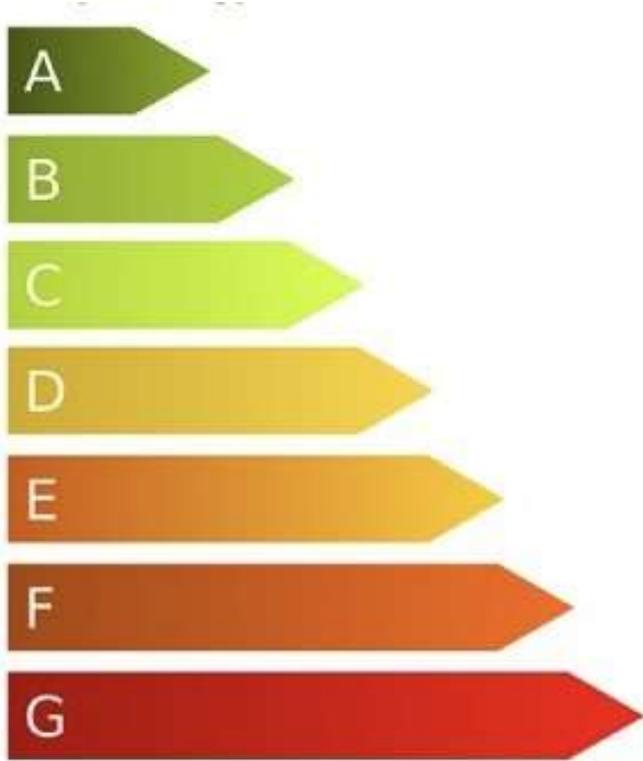


The Conceptual Framework for ComfyHouse Activities

STEAM approaches for the schools to support the energy efficiency for houses, the case of :

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About the project

The European Green Deal is at the heart of the new EU agenda. It aims to make Europe climate-neutral in 2050. The European Commission has adopted a set of proposals to make the EU's climate, energy, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55% by 2030, compared to 1990 levels.

Buildings are responsible for about 40% of the EU energy consumption and 36% of energy-related greenhouse gas emissions. Buildings are therefore the largest single consumer of energy in Europe. Heating, cooling and domestic hot water account for 80% of the energy consumed by us citizens. Currently, about 35 % of buildings in the EU are over 50 years old, and nearly 75 % of buildings are energy inefficient. At the same time, only about 1 % of the building stock is renovated each year.

The energy efficiency renovation of buildings is one of the levers for a low-carbon transition, where building renovation solutions represent great potential. The conclusions of the Global Summit 2020 show that stimulating education and green skills at all levels of education are critical for enhancing the opportunities for regional development.

Aksantys and other European partners are committed to creating a holistic and complex conceptual framework, which would allow the implementation of the educational programme in a systematic manner into the general educational curricula. A Special Pedagogy Guideline, addressed to local stakeholders, policy



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makers, and schools' headmasters, will also be created in order to support green education in the educational system. Partners will organize a series of trainings, local exhibitions, as well as international meetings to elaborate on the strategy on how to promote energy efficiency solutions for houses.

Introduction

ComfyHouse project is to develop and implement an innovative, tailored-made educational programme for teachers and pupils based on STEAM approach that will increase kids' understanding of the renovation of houses for their energy efficiency purposes.

STEAM-based education is being enthusiastically embraced as a tool in educating children, also in terms of ecology and environmental protection. And while the need to implement environmentally friendly solution is indisputable, implementing STEAM in the classroom can be challenging for teachers as it may require cross-disciplinary collaboration, increased workload and an understanding of the nature of the STEAM process. On the other hand, this method is ideal for familiarizing pupils with the topic in an interesting way, that requires children's involvement, and sensitizing them to local and global interdependencies.

The ComfyHouse project is a response for these educational needs.

