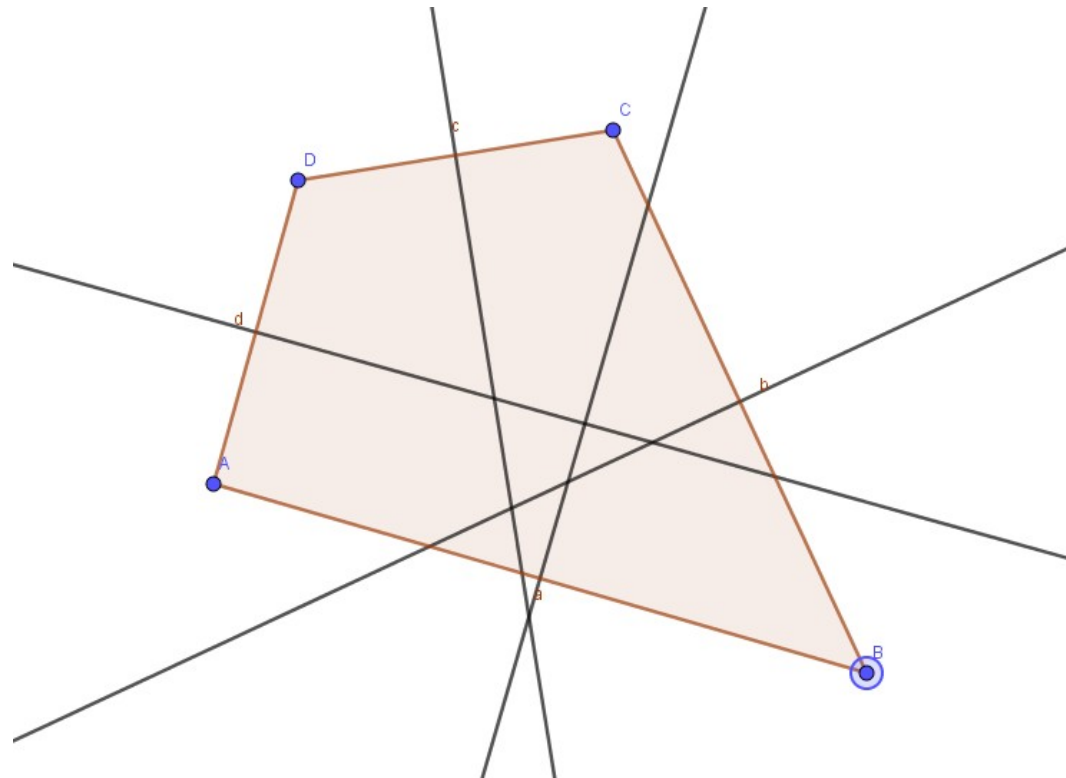
Educational software is one of the most important didactic tools in our time, so ICT can be used both to **visualize mathematical content** (for better understanding by students) and **as a tool for student research** (to discover relationships between mathematical objects and formulate theorems).

Software recommended to research work of students in primary, middle and secondary schools

- GeoGebra (www.geogebra.org) - especially for dynamic learning of geometry and algebra;
- Graphic Calculus (www.vusotf.eu) - functions and calculus;
- Vusoft (www.vusotf.eu) - statistics and probability.

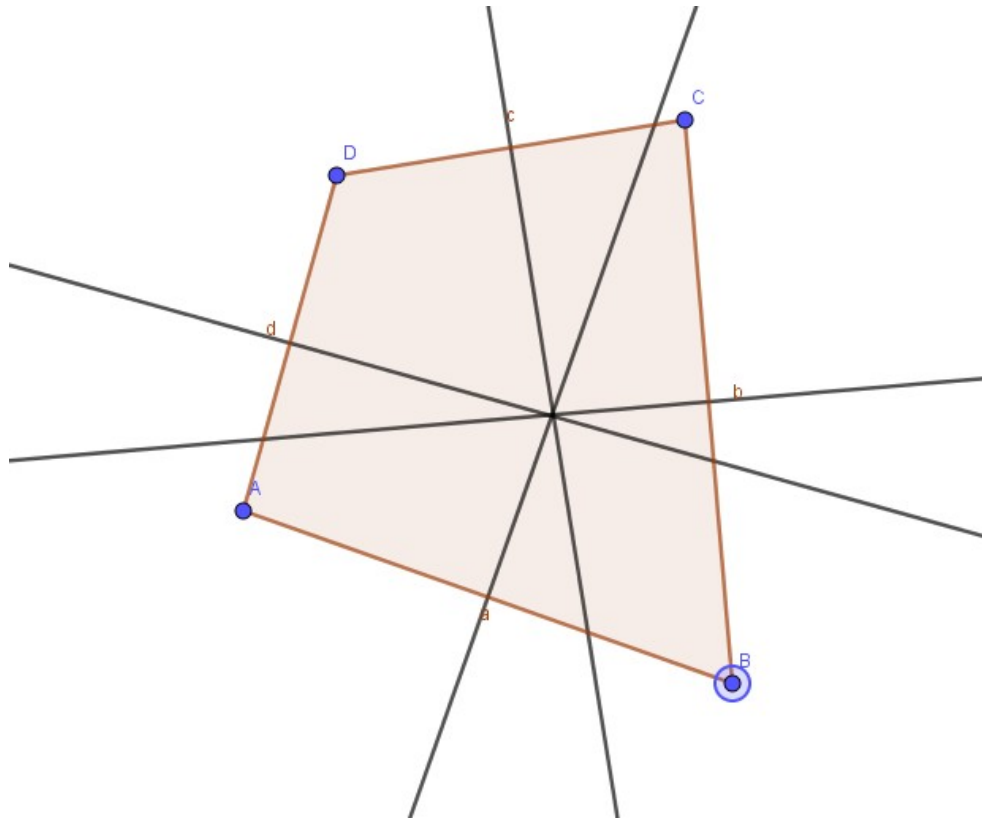
Example of using GeoGebra in research work of students

