

OPEN SCHOOLS FOR CLIMATE PROTECTION AND ENERGY CONSERVATION PROGRAMME: THE SCHOOL'S PERSPECTIVE

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ABSTRACT

An evaluation research was designed and implemented within the framework of the 'Open Schools for Climate Protection and Energy Conservation, 2017–19, Berlin-Athens' programme, using mixed methods of collecting, analysing and making use of qualitative and quantitative data, with a view to discovering whether programme participation affected students, teachers and school communities in general. The article focuses on the first of the three case studies developed in the context of the wider research, and relates to participants' experience from the programme. It also focuses on the perspective of the school which follows a whole approach towards supporting sustainable practices. The most considerable benefits for the school are the participants' familiarisation with aspects of climate and energy literacy, their awareness, and their taking action adopting energy saving and dissemination practices. The school became a learning and initiative centre relating to raising awareness among the local community about climate change.

KEY WORDS: *climate and energy literacy, climate change education, energy saving practices, school unit, programme evaluation.*

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Introduction

Nowadays, climate change is becoming a worldwide challenge. The global community is already experiencing and will continue to experience the consequences of the climate crisis. School buildings are some of the public buildings with the highest energy consumption in the city of Athens. Education in sustainable development can contribute to the energy reduction effort, with all the economic and environmental benefits that results from it, as well as to the development of climate and energy literacy for all members of school communities.

As a result, the programme 'Open Schools for Climate Protection and Energy Conservation, 2017–19, Berlin-Athens' was designed and implemented, aiming at energy conservation and raising awareness about climate change in 72 schools in the city of Athens. It was implemented under the auspices of the Greek Ministry of Education, Research and Religious Affairs, and carried out by the city of Athens in cooperation with 'Wind of Renewal', a social cooperative enterprise for social and green economy, innovation and culture, the

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citizens' initiative 'Respect for Greece', and the Independent Institute for Environmental Issues UFU. The programme offered a ten-step methodology, a suitcase with measurement devices, professional development opportunities for teachers, and interaction among schools through a moodle platform.

The aim of this paper is to present an assessment of the impact that the programme had on schools. The two main research questions, which are formulated more clearly later, focus on the development of the human resources involved, and the impact of the programme in school units that implemented it. In the context of the programme, an evaluation research was conducted, using mixed methods of collecting, analysing and making use of data. Descriptive statistics was used for quantitative data, and thematic analysis for qualitative data. It is the first time that a municipal project has been studied in schools of primary and secondary education and, what is more, over a wide sample. There is added value in this research, as its conclusions shed a light on aspects of environmental and sustainable education.

The article focuses on the first of the three case studies developed in the context of the wider research, which relates to investigating participants' experience from the programme, the school perspective. Firstly, a brief theoretical framework is presented, followed by a presentation of the research data collected, their analysis, and an effort to interpret and discuss the main research findings.

1. Climate change and energy conservation education

Education for sustainable development provides an appropriate framework for climate change education, promotes a systematic and interdisciplinary understanding of its causes and consequences, and suggests learning approaches fostering critical thinking and problem solving skills. It also enables both individuals and communities to develop decision-making skills (Flogaiti, 2005; UNESCO, 2005, 2016; Selby, Kagawa, 2013; Kopnina, 2014; Leicht et al., 2018). Education for sustainable development provides a new vision, a different educational approach, which enables individuals to get a better understanding of the world, and realise the interconnection of the problems in order to deal with the complexity of reality.

1.1. The whole school approach to climate change

Education for sustainable development provides a holistic framework for reflecting on environmental, economic, social and cultural sustainability issues, as well as integrating them (UNESCO, 2005). The sustainable school fully involves both teachers and students in participatory, collaborative and reflective procedures (Katsenou et al., 2013). It requires changes in its structure, organisation and function, with the aim of promoting a whole school approach to sustainability, which means the participation of all classes, full use and enrichment of the curriculum (Warner, Elser, 2014; Rickinson, Hall, Reid, 2016; Moore et al., 2019), and opening up to the local community. It intends to make the school community commit to goal setting and the implementation of every educational intervention aiming at its viability.

Adopting a whole school approach to climate change means that a number of actions and activities on climate change are organised in the school, including school governance, teaching content and methodology, school maintenance, and community partnerships.

The whole school approach focuses on procedures in which all members of the school community design and achieve their objectives together. In addition, energy management in school is being studied. Moreover, activities are designed, and decisions and actions are made by students, teachers, parents and other partners.

1.2. Studies on climate and energy literacy

Climate and energy literacy involves skills and knowledge that have an impact on the interaction between people and the environment, the understanding of scientific issues, and everyday decisions (Dupigny-Giroux, 2010).

Various scientific publications focus on climate literacy issues (Dupigny-Giroux, 2008; Maibach, 2008) and on students' understanding of climate change aspects, such as their perception of the greenhouse effect

(Christidou, Koulaidis, 1996; Shepardson et al., 2009). Additionally, views and alternative ideas on climate change have been studied (Harrington, 2008; McCaffrey, Buhr, 2008).

