





Popularizing Mathematics through International Collaboration: An Example of Good Practice from the eTwinning Project MathMay

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Abstract

Teaching mathematics is a challenge in itself. Today, mathematics is often perceived as “unpopular”, which makes it particularly demanding to engage students and motivate them to think and learn. Guided by these challenges, we designed the international eTwinning project MathMay, whose main goal was to popularize and apply mathematics through collaborative, creative, and interdisciplinary activities.

This paper presents selected tasks and examples of the project’s implementation. Elementary school students (aged 11–15) from two schools in Serbia and one in Spain participated in the project. The multidisciplinary nature of the projects fostered the development of multiple competencies - mathematical, digital, scientific, personal, and social. Students reported enjoyment and satisfaction while applying mathematics in real-life and creative contexts. Overall, all project tasks were successfully implemented, and the planned goals were achieved, demonstrating the potential of international collaboration for improving students’ motivation and positive attitudes toward mathematics.

Keywords: popularization and application of mathematics, eTwinning project, motivation, creativity, international collaboration, elementary school students.

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1. Introduction

Mathematics has always been perceived as one of the most demanding and abstract school subjects. Because of its structure and level of abstraction, it is often considered difficult, rigorous, and far removed from everyday experience. For many students, mathematics is not a popular or favorite subject because it requires persistence, patience, and continuity in learning. Yet, precisely in this logical rigor and need for sustained effort lies the true beauty of mathematics. From the time of Pythagoras and Plato, mathematics has been regarded as a language of harmony, balance, and truth – a discipline that reveals the order of the world and trains the mind to think clearly and systematically.

However, students often approach mathematics with preconceived notions that it is “too hard,” that they “never understood it,” or that “it simply is not for them.” Such beliefs can quickly weaken motivation and self-confidence, creating unnecessary barriers between learners and the subject

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itself. Many give up before they truly experience the creative and exploratory side of mathematics. Helping students overcome these barriers requires not only changes in teaching methods but also new ways to engage them – ways that awaken curiosity and encourage discovery.

Motivation plays a crucial role in this process. Intrinsic motivation, driven by curiosity, interest, and personal satisfaction, is one of the strongest forces behind genuine learning. When students are given the opportunity to explore mathematics through meaningful activities, they begin to question their assumptions and reshape their attitudes toward the subject. The goal is not merely to make mathematics easier, but to help students open up to it – to see its purpose, relevance, and connection to the world around them.

Project-based and experiential learning approaches can significantly contribute to this process. Rooted in the constructivist view of learning, these approaches position students as active participants who build their own understanding through exploration, experimentation, and collaboration. By connecting mathematical ideas to authentic situations, students experience mathematics as something alive, creative, and applicable. Through teamwork, discussion, and hands-on activities, they learn not only mathematical concepts but also perseverance, reflection, and the joy of discovery.

In this context, international educational initiatives such as eTwinning offer valuable opportunities for enhancing students' motivation and engagement. By collaborating with peers from other countries, students encounter mathematics as a shared, universal language that transcends cultural and linguistic boundaries. eTwinning projects foster interdisciplinary learning, digital literacy, communication skills, and intercultural awareness – all of which contribute to a more holistic and meaningful learning experience.

The purpose of this paper is to present the MathMay project as a case study (an example of good practice) that illustrates how project-based learning and international collaboration can enhance students' motivation, engagement, and interest in mathematics. The project demonstrates that when mathematics is brought closer to students' experiences and imagination, it can become not only understandable but also inspiring and enjoyable.

2. Theoretical and Pedagogical Background

2.1. Constructivism and the Development of Mathematical Thinking

Modern approaches to mathematics education are grounded in constructivist theory, which views learning as an active process of constructing knowledge rather than passively receiving ready-made information (Piaget, 1972; Vygotsky, 1978). Understanding develops through interaction with problems, reflection and dialogue, while new ideas are connected with prior knowledge and explored through multiple representations (Stevanović, 2024).

