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Professional paper

ENVIRONMENTAL AWARENESS THROUGH STEM EDUCATION

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Abstract

Climate change and the problem of pollution are becoming increasingly worrying problems. New species are added to the red list for species threatened with extinction daily. Temperatures are rising, floods are increasing and we are still not taking appropriate measures. Pollution of air, water, and soil are the main factors in reducing the productivity of plants, and unfortunately, the main cause of these consequences is man. This fact worries us a lot, therefore we see it as reasonable that steps for improvement should be taken from the earliest ages. We are all aware of the rapid technological development, and thanks to innovative methods in education we can develop ideas for solving problems in everyday life. The idea is to interweave biodiversity conservation using technology. The students' goal is, by using technology and new methods of learning, to develop their ideas on how they can contribute to the protection of nature. This will be motivating for them so that they too can provide important solutions, as well as not feel the learning process is tiring. Perhaps more often we talk about the negative impacts of global warming on the above-ground part of the earth, but we must not forget the fact that underground assets are equally important. We will mention the importance of mushrooms on planet Earth and stop to consider how they are affected by negative human interventions in the living environment. This research has to do with cross-curricular integration, where 120 students from grades 5-9 of the Ismail Qemali Elementary School were involved. The largest numbers of activities were extracurricular activities carried out in the framework of various projects as well as eTwinning projects. STEM education has had a positive impact on the improvement of the educational process. Innovative approaches have been very well accepted by students when we consider the fact that they already belong to the digitalization era.

Keywords: STEM education, micro:bit, coding, technology

Introduction

The problem for educators here is that the consequent absence of a sound educational rationale for this combination of subjects inhibits its development. There needs to be a reason for integrating these subjects which relates to quality learning outcomes for students. Given the developing momentum of the STEM agendas, it may be unwise for technology educators to isolate themselves from this movement. In addition, it may be an opportunity to reinforce the place of Technology Education in the school's core curriculum. Rather than integration, a more reasonable approach may be to develop interaction between STEM subjects by fostering cross-curricular links in a context where the integrity of each subject remains respected. (Williams, 2011) Integrated STEM education often requires numerous materials and resources for students to investigate solutions to real-world problems through designing, expressing, testing, and revising their ideas. Materials can include construction tools such as saws, measuring devices, and hammers; electronic materials such as computers, design programs, robotics kits, and calculators; and other materials used in design, which could include wood, styrofoam, glue, cardboard, or construction paper. Through the use of these materials in design activities students can better understand technology (Stohlmann et al.,2012). STEM education in Europe needs to be developed, both for students and teachers. Such professionals are in short supply, largely because attracting students to STEM careers has proven to be a daunting challenge, jeopardizing Europe's ability to compete globally. Part of the problem seems to be that students do not have adequate information about the possible jobs they can do in the future in these fields. This means

that schools in Europe must increase efforts to motivate students in this direction in two ways: by preparing integrated STEM lessons and by connecting those lessons to the real world.https://files.eun.org/scientix4/Scientix-Newsletter-Apr22.pdf.
STEM education unquestionably increases the creativity of students, the deepening of ideas in solving problems in everyday life, in this way developing the critical thinking of students, students feel freer in expressing their ideas as well as feel more important during the realization of the learning process, because this type of education places the student at the center of the educational process. (Jashari, 2023). In elementary education, the goal of STEM career counselors is to inform students and other teachers about the role science plays in society and to nurture the foundational skills children will later need to pursue a career in STEM. In secondary teaching education, when students make practical decisions about their future professionalism, their needs become more specific. Counselors should then focus on actively promoting STEM careers by providing specific information about the skills required. Importantly, advisors facilitate dialogue with industry and academic specialists, helping students discover available opportunities and how to pursue them. These can be in areas such as renewable energy, conservation, urbanism, transport, and space exploration https://files.eun.org/scientix4/Scientix-Newsletter-Apr22.pdf.
Attitudes and beliefs are essential, both for students and educators, Geoffrey (2010) notes that the most important cause of student underachievement in ICT is low expectations on the part of educators. Teachers' attitudes and beliefs about education and the integration of ICT in education have been shaped and reshaped throughout their lives from their school days, then as university students, and finally as practicing teachers. As a result of positive and negative personal experiences, or through forms of professional development, teachers' attitudes and beliefs about the integration of ICT in STEM education may change (Harris and Bennett, 2001). For example, according to a review by Buabeng-Andoh (2012), beliefs and actions feed each other: “Those teachers who believed that computers made lessons more interesting, easier and fun for them and their students and by providing diversity and motivation, were more likely to use computers in their teaching practice". Becker and Riel (2000) found that ICT-savvy teachers were more likely to expect their students to contribute new knowledge and provide a motivating atmosphere for thinking about divergent innovations.