Numerous studies on energy literacy show that both students and adults have insufficient knowledge and various misconceptions regarding concepts of energy sources, issues that have to do with the use of energy sources, energy production, and its consumption and conservation (Bodzin, 2011; DeWaters, 2011). Actions for promoting energy literacy can help students become familiar with its aspects, and also adopt desired sustainable practices (Zografakis et al., 2008), since, although students have alternative ideas on energy issues, their errors tend to reduce over the years of training (Herrmann-Abell, Deboer, 2015).

2. Research in the context of the programme

A flexible research project (Robson, 2007) was developed in the context of the programme ‘Open Schools for Climate Protection and Energy Conservation, 2017–19, Berlin-Athens’. Gradually, the project evolved and transformed by using mixed methods of collecting, analysing and making full use of qualitative and quantitative data. An evaluation research was designed and implemented, aiming at the assessment of the impact that the programme had on schools, students and teachers. Table 1 shows the basic research questions:

Table 1. The research questions

Research Questions	
1	In what way did the implementation of the programme contribute to the development of the human resources involved?
2	What was the impact of the programme on the schools involved?

Three case studies were reviewed in the context of the research project (the experience of the school, students and teachers). In the first case study, the focus of research is the experience that the wider school community gained from participating in the programme, which is the main subject of this article. An effort has been made to:

- identify both quantitatively and qualitatively how the participants understand issues relating to climate change and energy conservation;
- identify any changes in terms of knowledge, skills, attitudes and values;
- develop good practices, strong points but also any obstacles in the programme implementation.

More specifically, the following were used:

- a questionnaire (<https://bit.ly/2XJIV0P>) with open-ended and closed-ended questions with the aim to show what the school experience was, and
- three (3) semi-structured group interviews/discussions: two were held in primary schools and one in a secondary school. Students, teachers and school principals participated in these interviews/discussions.

2.1. Designing and using the research tools: analysis presentation

A questionnaire was created so that the experience that the school gained from the programme could be investigated. The questionnaire comprised of 22 closed and open-ended questions with sub-questions, and was completed by the teacher groups participating in each school. The answers to the closed-ended questions were analysed and processed in SPSS22, whereas for those to the open-ended questions, NVivo12 was used. Descriptive statistics was used for quantitative data, and thematic analysis for qualitative data.

In addition, three semi-structured group interviews were designed and carried out, in which 12 students, 12 teachers and three school principals participated. They were carried out after the programme was com-

pleted in the schools, and they were recorded on voice recorder. After that, the content was processed and analysed in NVivo12.

Among the assumptions made in this research are the voluntary participation in the research and the honest manner in which the participants answered the questions. The group interviews were carried out in three schools, with students, teachers and school principals.

All the results presented below are quantified yields of the qualitative data resulting from their large volume. Only Figures 7, 8 and 9 show answers given in 11 closed-ended questions. At the end of the data analysis presentation, some key issues are mentioned that emerged from the interviews.

2.2. Research data analysis

A total of 72 schools, 198 teachers (all schools and teachers participating in the programme) and 2,807 students (ten students from each school chosen by their teachers) took part in the research (Figure 1); 25 of the participating schools had previous experience in climate change and energy conservation issues; 161 energy teams and 70 energy councils were created.