The concrete objectives of this project are to:

- use and promote STEAM approach among teachers and pupils to learn about the energy efficiency building renovations;
- to develop and promote innovative pedagogies on topics relevant



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environmentally to the European societies;

- support teachers with the project-based learning tools including STEAM disciplines;
- equip kids with proper skills promoting STEAM learning;
- enable a partnership between Project Partners, and also between different sectors (educational versus private sector).

The following activities are foreseen in the project:

- Organization of the study visit – Teachers from both school meet at the premises of Bucharest school to share their experiences.
- Educational programme:
 - ComfyHouse - How to make your house energy efficient? – the goal of this part is to prepare a manual for teachers, where they can find useful information on topics related to energy efficiency in buildings, as well as how to teach children about the topics covered in this project, i.e. how to make their homes more environmentally friendly and energy efficient.
 - ComfyHouse - How to teach energy efficiency in homes using the STEAM approach?- the ComfyHouse Innovative Pedagogy Guideline involves the preparation of materials, including ready-made lesson plans for use in educational activities.
 - ComfyHouse - Implementation of educational programme – assumes dissemination of the program.
 - ComfyHouse educational week - organisation of the Exhibition.



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Methodology

In order to deliver the most tailor-made educational materials, supported by innovative solutions, in the first place the Consortium of experts performed individual interviews with teachers about their needs in terms of the implementing of STEAM approach in their classes.

Before creating the program, a questionnaire was conducted among teachers to determine what the teachers' knowledge was about energy efficiency in buildings, the construction of buildings including energy and water saving solutions and their ways of saving heating energy, electricity and water in their daily lives. They also tested the students' knowledge on topics related to environmental protection, energy efficiency use of resources in their daily activities. They asked what students knew about house construction and how people can affect climate change.

The second part of the questions concerned teachers' needs for introducing the STEAM method in their classes with their students, as well as the need for lesson materials on the specific topic of improving the energy efficiency of buildings. In addition, teachers were given the opportunity to point out which solutions for improving students' ecological awareness are working well in their school, and which need improvement.

Results



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Teachers' knowledge about the energy efficiency solutions for houses.

The study based on the survey and talks being performed with teachers from both schools in Lithuania and Romania allowed us to determine what teachers' practical knowledge is, or what solutions they themselves use to save heating energy, water and electricity in their homes. This helped us assess what theoretical and practical materials we could prepare for teachers to improve or organize their knowledge in this area.

For this purpose, we asked teachers three questions.