Constructivist perspectives are closely related to the development of mathematical thinking, which evolves from concrete experiences toward abstraction (Tall, 2008). Mathematical thinking involves conjecturing, reasoning, and generalizing—not only calculation. Errors are considered meaningful steps in the learning process and contribute to deeper understanding (Skemp, 1987).

2.2. Problem Solving and Pólya's Model

One of the most influential frameworks for nurturing mathematical thinking is George Pólya's classical problem-solving framework, which outlines four iterative stages: understanding the problem, devising a plan, carrying out the plan and looking back (Pólya, 1957). The model emphasizes reasoning, reflection, and metacognition—thinking about one's own thinking.

By explaining strategies, evaluating solutions, and considering alternative paths, students move from procedural performance to genuine problem-solving. This approach nurtures persistence, creativity and self-regulation (Schoenfeld, 1992; Chacón-Castro, et al., 2023) and aligns naturally with constructivist views of learning by positioning students as autonomous learners who actively engage with challenges, learn from exploration, and develop confidence through experience.

2.3. STEAM and Project-Based Learning

In recent decades, education has increasingly turned to interdisciplinary frameworks such as STEAM (Science, Technology, Engineering, Arts, and Mathematics) that bridge disciplinary boundaries and connect mathematics with real-world contexts (Blomhøj & Ärlebäck, 2018; Chistyakov et al., 2023). Within STEAM-oriented teaching, mathematics becomes a tool for design, analysis and creative expression rather than an isolated set of procedures.

Project-based learning (PBL) represents a practical application of these principles. Through extended, inquiry-driven tasks, students collaborate, explore, and transfer knowledge to authentic situations (Kolb, 1984; Blumenfeld et al., 1991; Ikhlas & Huda, 2025). When mathematics is applied in meaningful ways such as building models, designing gardens or analysing data, it becomes tangible, purposeful, and engaging. Experiential environments of this kind foster creativity, interdisciplinary thinking, and a deeper connection between mathematics and students' everyday experiences (Papadakis, 2016).

2.4. Motivation and Affective Dimensions of Learning

Beyond cognitive development, affective factors such as motivation, attitude, and self-efficacy play a crucial role in mathematical learning. According to Self-Determination Theory (Deci & Ryan, 2000), intrinsic motivation grows when learners experience autonomy, competence and relatedness. When students perceive that they have control over their learning, that their contributions matter, and that they are capable of success, their willingness to engage with challenging material increases.

Richard Skemp's (1976) distinction between instrumental and relational understanding further highlights this dimension: students who learn mathematics as isolated rules often become anxious or disengaged, while relational understanding fosters appreciation, confidence, and long-term interest. Supporting intrinsic motivation thus means creating learning environments that support curiosity, exploration, a sense of accomplishment and valued over the rote performance (Stevanović, 2024)

2.5. Popularization of Mathematics and the Role of eTwinning

Efforts to popularize mathematics aim to humanize the subject and reveal its creative, aesthetic, and practical dimensions (Papadakis, 2016; Skemp, 1987). Popularization is not about simplifying mathematics but about making its beauty and relevance visible. Through interdisciplinary activities that combine art, technology, and collaboration, students experience mathematics as a universal language that connects ideas, cultures, and people.

The eTwinning platform provides a framework for such educational innovation by connecting schools and teachers across Europe through digital collaboration on educational projects (Şahin et al., 2024). Its flexible and inclusive model encourages peer learning, intercultural dialogue, and the development of digital competencies (Camilleri, 2016). In mathematics education, this means students can explore real problems together, share cultural perspectives, and co-create mathematical models in a collaborative online space. In this sense Projects such as MathMay demonstrate how eTwinning initiatives can successfully merge constructivist pedagogy, project-based learning, and motivation theories into a unified approach that strengthens students' engagement and transforms their perception of mathematics – from a difficult and abstract subject into a language of discovery, connection, creativity and joy.