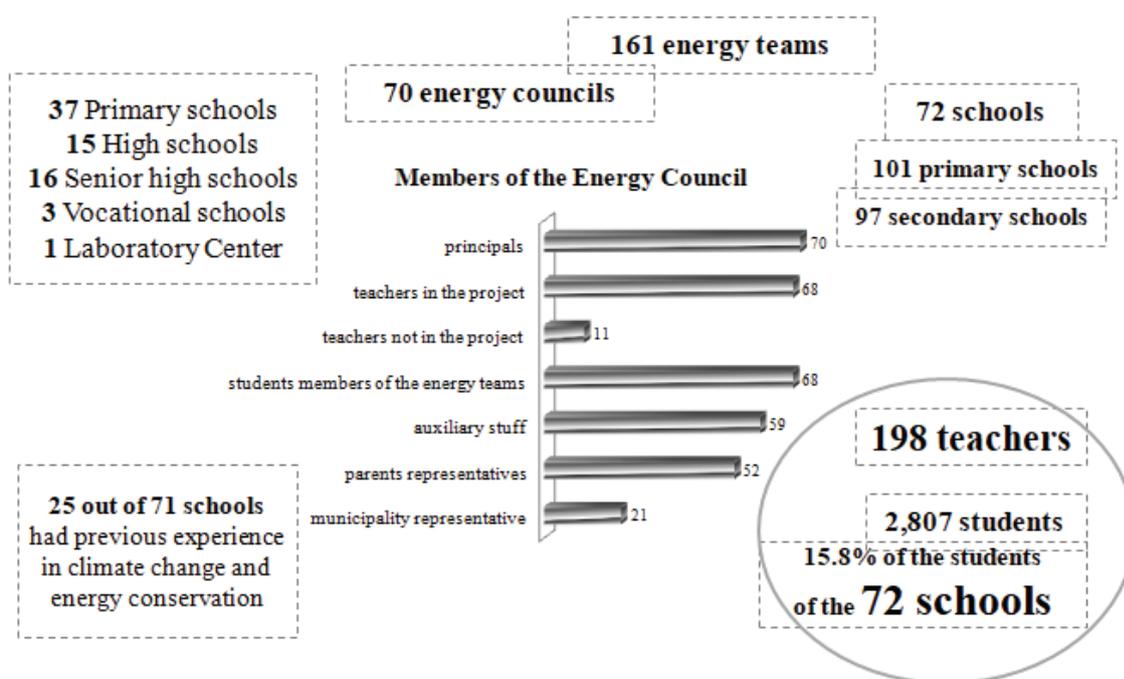


Figure 1. Individuals and teams participating in the research

During the energy tour, issues concerning heating, lighting, ventilation, and the use of electrical appliances were identified (Figure 2).

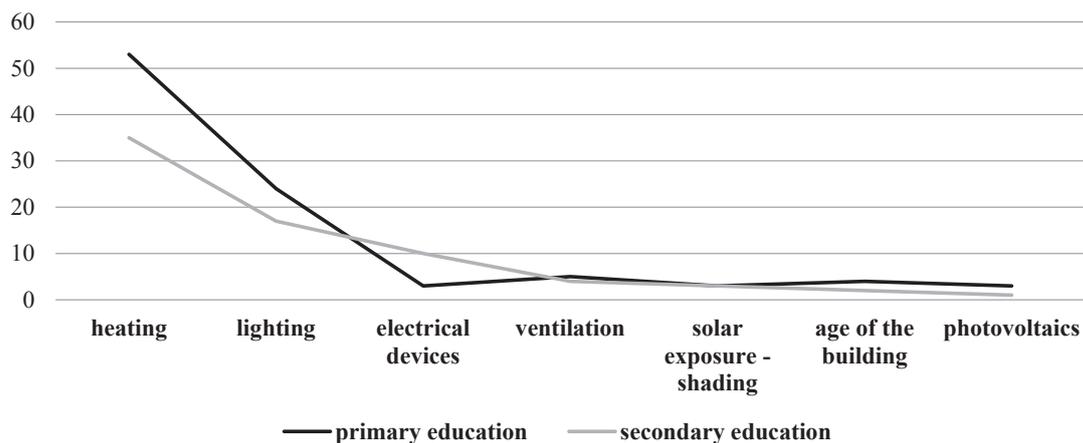


Figure 2. Issues identified during the energy tour

The experience that the students gained from the energy tour around the school premises was assessed as particularly important, since it raised their awareness and was received with great enthusiasm (Figure 3).

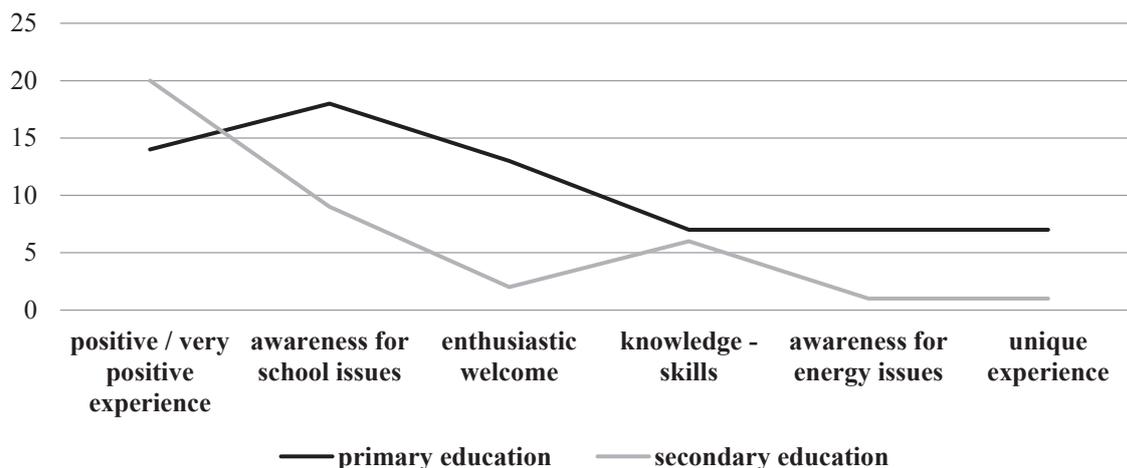


Figure 3. The students' experience from the energy tour in the school premises

It turned out that the measurements with the instruments in the suitcases, the creative activities, the energy tour, the energy-saving practices and programme dissemination, the use of the educational material provided, the energy inspection, and the eco-code were highly effective (Figure 4).