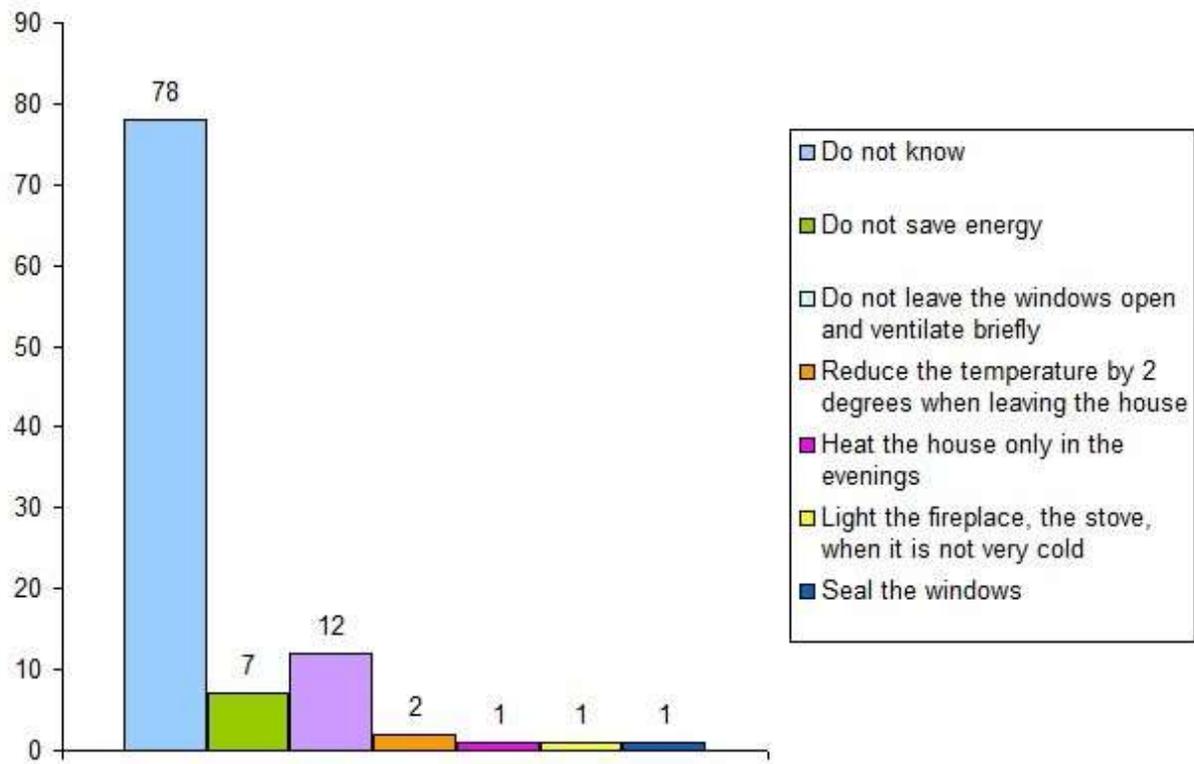
- How do they save heating energy at home?
- How do they save water at home?
- How do they save electricity at home?

How do teachers save heating energy at home?

Respondents listed a number of practical solutions for use in homes to improve their energy efficiency and save water. However, when it comes to saving energy, the largest group, about 78%, do not know how to save energy at home, and 7% do not save energy in their homes, 12% said they do not leave windows open and ventilate briefly. About 2 % of teachers said, they lower the temperature by 2 degrees when leaving the house. A small group, about 1% seals the windows, heats their houses only in the evenings or lights only the fireplace when it is not very cold.



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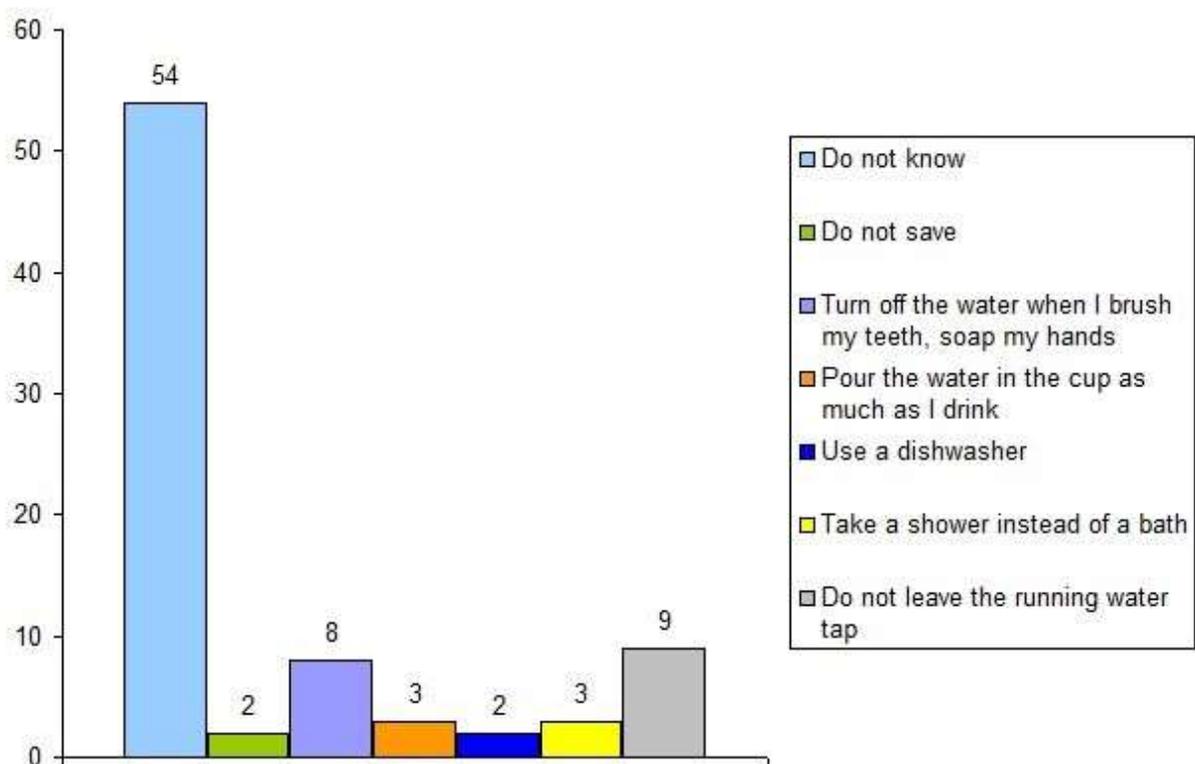


