

THE GOERUDIO LEARNING COMMUNITY: DEVELOPING TEACHERS' AND STUDENTS' RESPONSIBILITY TO SUPPORT STUDENT LEARNING SCIENCE

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Abstract The article is a study of the Goerudio science project, a European funded project in the framework of the Lifelong Learning Programme – Transversal Programme – Key Activity 4 Multilateral Project. The project, which is being implemented in seven European countries, has created a strong learning community across Europe, made up of teachers of science and their students. Its main aim is to find ways of motivating students to learn science. The learning community aims to enhance students' motivation by encouraging both teachers and students to work together in order to identify and share innovative practices to make science more appealing to students.

Key words: science, technology, motivation, students, teachers, learning

The Goerudio project and its European context

Our society is increasingly dependent on scientific and technological knowledge, skills and devices. The influence of science and technology is very likely to continue to increase in the next years. Science and technology have become a necessary part of one's future personal development and all citizens, regardless of their professions, should be familiar with them as elements of their general education, as they ensure one's adjustment and well-being in society. It goes without saying that our world needs experts with scientific and technological qualifications at the highest level as well as a general public having a broad understanding of the contents and methods of science and technology. What society needs does not necessarily lead to a growth in interest in these subjects and an understanding of basic scientific ideas and ways of thinking. In many countries, the number of students who enrol in scientific and technologic studies is declining and surveys carried out in schools have shown lack of students' interest in science classes. Although our world is shaped by science and technology too few students choose science at school once it is no longer compulsory. Lots of European projects have made efforts to find a solution to this challenging situation and raise students' interest and stimulate their motivation to study science. The Goerudio science project, implemented in seven European countries, a European funded project in the framework of the Lifelong Learning Programme – Transversal Programme – Key Activity 4 Multilateral Project, has created a strong learning community across Europe made up of teachers and students, whose main aim is to find ways to enhance students' motivation to learn science [1].

Project main stages

Project Research

The project development relies on solid research carried out in all participant countries. Research was based on the observations collected from comments posted on the project platform by the learning community created (teachers of science and technology and students from seven European countries). Each partner posted 50 comments on the platform about the problems encountered when teaching science subjects and their solutions. The problems identified were common across European schools: 'teachers' lack of time, reduced number of classes allotted in the curriculum, students not having the necessary basic knowledge, students' inability to link science with life, students' lack of autonomy and learning skills, lack of appropriate teaching aids and unsuitable laboratories. On the other hand students related most of their poor performance during science classes to teachers' complex performance: from teachers' voice, enthusiasm, experience or personality to teaching methods, communication skills, inability to create good atmosphere or rapport with students or text books used.'

The most effective projects and experiences available at European level in the field were also selected and uploaded on the site, with a view to identifying innovative practices, which could enhance students' motivation to learn science. Results showed that an inquiry based, interactive and amusing approach relying on both traditional and state-of-the-art teaching methods make science more appealing and accessible.'

Innovative initiatives

The community identified and reviewed 210 successful and useful projects, which could be recommended to other teachers. The projects selected by the new learning community focused on innovative practices for scientific issues taught in a more interactive and attractive way as well as innovative teaching methods based on students' autonomy in managing their own learning process.

In the next stage of the project the teachers made comments on the projects uploaded by their peers [2]. There were thirty comments per partner on these projects showing a wide range of teachers' opinions and attitudes, all of which imparted/showed teachers' enthusiasm and willingness to adopt the new internet-based resources in their classrooms. The teachers were free to choose the most suitable initiatives according to their needs from a collection of more than 200 initiatives coming from all over Europe. All teachers recognised the potential of these resources; there were also a few instances when teachers complained that the language of the initiative was a barrier but they also found some solutions: they resorted to their colleagues or even students for help and so they had the translations of the resources. Most comments were on science projects (10), technology (5), Mathematics (4), Chemistry/Physics, (4), Biology, (4), ICT, (3).

Most comments were on the projects uploaded by the Italian partners (9), followed by Romanian teachers (6), Polish and Spanish (4), Slovak (3) and Bulgarian and Latvian partners (2). The classification of comments according to the ownership of the initiatives reveals the prevalence of Italian and Romanian posts. One explanation for this is the direct comprehension of the messages. However, two comments out of three were related to initiatives uploaded by other project partners, which reveals teachers' interest in networking and in the exchange of ideas across Europe. The teachers appreciated the added values of this collection of initiatives. All the comments collected so far have been positive. No matter how diverse the comments seem to be there are two main reasons why teachers appreciated the initiatives uploaded on the project platform:

- as a confirmation of and support for their own experiences. Teachers used the initiatives available on the portal to find confirmation and support regarding experiences they already put in practice.
- as a resource of new experiences to use during their classes (e.g. Pictograms at mathematics; Eduscience at biology and science).

The Romanian teachers' comments appreciated the following benefits of the initiatives (in order of frequency):