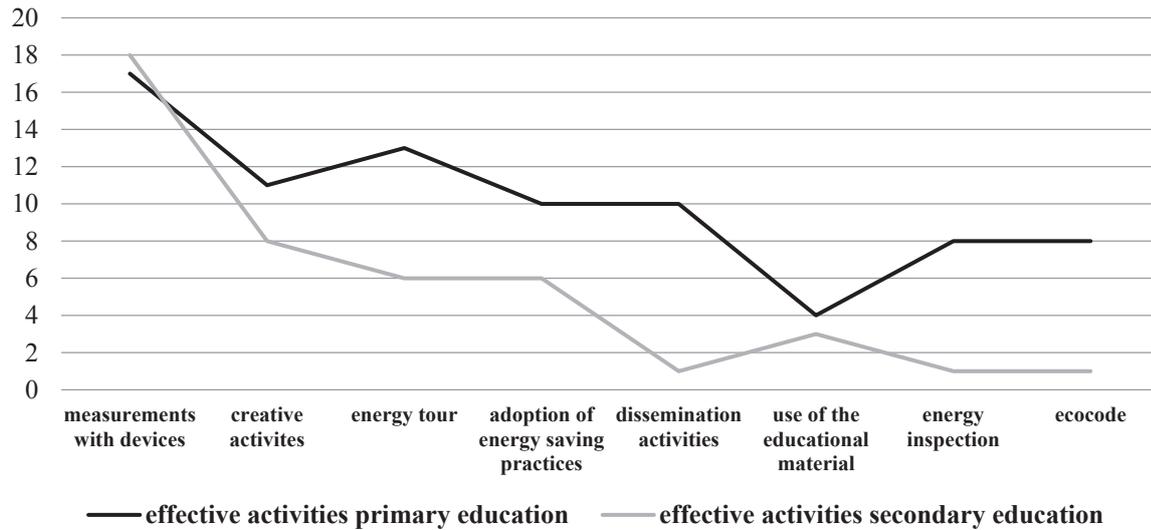


Figure 4. Effective activities

Actions more frequently usable on school projects were dissemination practices, heating regulation, use of eco-code and energy-saving reminders, the correct use of electrical appliances, and practices relating to ventilation, solar exposure, lighting and energy inspection (Fig. 5).

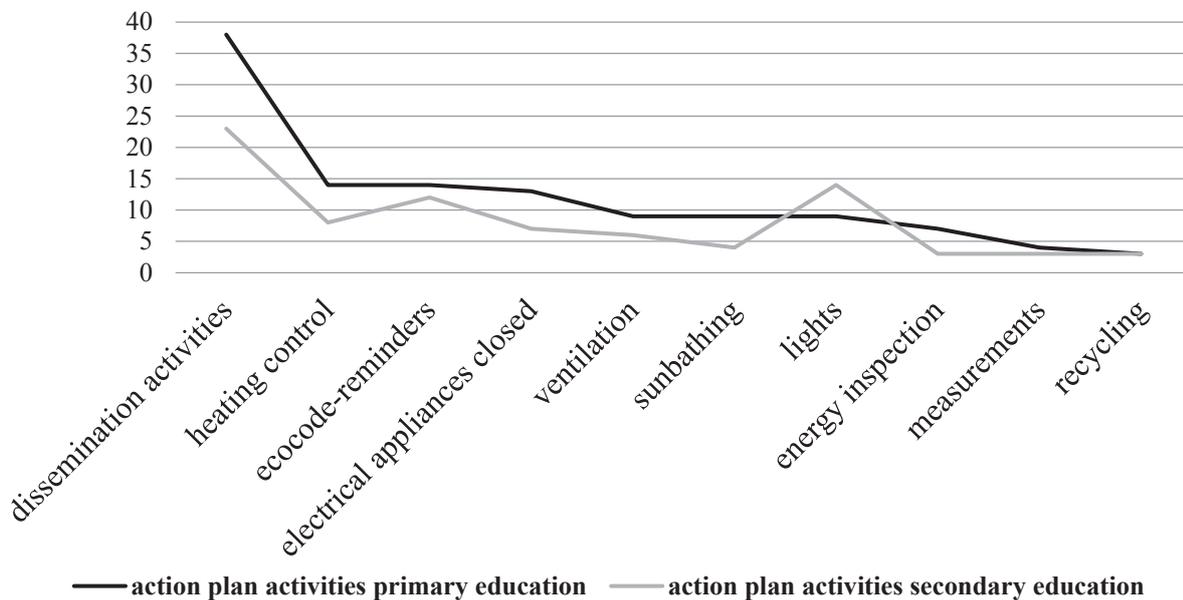
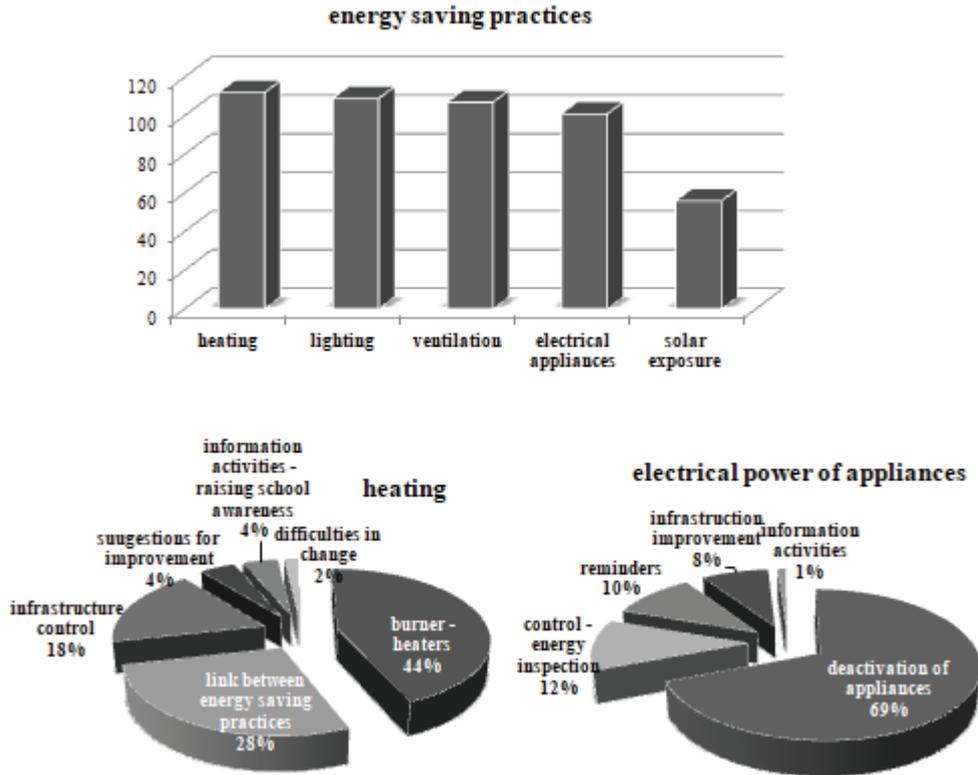