Is it possible to inscribe a circle in every quadrilateral?



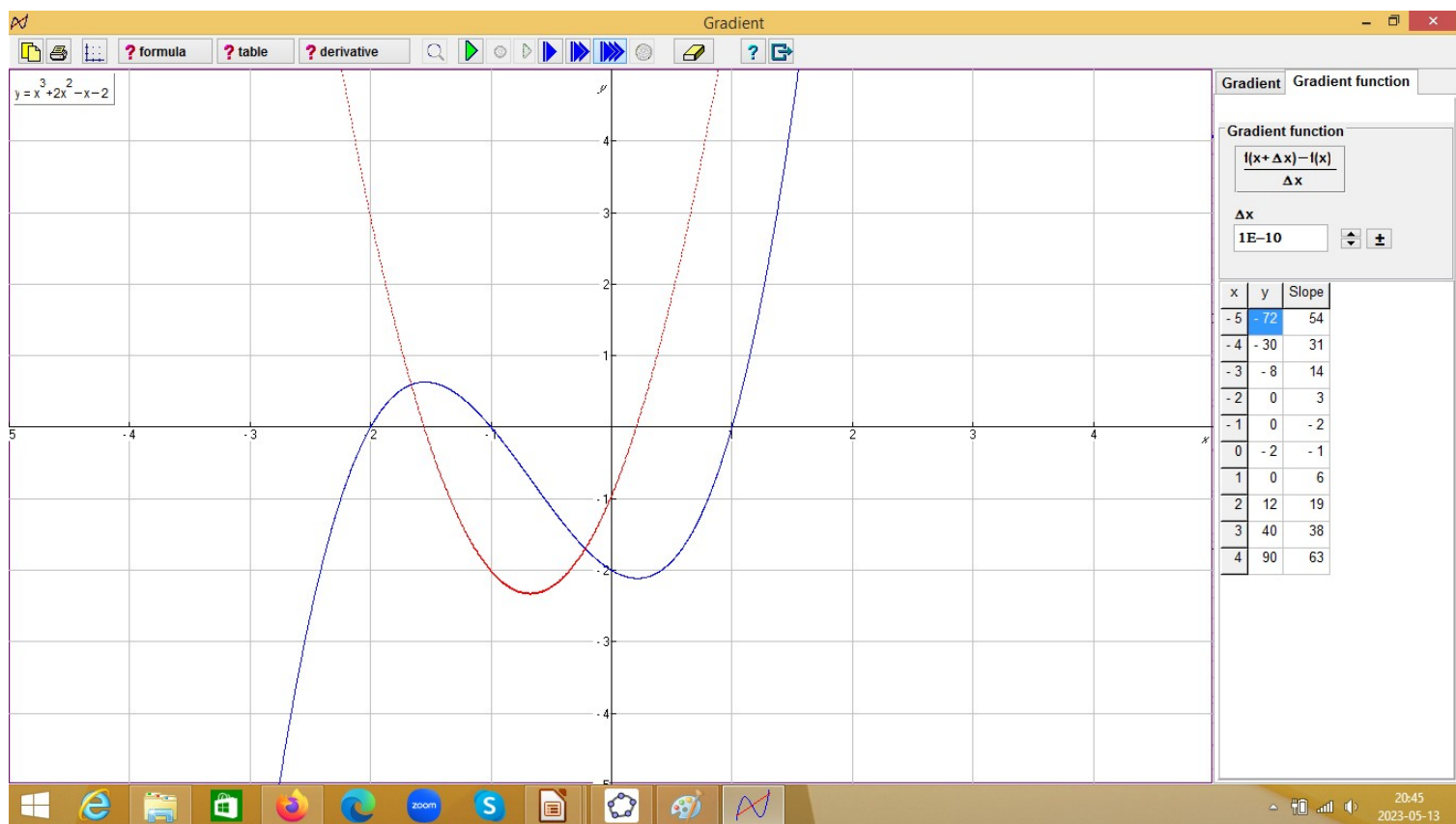
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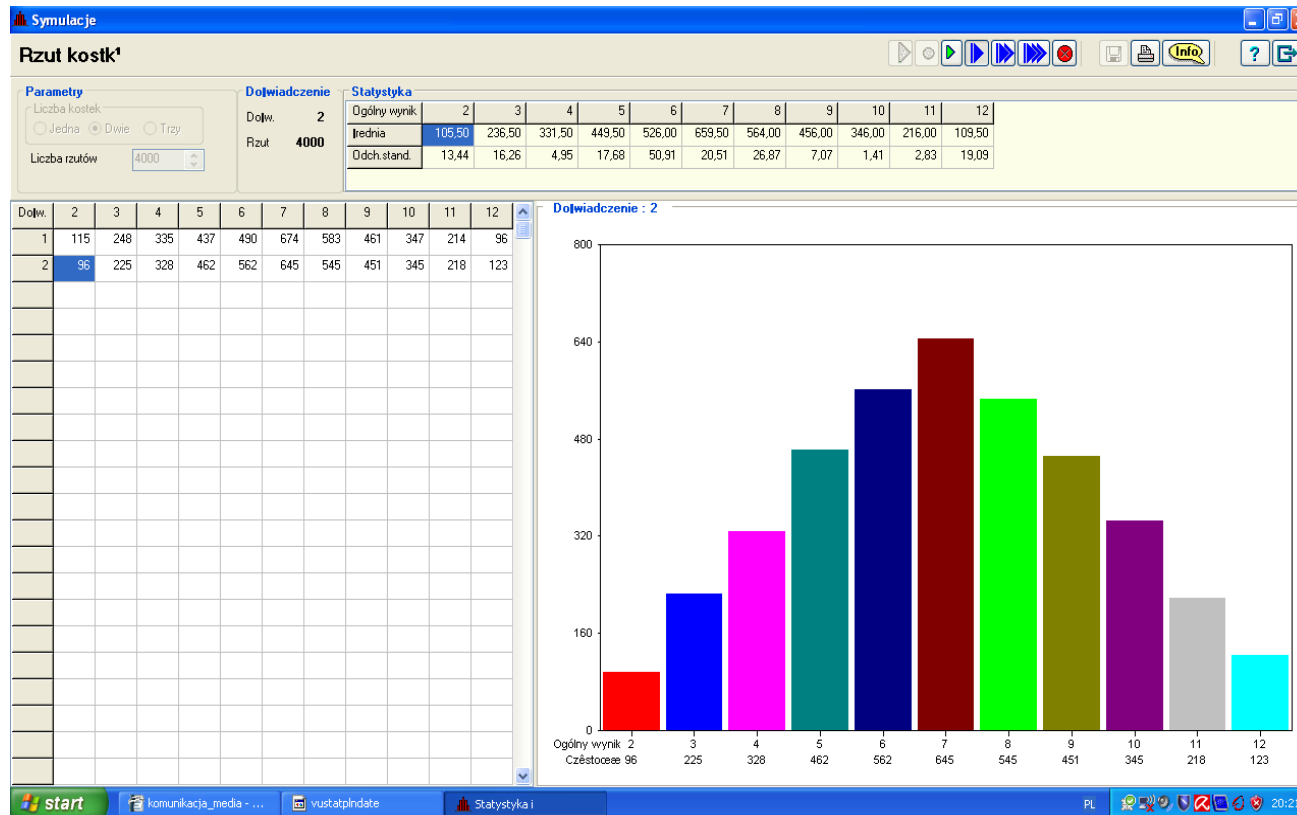
Example of using Graphic Calculus in research work of students

We discover the relationships between the properties of the function and the properties of the derivative



Example of using Vustat in research work of students

Middle school students discover the Gaussian normal distribution by performing simulations



Conclusions

- Style of learning based on different activities and investigative work helps students to discover mathematics, to understand mathematics and to enjoy mathematics.
- Students start to look at mathematics from quite new side: not as at the domain accessible only for selected people, but as at the domain that can be discovered with using ICT and thinking.
- The use of ICT as a tool for student research work is part of creating a digital society from childhood and adolescence, especially since it not only trains the ability to use devices, but also develops thinking so necessary for a successful life.

Thank you for your attention

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