Material and methods

This research involves cross-curricular integration, where 120 students from grades 5-9 of the Ismail Qemali Elementary School were involved. The largest numbers of activities were extracurricular activities carried out in the framework of various projects and eTwinning projects.
Students cultivate mushrooms, from which they then design their favorite model. They design models where they present the relief to show biodiversity, and ways of preserving nature, where they use coding as an opportunity to solve the problem of pollution and global warming. Students use different applications for their research such as GPS coordinates, determination of species, control of pollutants, preparation of their electronic book, posters, games, quizzes, and presentations. The students prepare their evaluation form. They evaluated each other's work all the time based on the criteria prepared for evaluation.

Figure 1.a-fungi mycelium; b-model from mycelium; c-e book created by students

The use of the micro: bit is often used during lessons in the subject of Natural Sciences, as well as in the subject of Biology, so that students, depending on the topic of the lesson, can create codes, which they can then use for research them within the lessons.

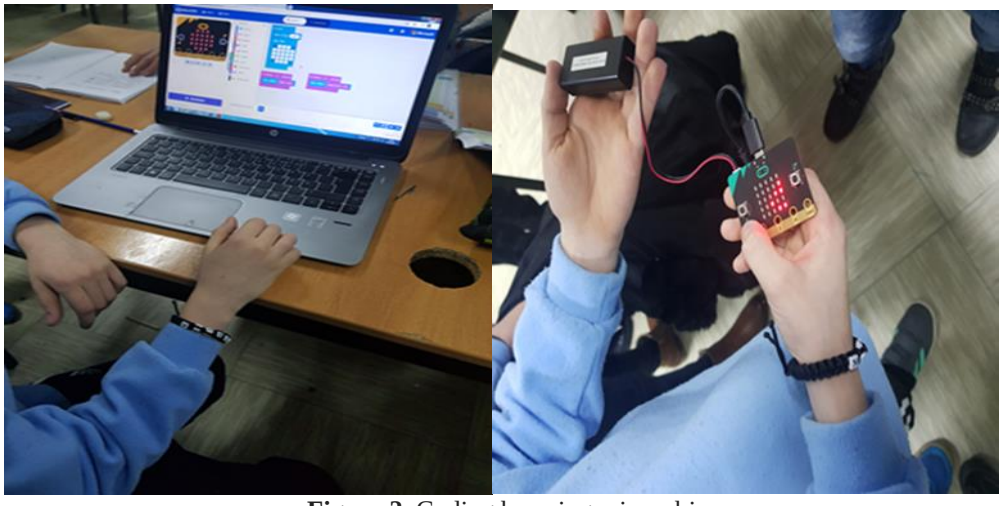


Figure 2. Coding by using micro: bi

Setting motors in motion, and controlling them using the micro: bit device, helps students develop ideas about how robots work. The example shown below shows a basic way of how the robot can work, but you can make changes to the way it works, adapting it to your

requirements. By adding specific sensors, you can set conditions for each detection action and even allow it to move autonomously.