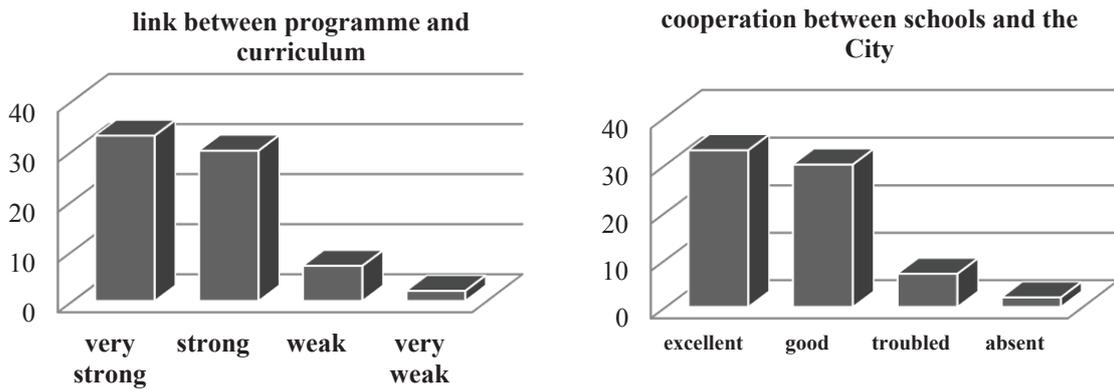
Figure 5. Actions usable on school projects

The most popular energy-saving practices were those relating to heating, lighting, ventilation, use of electrical appliances, and solar exposure (Figures 6, 7, 8).



Figures 6, 7, 8. Popular energy-saving practices and examples of analysis of sub-categories

Teachers agree that there is a strong link between the programme and the curriculum in most of the answers (Figure 9), while there is always room for improvement in terms of cooperation between schools and the city of Athens (Figure 10).



Figures 9, 10. The link between the programme, the curriculum and the city of Athens

The overall impression of the programme is very positive, especially in terms of informing students about energy issues, and will have a positive impact on school energy issues in the future (Figure 11).