- Raising students' interest in science and technology: making science and technology more accessible and attractive. promoting challenging topics; "As a school principal of a private institution where the study of sciences – especially of Mathematics – is of great relevance for the national evaluations and for the entry of our students in the lower secondary schools of high ranking, the project Goerudio is a positive example of diversification and personalization. Our teachers are always in search of new approaches to make math and the sciences more palatable to young children and the site of this project offers a good repository of interesting approaches to sciences relevant to young students. Thank you for this to the collectors that have made up the selection. AC school principal."
- Applicability of online project materials designed to classroom learning contexts; "The site is excellent: it can be shared by teachers and pupils. All the materials are practically applicable directly in science classes. The web is mainly focused on online materials and videos. It helps teachers create new online educational materials. It also provides teachers with good links to other websites of interest. CS" "It raises awareness about the role of science within the community."
- Providing teachers with useful teaching and learning materials and helping teachers create new online educational materials; "It provides teachers with accessible and useful resources by creating links to other websites with interesting online interactive educational material (photos, videos, animations, exercises, graphs, links) and learning activities." "The reviewed projects make science accessible and easy through videos; they provide reliable learning materials by using ICT, which enables students to visualize theoretical abstract concepts."
- Promoting new methods in teaching sciences: "it helps teachers with new teaching methods to meet their students' cognitive, social and physical needs through activities that are designed to be developmentally appropriate." "It helps teachers in their development."
- Encouraging European cooperation and communication (exchange of ideas, experiences, solutions) among teachers across Europe. "The project is strongly innovating as it involves teachers and students in a common effort in order to collect, review and share experiences related to the most effective, interactive and innovative approaches to the teaching and learning of science; the project will create a learning community where teachers and students will have the opportunity to discuss and find solutions in order to promote and continuously upgrade science learning in an attractive and challenging way."
- Building appropriate links between schools and the world of work (linking theory with practice). "The project Goerudio is a positive example of how to motivate our students to learn. Our students are very oriented towards the practical application of their studies so all the examples offered by the big inventory of approaches created by Goerudio and which anchor knowledge in real life applications and liaises it with specific skills, seem to be very suitable for our students." "It promotes mutually beneficial relationships between industry, scientific, academic and educational communities."

- Encouraging the use of ICT in teaching science and technology; motivating teachers to use new technologies. “Redooc is an online platform for mathematics. It has video theoretical lectures explained in a simple and accessible way. The lectures are accompanied by exercises in the form of online games. Each visitor has a user profile that shows the summary of the activities performed and the results obtained. It is simple and encouraging. It promotes training materials designed to introduce e-applications to people with very basic or no knowledge of information and communication technologies.”
- Developing life skills (entrepreneurial skills, teamwork skills, organizational skills, presentation skills, survival skills: how to deal with natural disasters). “Robotics engages students in complex, strategic problem-solving and higher-order thinking—a set of skills that is a high priority for 21st century education. What is more, this kind of problem-solving can be introduced in a gradual, self-motivated way, so beginner students can experience satisfying achievements right away and can quickly move on to new challenges in a continuous progression toward greater levels of sophistication. Robotics is a great way to get kids excited about science, technology, engineering, and math (STEM) topics. Studies show that it is highly effective in developing team-work and self-confidence.”
- Empowering students by promoting student involvement in learning. “The project promotes active/ interactive learning, learning through discovery, learning by doing, involving students in their learning process. It enhances students’ motivation to learn science.” “As teachers we have to be prepared to meet the needs of children cognitively, socially and physically through activities that are designed to be developmentally appropriate. Learning through discovery is a motivating method of personalizing learning experiences, allowing the individual the opportunity to experiment and discover for themselves. This should become a fundamental teaching method in the educational process, especially for the science subjects, which are sometimes difficult to be understood by pupils. So the project idea is very good and inspiring, it contains a lot of challenging topics with high transferability potential in my classroom.” It encourages interactive learning and critical thinking.” “The strengths of the project are on the visualization of scientific knowledge learnt in classrooms and the development of life skills (logical/ critical thinking) through science through challenging games.” “It contributes to students’ personal development.” “It stimulates students’ creativity and imagination, students’ natural curiosity.”
- Encouraging students to cooperate and ask questions on forums in order to clarify ideas and get answers to questions. “The idea is excellent: a forum that students can access, ask questions and have pertinent answers from experts. The portal can be used as a personal tutor.”
- Helping disabled students with their science subject learning.” It helps teachers to meet students’ special needs (disability as well as above average students). It provides teachers with useful and challenging materials for students with learning disabilities, students who require special attention.”
- Encouraging multilingualism through teachers’ cooperation;
- Raising awareness about the importance of protecting the quality of our environment;
- Creating supportive contexts for intergenerational learning (children, students, teachers, parents, grandparents).
- Raising awareness about new jobs; “It promotes career opportunities to young people through an effective use of social media and ICT. It promotes career opportunities in science for young people.”

- Raising awareness about global problems that our earth is facing nowadays;

Future developments

The analysis of teachers' comments shows that most teachers have found interesting and relevant methods to enrich their teaching. Most of them started to use the methods they came across on the Goerudio portal [2]. Most comments are positive:

- "teachers appreciate the new and innovative methods";
- "the widespread use of ICT and online resources can facilitate the science education";
- "participation in the projects is prestigious for schools and certainly enriches the expertise of teachers";
- "the methods engaging students (projects, group work) are effective in motivating students";
- "learning through fun increases students' creativity and encourages them to explore".

The teachers were encouraged to try their hand at producing their own teaching products. They also came up with new ideas and suggested other types of activities (creative models, lesson plans, tests, worksheets), which should stimulate students' interest in science and therefore motivate them to learn.

Conclusions

The project idea has proved to be compatible with the challenges schools face today and seems to fill a gap. It is common knowledge that in spite of the dramatic advance of science and technology and the results previously reached, teachers still complain about the lack of motivation of secondary and vocational education students in studying science related topics as well as about the difficulties in updating their teaching methods in order to direct/increase the interest of their students toward scientific issues. The project ideas are supported by the results obtained so far: the participants (teachers and students) have highlighted the need to cooperate and collaborate in order to change the existing approach to teaching and learning science in schools. Teachers should capitalize on the interest of students by allowing them to see the relevance of the topic in relation to their lives, introducing an element of fun in the learning process and providing adequate hands-on activities to stimulate and motivate them to learn. Science should be made more attractive and accessible through interactive methods and extensive use of modern technologies [2].

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