The popularization of mathematics through constructivist, project-based, and collaborative approaches enables students to rediscover it as a creative and meaningful human activity. When learning becomes experiential, social, and emotionally rewarding, mathematics transforms from a source of anxiety into a field of inspiration and curiosity.

3. The MathMay Project: Concept and Implementation

The *MathMay* project was created in elementary school practice, with the idea of making mathematics more approachable and interesting. The main intention was to popularize mathematics by showing it as meaningful, creative and connected to everyday life. The project relied on the eTwinning platform, which made international cooperation possible and allowed students from different countries to explore mathematics together.

3.1. Participants, coordination, and collaboration framework

The project was coordinated by the lead author and carried out at the elementary school “Vasa Čarapić” in Belgrade, Serbia. Two more schools participated in the activities: the elementary school “Danilo Kiš” from Belgrade and Colegio CPR NS Lourdes from Santiago de Compostela, Spain.

The first phase included students in 6th and 8th grade (about 12 and 14 years old, respectively). As the project developed, younger students from grades 1–4 were also included. This broadened the participation and gave more students the chance to take part in the activities.

Communication between the partner schools was mainly through the eTwinning platform, which offered a safe space for sharing materials and tracking project progress. For more direct and frequent interaction, teachers and students often used Google Meet (see Fig. 1 for an example of a coordination meeting). These meetings helped build trust, improve communication, and enable direct cooperation between students from Serbia and Spain. They also exchanged videos, short reports, photos, and presentations, which helped keep the project active and connected.



Fig. 1. Teachers' coordination meeting with the partner school via Google Meet.

3.2. Educational purpose and basic goals

The *MathMay* project was designed according to the principles of constructivist and experiential learning, emphasizing student engagement, autonomy, and meaningful application of knowledge. Its main educational objectives were:

- To popularize mathematics through creative and engaging activities;
- To increase students' motivation and interest by showing mathematics in real and understandable contexts;
- To develop important competences such as mathematical reasoning, digital skills, communication, teamwork, creativity, and problem solving;
- To encourage interdisciplinary thinking by connecting mathematics with art, science, geography, biology, physics, and technical education;
- To support international cooperation and communication in English, and to show mathematics as a universal language.

These goals matched the national curriculum and the general aims of the eTwinning community. Teachers from different subjects provided support when needed, helping the project become naturally interdisciplinary.

3.3. Structure and implementation of project activities

The project consisted of several connected activities that encouraged students to apply mathematics in practical and creative ways. The first and central activity was *The Kite Festival*, where students designed and built kites using geometric reasoning. A second activity, *The Geometry Garden*, required students to plan a garden layout using geometric shapes and basic measurements. In addition, a short task involving *Fiscal Receipts* engaged students in extracting and analyzing numerical data from everyday contexts. As the project developed, students collaboratively created a simple visual identity for the initiative, including the project logo (see Fig. 2). As the project progressed, interest grew, and younger primary school grades were gradually included, contributing to the expansion and sustainability of the initiative.

Each activity was supported by digital tools, online consultations, and periodic virtual meetings with partners in Spain and Serbia. Students exchanged drawings, designs, videos, and final presentations through the eTwinning portal, creating a shared interdisciplinary learning space despite geographical distance.



Fig. 2. Logo of the MathMay project, created collaboratively by students.

3.4. Interdisciplinarity, creativity and student engagement

Interdisciplinarity and creativity were an important part of the *MathMay* project. Teachers of art, biology, geography, physics, and technical education provided consultative support, offering advice and brief explanations that supported students' work. Their guidance helped students link mathematical ideas to practical aspects, such as choosing suitable materials, decorating kites, and understanding the natural and technical elements of the tasks. Students designed, drew, selected materials, and shaped their own ideas, which encouraged their creativity and helped them experience mathematics as something practical and understandable. Through this process, mathematics became a tool for creating, not just calculating.

