

TEACHING MATHS IN SECONDARY (MIDDLE AND HIGH) SCHOOLS: COMPLEX STRATEGY AND ITS SUCCESSFUL IMPLEMENTATION

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The rapid change of the world, a lot of temptations for young people far from learning and science, require teachers to pursue new approaches and ways to encourage students' motivation for Maths. We developed one of them at our specialized school – Gymnasium No.45 in Kharkiv (Ukraine, East Europe), and have been using it successfully for 25 years.

The education process is based on the cooperation between the students, their parents, the teachers and senior management, city authorities and extra-curricular Maths centers. Maths teaching is a complex strategy, which includes using heuristic methods at lessons, solving research-based problems and participating in various competitions. The forms and ways of work may vary, but the development of an integrated personality with a scientific mindset is the main goal.

After entering the Gymnasium, students cooperate with teachers at lessons and summer schools, and while preparing for competitions and conferences. It is very effective to organize group work at lessons while solving multi-case problems, especially in geometry. It influences the development of students' critical thinking and teamwork skills. What could be easier than a parallelogram and its altitude? This is a typical example of the false simplicity of such problems.

Students should realize the role Maths plays in the modern world, its connection with Physics, Computer Science etc. What is common between AM-GM inequality and an electric circuit? Can a student write a computer program for geometry homework? With such a complex approach to Maths learning it is possible and even necessary. Why wait for college to let students do research? Preparation for scientific tournaments and conferences lets students do it much earlier. For instance, our students obtained new results about the perimeter of a triangle inscribed in the given triangle, using p , r and R , and found non-trivial lower and upper bounds for different cases.

Maths games, tournaments, festivals, and Olympiads highly motivate students to learn Maths at school and do research in the future. Olympiads should not only be a kind of sport, but also a way to explore modern scientific ideas. For instance, one of the problems at Kharkiv Region Maths Olympiad is related to the research of a functional equation, with a set of triangles as the domain. Additivity, homogeneity and the idea of a space basis in an unusual situation are used in the solution.

Complex teaching of Maths that includes lessons, research, Olympiads, summer schools “Maths and Computer Science” is highly effective. Our students are involved in scientific activities and win various competitions. Our school graduates enter science specialties at universities in different countries. Thus, the presented experience can be successfully replicated in other schools.