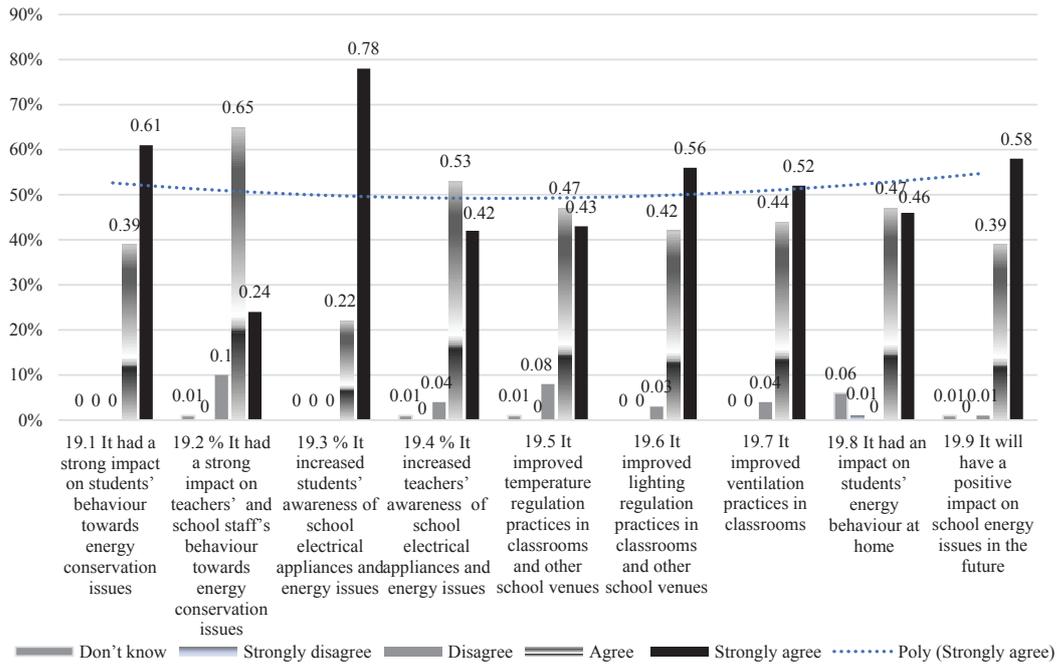
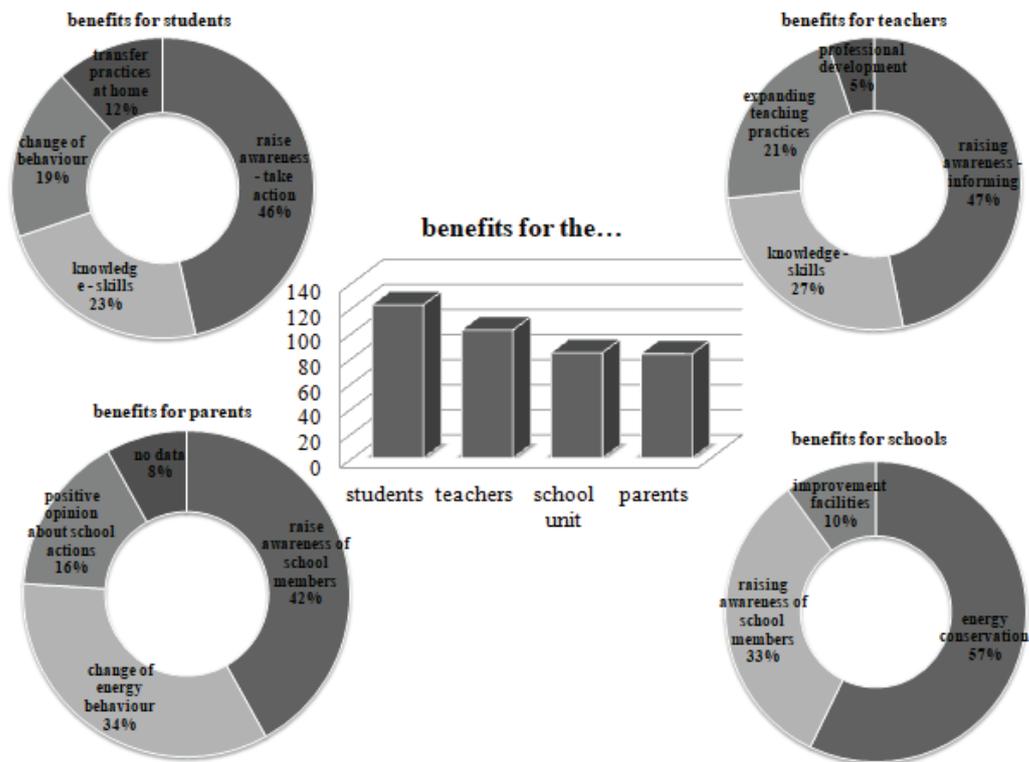