Throughout the project, students collaborated within their own classes and grade levels, working in teams and sharing responsibilities in accordance with the requirements of each activity (see Fig. 3). The international component of the project enabled them to collaborate with peers from partner schools through joint online meetings, video exchanges, photos, and shared presentations via the eTwinning platform. This form of collaboration strengthened students' communication skills, encouraged the meaningful use of English as a working language, and fostered a sense of belonging to a wider European educational community.



Fig. 3. Students working collaboratively in small groups during project activities.

This way of working encouraged higher student engagement and improved their attitudes toward mathematics. When mathematical concepts are used in concrete, creative, and cooperative activities, they become more motivating, clearer, and more interesting for learners.

4. Project Tasks and Activities

The MathMay project included several interconnected activities designed to popularize mathematics and encourage students to apply mathematical concepts in meaningful, creative and collaborative contexts. Activities were implemented within individual classes, at the grade level, and in cooperation with partner schools in Serbia and Spain. The sequence of tasks reflects the natural development of the project, which gradually expanded as student interest and school-level engagement increased.

The project began with “The Kite Festival”, an experience-based activity in which 6th-grade students calculate, construct, build, and design their own kites. After this initial success, additional activities were introduced, including “The Geometry Garden”, where older students created garden layouts using geometric shapes, calculated areas and costs, and explored interdisciplinary connections with biology and design. A third task, “Fiscal Receipts”, engaged students in data extraction, classification, and real-life numerical analysis through the study of supermarket receipts.

As the project gained momentum, younger primary grades (1–4) were also included (see Fig. 4). Their teachers conducted creative interdisciplinary activities, including thematic lessons, drawing and decorating numbers, basic measurement projects, mathematical obstacle courses, and team-based competitions in fast calculation. This expansion demonstrated that the idea of popularizing mathematics was well-received across grade levels and that students enjoyed learning through practical and playful tasks.



Fig. 4. Third-grade students performing measurement and practical tasks.

Overall, the diversity of activities, the collaborative spirit among teachers, and the inclusion of international partners helped build a strong sense of community, motivation, and shared purpose within the project.

5. Example of Good Practice: The Kite Festival

The Kite Festival activity served as the central example of good practice within the MathMay project. It combined geometry, creativity, teamwork, and international collaboration, offering students a highly engaging and memorable learning experience.

5.1. Purpose and Organization

The activity was designed for 6th-grade students, who were divided into small teams and instructed to design, build, and test a functional kite. All instructions, guidelines, and examples were provided in person and through Google Classroom. Students had the freedom to choose materials, colors, decorations, and construction techniques. They also completed a *Kite Specification Sheet*, documenting measurements, shapes, symmetry, materials, and design elements (Fig. 5).

Each team:

- selected a name for their kite,
- independently collected materials,
- documented the process (photos or short videos),
- completed the specification sheet,
- prepared their kite for the final festival event.

To strengthen motivation, the festival included several evaluation categories: creativity of design, aesthetic elements, flight stability, and duration of flight. The jury included teachers of mathematics, art, the school psychologist, and the deputy head teacher.

5.2. Mathematical and Interdisciplinary Elements

The activity naturally integrated several mathematical concepts:

- geometric shapes and diagonals,
- axes of symmetry,
- angles and measurements,
- perimeter and area,
- proportional reasoning,
- the relationship between dimensions and aerodynamics.

Students quickly realized that accuracy in measuring and assembling the frame directly affected how well the kite would fly.

Interdisciplinary aspects included:

- physics (balance, wind force, resistance),
- art education (design, color patterns, decorations),
- technical education (materials, joining techniques),
- digital skills (photo/video documentation, online communication),
- language (speaking in English with international partners).



Fig. 5. Students' kites during and after the construction process.

5.3. The Festival Event

The final event brought together all 6th-grade classes of the lead school, as well as guests from the partner school "Danilo Kiš". Younger students watched and cheered, asking whether they would participate in the same activity once they reached 6th grade. Older students expressed that they wished they had such an experience earlier. A friendly, collaborative atmosphere dominated the event, and students visibly enjoyed both the flying competition and the social interaction (Fig. 6).