How do teachers save water at home?

The survey indicated that awareness related to water saving is higher, but still 54% of teachers do not know how water is saved and 2% of them do not save water in their homes. Among the ways to save water, teachers indicated not leaving water running - 9%, turn off the tap when brushing teeth, washing hands - 8%. Approx. 3% of respondents would choose showering instead of bathing and 2 % are using a dishwasher instead of washing dishes by hand. About 3 % pour only as much water as they drink into a cup.



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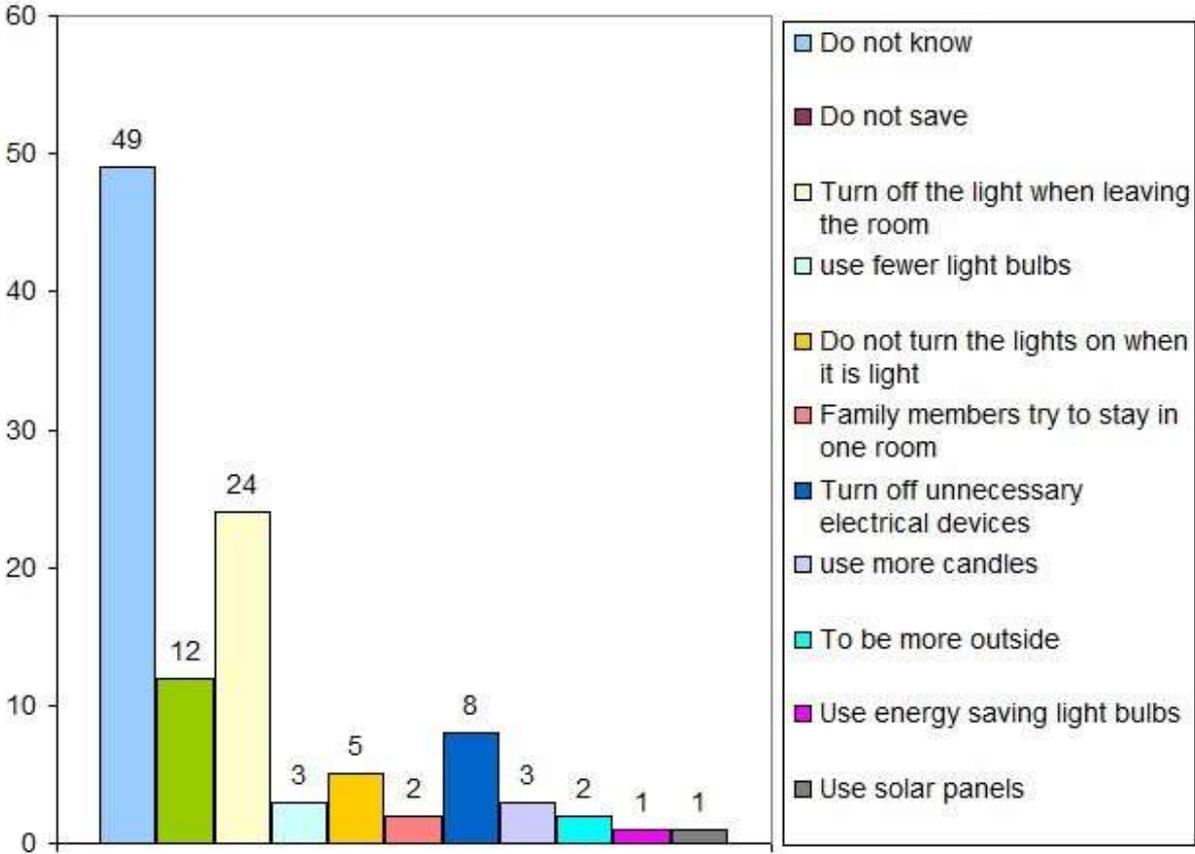
How do teachers save electricity at home?