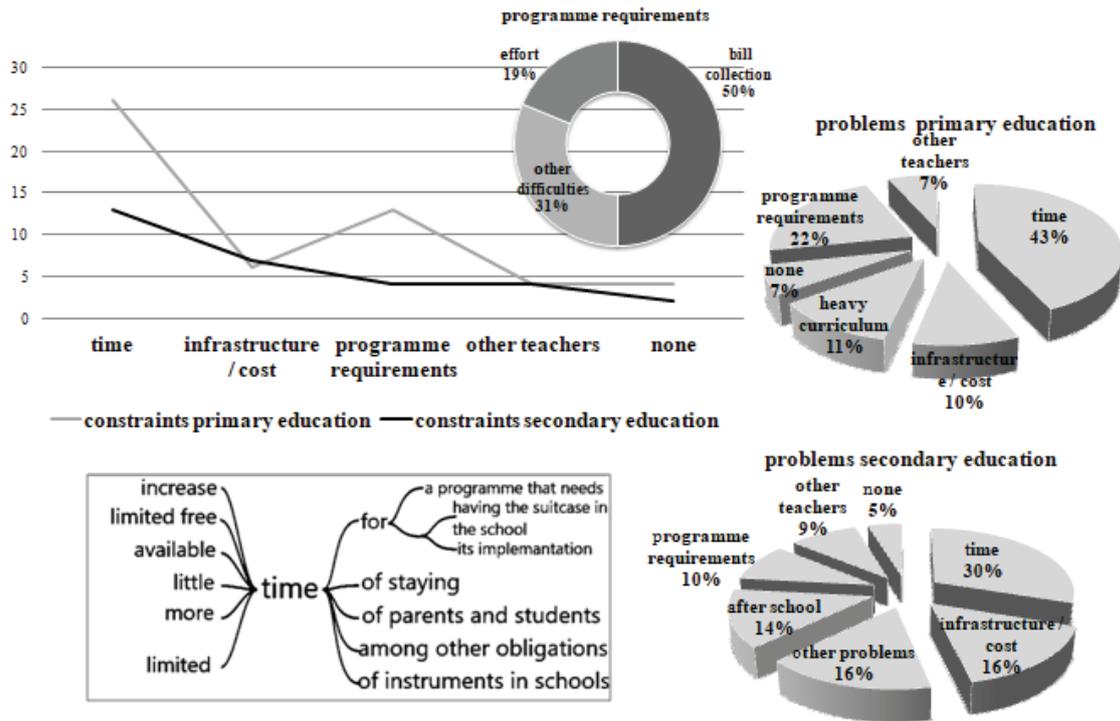
Figure 11. Overall impressions of the programme

The benefits of the programme concern students, teachers, the school, and even parents (Figures 12, 13, 14, 15, 16).



Figures 12, 13, 14, 15, 16. The benefits of participating in the programme

Among the problems encountered during the implementation of the programme were the time spent on it, the infrastructure and the cost of its improvement, the requirements of the programme, as well as teachers who did not participate in the programme (Figs. 17, 18, 19, 20, 21).



Figures 17, 18, 19, 20, 21. The benefits of participating in the programme

Suggestions for improving the programme include the key role of the state, the school equipment, the institutionally based time necessary for designing programmes and projects for all levels of education, the programme extension, support from trained scientific/technical staff, and school/teacher collaboration (Fig. 22).

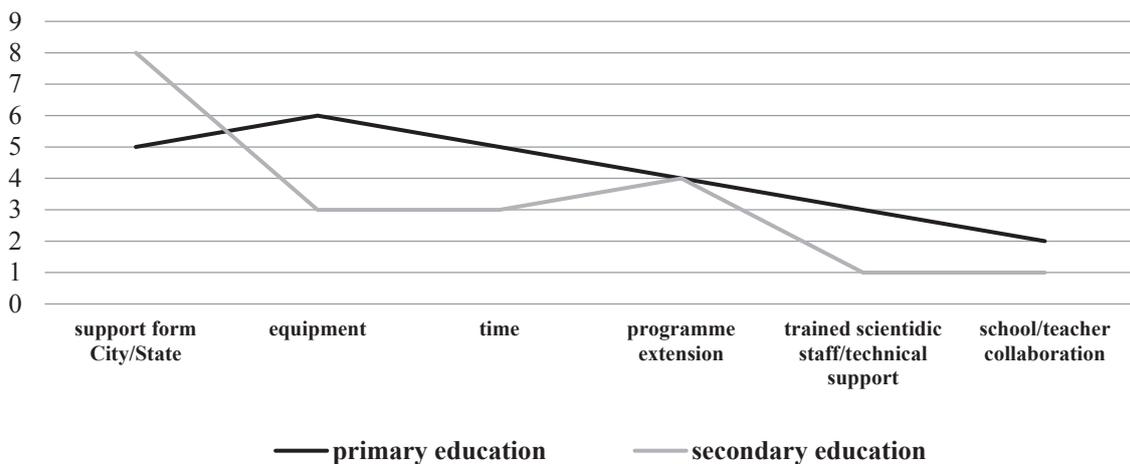


Figure 22. Suggestions for improving the programme.

The main points from the group interviews focus on the following:

- the positive assessment of the programme, with numerous benefits for both individual participants and the school
- the enrichment of the learning process with practices leading to involving and including every individual
- collaboration
- the positive assessment of training sessions by the teachers who participated in the programme
- the significant contribution of the ten-step methodology framework and the well-organised related activities
- the moodle, which worked as a kind of portfolio for every school, supported step by step the recording of the programme actions and the interaction among schools.