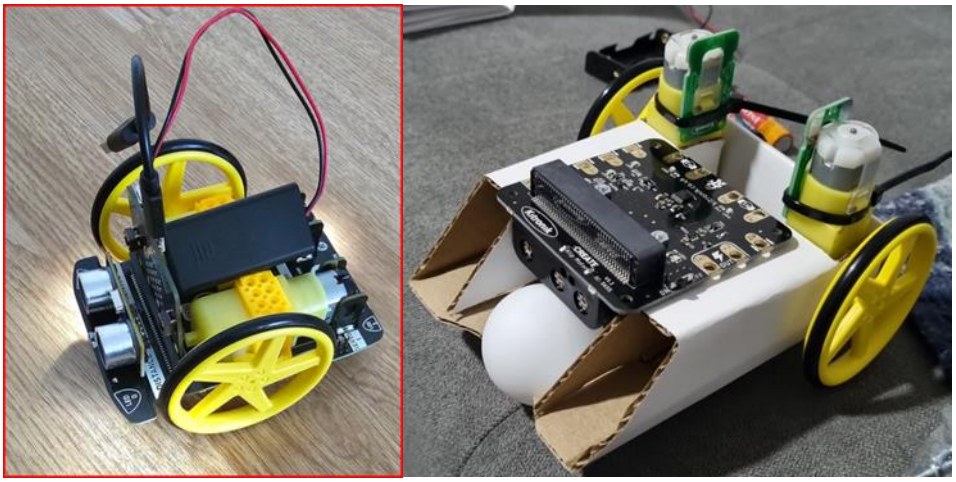


Figure 3. Motors coded by using micro:bit

Measuring the pH of liquids is an important experiment that can be done in the Natural Sciences course. The pH values of liquids range from 0-14. Where neutral pH has a value of 7, which is characteristic of clean water.

pH values 0-7 are characteristic of the acidic properties of liquids, while 7-14 are characteristic of the basic properties of liquids. By measuring the pH of tap water, river water, and rainwater pH, students can make comparisons to these values by comparing them with normal values , and in this way, they can conclude the cause of the change in these values. values and give ideas for solving these problems in the future.

The activity can be carried out in several teaching units within the natural sciences, where students during this experiment prove that different substances have different pH values due to their different composition, but there are cases where the same substance can have Different pH, as is the case with clean water and after pollution, therefore, during the realization of such an experiment, students can prove for themselves how river water has different pH values from the source and along its flow. The change of these values outside the normal limits is quite harmful when we consider the fact that most aquatic animals have an ecological valency of 6.5-8 as far as the pH of the water is concerned.

Students can also measure pH values during the preparation of yogurt from milk, where during the experiment they will see the change of these values in milk and then in yogurt after its preparation. The students prove that the change in these values is a result of the fact that the glucose found in the milk has been transformed into acid, in this case, lactic acid, all this happens as a result of the action of bacteria that possess enzymes to make these changes.