Fig. 6. Kite Festival: students with their completed kites at the final event.

Students' reactions were highly positive. Many expressed excitement that mathematics was applied in a practical, creative way. Typical comments included:

- **“We finally applied math.”**
- **“This is the best math class ever.”**
- **“We enjoyed making and decorating kites in pairs.”**
- **“We met new friends from another school.”**
- **“I loved connecting with students from Spain.”**

5.4. International Collaboration

A key element of the activity was cooperation with students from CPR NS Lourdes in Spain. Both sides organized their own kite festivals, after which they met online to exchange videos, discuss designs, and compare the kites' performance. Students engaged in a friendly discussion about which shapes, sizes, or materials produced the best flight results (see Figure 7). The international dimension significantly increased student motivation and confidence, especially in communication. Younger students were initially shy, particularly in English, while older students adapted more quickly and communicated enthusiastically.



Fig. 7. Students engaging with shared digital content during the international collaboration.

5.5. Teacher Reflections and Project Growth

Teachers noted a strong “activating energy” among students and staff. The success of the activity encouraged teachers of younger grades to join the project, and even colleagues from technical education expressed a desire to participate more actively in future iterations by constructing kites during their regular classes. The activity was so well-received that it continued to be organized at the school as a “traditional event” even after the project lead moved to the university.

Overall, “The Kite Festival” demonstrated that creative, practical mathematical tasks can transform the classroom atmosphere, strengthen student motivation, and foster a sense of community, while simultaneously supporting mathematical thinking.

6. Discussion

The findings from the MathMay project suggest that creative, experience-based activities can play an important role in strengthening students' motivation and attitudes toward mathematics. By using mathematical concepts in practical, collaborative tasks, students gain a clearer understanding of how mathematics functions beyond the classroom. Activities such as building a kite offer opportunities to apply geometry in a tangible way, connecting measurement, spatial reasoning and design with creativity and teamwork.

These activities also support the development of core competencies outlined in contemporary educational frameworks – mathematical, digital, social, and intercultural. The international component of the project was particularly powerful. Students perceived mathematics as a universal language that allowed them to communicate, collaborate, and present their ideas beyond national boundaries. This experience contributed to greater confidence, curiosity and openness toward using English in a real communicative context.

Another important outcome relates to teamwork. Although working in teams initially required additional support, organization, and teacher patience, it produced highly positive effects. Students felt valued, included, and responsible for different parts of the project. The activity encouraged them to negotiate, divide tasks, and rely on each other, contributing to their sense of belonging and collective success.

The project's positive effects align with contemporary pedagogical perspectives, including constructivist, motivational, and STEAM-based approaches. These frameworks emphasize active engagement, creativity, and the meaningful application of mathematical ideas.

At the same time, several limitations should be acknowledged. The project was implemented with a relatively small sample, and the analysis is descriptive rather than systematic. Furthermore, teachers noted that a significant limitation is the lack of time and space within annual and monthly teaching plans to implement more project-based activities of this kind. This reflects a broader systemic challenge in fully integrating experiential and interdisciplinary learning into everyday mathematics instruction.

7. Conclusion

The MathMay project demonstrates that when mathematics is connected with creativity, collaboration, and real-life contexts, students engage more deeply and enthusiastically with the subject. Activities such as “The Kite Festival” show that even simple tasks can become powerful opportunities for developing mathematical thinking, teamwork, communication skills, and positive attitudes toward learning.

Interdisciplinary collaboration, international exchange, and teachers' supportive engagement contributed to a learning environment in which students felt motivated, successful, and genuinely excited about mathematics. These findings suggest that project-based, practical activities have the potential to transform how students perceive mathematics - from a difficult and abstract subject into an enjoyable, meaningful, and shared human experience.

Future work may include a more detailed analysis of student reflections and evaluation materials, which could provide deeper insight into how project-based activities influence motivation and mathematical understanding.

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