Discussion and conclusions

The first research question concerns the impact of the programme's whole approach on the school community, that is, the contribution of the programme to the participants' development. Indeed, according to the teachers who completed the school questionnaire as a group, but also from their statements in the group interviews, the benefits were multiple for students, teachers, the school in general and parents, although it seems that in future implementation of the programme, the parents' degree of involvement is greater. The participants became familiar with aspects of climate and energy literacy (knowledge and skills, attitudes and values), raised their awareness and took action on this issue, and adopted energy conservation practices, and, finally, dissemination practices. The schools were supported in adopting sustainable practices, and the schools improved both their self-image and their image in the wider local community. The school became a learning and initiative centre, in order to raise the local community's awareness of climate change.

The second research question focuses on sustainability. Overall, the programme assessment was positive, and, more particularly, its methodology, equipment and educational material. The key element was the participation of all those involved in designing an action plan together, implementing it, and evaluating it. The programme leaves a legacy of developed codes of communication and cooperation, and experience and expertise after effective practices; and obstacles and difficulties have been identified.

Inside the school, there is collaboration between students, trained teachers and principals, as well as auxiliary staff. Parents and friends, scientists and professionals in the field of energy are involved through visits. Actors in the programme and representatives of the state are involved too. The schools participating in the programme interact via the moodle platform, where ideas and practices are identified and exchanged, as happens in face-to-face teacher training sessions. All these can support other schools that wish to implement the programme and deal with other issues.

The research highlighted the identification of common practices and discussion among the participants in primary and secondary education, although their background knowledge is different, as is the programme development framework (energy teams of mixed composition, frequency of implementation activities, specialty teachers).

The need to identify the current condition of school buildings showed that users had little knowledge of the buildings themselves, and their functions as well. It proposed the creation and recording of the energy profile, which is the strong and weak energy characteristics of all the school buildings. In this way, there will be a database to use, so that infrastructure and equipment can be improved, mainly by the state, as there is a cost problem.

This paper is only one among others (Ioakimidou, Piliouras, Tsolakos, Kasoutas, 2020; Piliouras, Dimopoulou, Ioakimidou, Tsolakos, 2021) that attempts to cover the spectrum of the impact the programme on energy consumption and climate change had on various stakeholders. However, this research aims to stimulate a number of studies on key environmental issues, such as climate change and conservation energy, since climate and energy literacy is a priority nowadays. It is the first time that such a wide-ranging study on this issue has been conducted in Greek schools, and one of the few worldwide. The research was done in the context of a programme that regards a school as a whole organisation that can develop a sustainability culture, and at the same time as a development framework for all the participants.

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ATVIROS MOKYKLOS KLIMATO APSAUGOS IR ENERGIJOS TAUPYMO PROGRAMA: MOKYKLOS PERSPEKTYVA

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Santrauka

Vykdamas „Atviros mokyklos klimato apsaugos ir energijos taupymo“ (2017–19, Berlynas-Atėnai) programą, sukurtas ir atliktas vertinimo tyrimas, taikant mišrius kokybinių ir kiekybinių duomenų rinkimo, analizės ir naudojimo metodus, siekiant išsiaiškinti, ar dalyvavimas programoje buvo naudingas studentams, mokytojams ir apskritai mokyklų bendruomenėms. Tyrime dalyvavo 72 mokyklos, 198 mokytojai (visos mokyklos ir visi programoje dalyvaujantys mokytojai), 2807 mokiniai (po 10 mokinių iš kiekvienos mokyklos). Kiekybinių (SPSS 22 versija) ir kokybinių duomenų teminei analizei (NVivo12) taikyta aprašomoji statistika. Mokyklai naudingas buvo dalyvių supažindinimas su klimato ir energetinio raštingumo aspektais, siekiant jų sąmoningumo bei atitinkamo veikimo, taikant energijos taupymo ir sklaidos praktiką. Nauda studentams, mokytojams, apskritai mokyklai ir tėvams įvairi. Laikytasi nuomonės, kad mokyklos taiko tvarią praktiką ir tobulina savo įvaizdį vietos bendruomenėje ir plačiau.

Atlikus tyrimą pabrėžta įprasto pradinio ir vidurinio ugdymo dalyvių praktikos ir galimybių diskutuoti būtinybė, net jei moksleivių žinios nuo mokyklos programų skiriasi. Skatinimas nustatyti esamą mokyklos pastatų būklę atskleidė, kad vartotojai apie pačius pastatus ir jų funkcijas mažai ką žino, tad siūloma parengti visų mokyklos pastatų energines charakteristikas. Taip bus galima panaudoti duomenų bazę, siekiant pagerinti infrastruktūrą, diegti naujesnę įrangą daugiausia valstybės lėšomis, nes pačioms mokykloms lėšų trūksta.

Mokykla tapo mokymosi ir apskritai švietimo centru, siekiant informuoti vietos bendruomenę apie klimato pokyčius. Tyrimas atliktas vykdamas programą, kurioje mokykla vertinama kaip organizacija, galinti plėtoti tvarumo kultūrą, kartu ugdyti programos dalyvius.

PAGRINDINIAI ŽODŽIAI: *klimato ir energetinis raštingumas, švietimas klimato kaitos klausimais, energijos taupymo praktika, mokyklos padalinys, programos vertinimas.*

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