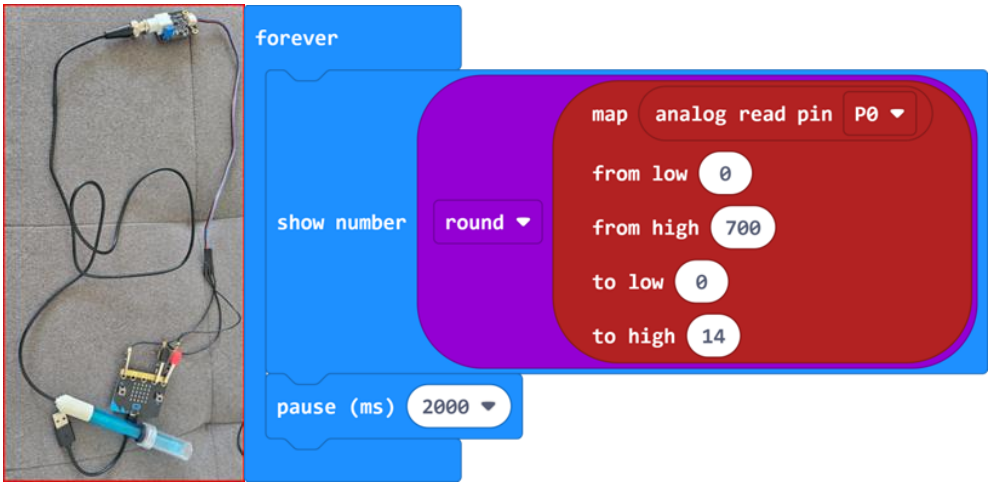
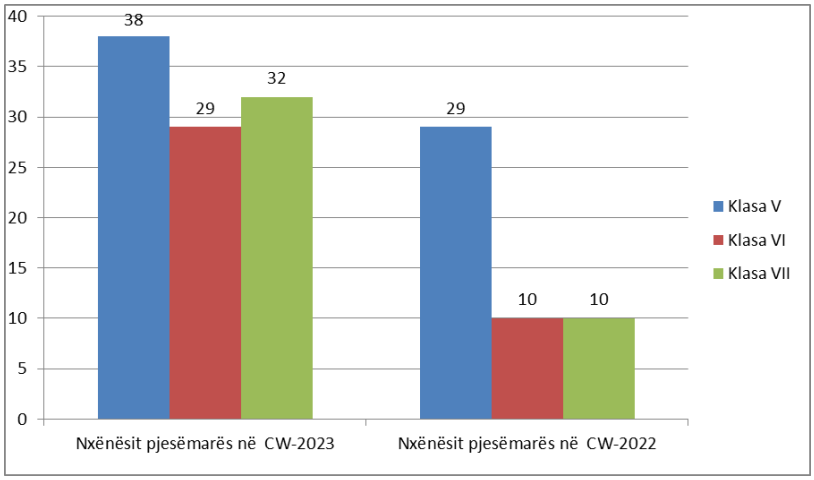


Fig.4.Ph meter sensor

The BBC %ro: bit: from the UK to the world

Results and discussion



Graph.1. Students participated in Code Week during the 2022-2023 and 2023-2024 Academic year

The students who voluntarily participated in the Coding Club (Code Club) have shown satisfactory results as well as increased interest in coding in Natural Sciences, showing different ideas for ways to solve problems in everyday life

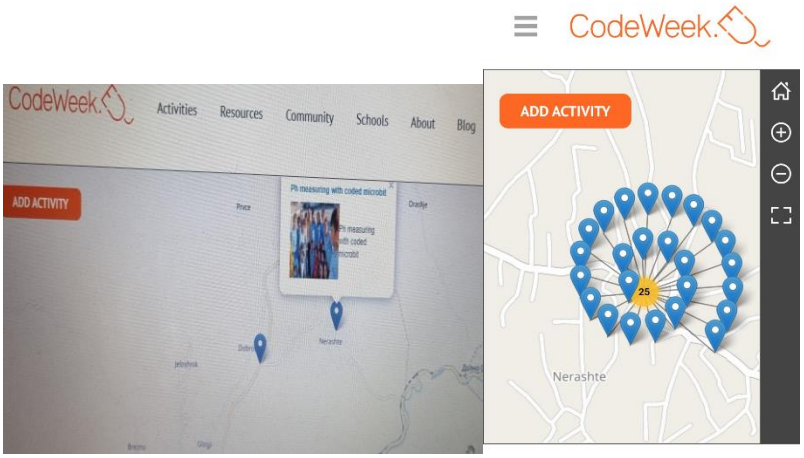
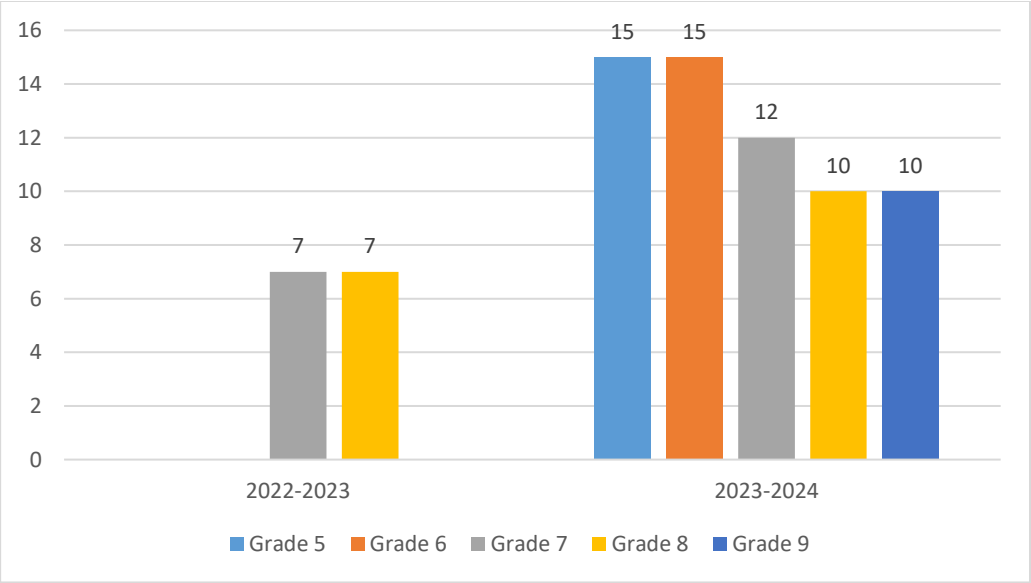


Figure 5.Code Week activities during 2022-2023 and 2023-2024 Academic year

In addition to the increase in the number of students who in 2023, compared to the previous year, registered their activities in Code Week, in the photo above we can see that the number of activities has also increased.



Graph.2.Difference between students included in eTwinnig projects during the 2022-2023 and 2023-2024 Academic year

- Climate change and the problem of pollution are becoming increasingly worrying problems. New species are added to the red list for species threatened with extinction daily. Temperatures are rising, floods are increasing and we are still not taking appropriate measures. Pollution of air, water, and soil are the main factors in reducing the productivity of plants, and unfortunately, the main cause of these consequences is man. This fact worries us a lot, therefore we see it as reasonable that steps for improvement should be taken from the earliest ages. We are all aware of the rapid technological development, and thanks to innovative methods in education we can develop ideas for solving problems in everyday life.
- The idea is to interweave biodiversity conservation using technology.
- The goal is for students, using technology and new methods of learning, to develop their ideas on how they can contribute to the protection of nature. This will be motivating for

them so that they too can provide important solutions, as well as not feel the learning process is tiring.

- Perhaps more often we talk about the negative impacts of global warming on the above-ground part of the earth, but we must not forget the fact that underground assets are equally important. We will mention the importance of mushrooms on planet Earth and stop to consider how they are affected by negative human interventions in the living environment.
- Dealing directly with the problems of the living environment increases students' desire to protect it.
- Students develop their ideas for possible solutions to the problems caused by global warming and pollution.
- Fungi cultivation as well as designing with their mycelium in students increases the possibility of developing this option as a future profession

Conclusion

- STEM education has had a positive impact on the improvement of the educational process. Innovative approaches have been very well accepted by students when we consider the fact that they already belong to the digitalization era.
- The students expressed their satisfaction, they felt free and independent, and the cooperation between the students has influenced them to develop better socialization, as well as the idea that together they can solve problems faster.
- Students have felt important because they have always seen the results of their work.
- Students are liberated from paradoxes and have improved their difficulties in presenting to others.
- The challenge for the realization of the activities has been the lack of sufficient conditions; therefore the models have been completed with a bit expensive means.

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