Although a large part of teachers know a lot about environmental protection, almost half of them said they do not know how we can save energy and 12 % do not save energy at home. Among the ways to save energy, the most indicated was to turn off the light when leaving the room – 24% and to switch off unnecessary electrical appliances – 8%. Other ways to implement energy savings were to use less light bulbs, use more candles, not turn the lights on when it is light, spend more time together in one room or spend more time outside. Only



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1% of respondents indicated using energy saving light bulbs and installing solar panels.



Students' knowledge about the energy efficiency solutions at houses

Based on the results of surveys conducted among students, we collected information on what knowledge do the pupils have in environmental topics, energy efficiency usage of resources in their daily activities at homes.

We can conclude that students have general knowledge of environmental protection, including saving plants and animals, about climate change and global warming.

They are aware of human impact on the environment and pollution, especially



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that human activities are causing the climate warming, and as a result melting of glaciers and disappearance of certain animals and plants. They understand the mutual responsibility to act and stop global warming. The students also know that climate change has a negative impact on human health through deteriorating air and food quality. They know that we should protect the environment by reducing consumption, sorting garbage, reducing, recycling, and reusing things and can answer the questions: Why do you need to sort? Why is it important to live in a clean environment? Most students recycle paper, plastic, and glass and some of them make compost.

Pupils know that they have to save the resources used because some are exhaustible. The older children can name renewable energy resources (solar, wind, biomass) and some ways to save resources, such as traveling by bicycle, using economical light bulbs, and using cloth bags instead of plastic ones.

Many of the above issues are addressed in science and English classes, where various aspects of the environment are covered in textbooks (e.g. carbon footprint, endangered species, voluntourism, vertical farming, etc).

Surveys have shown that topics related to energy, water, and electricity conservation should be addressed to a greater extent during school classes. Children should be sensitized to the fact that any action, even small, will help achieve the goal of reducing emissions into the atmosphere. By pointing out specific solutions for use in homes and starting education at school age, it will be possible to sensitize families and children now and in the future to the savings possible in households and collective responsibility for improving our climate.

What do children know about house construction and how can a person affect



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climate change?

The surveys showed that children have little knowledge of practical solutions for saving energy, water, and electricity at home and in everyday activities. Many parents and children would certainly give the correct answer in theory, but in practice, children know little about the subject and even fewer have formed daily habits in this regard. They mostly get their knowledge of this problem from children's games (practical games, video games, etc.), but not from real-life problems.

Pupils have general knowledge about different types of houses built in different countries and different climate zones. They can name the basic materials from which houses are built (wood, bricks, and blocks), and some students know about the use of external thermal insulation with expanded polystyrene. They can list parts of a house. Some of them live in houses constructed by their parents and have seen the process.

Children have very basic knowledge about using resources in our homes (water/electricity saving, recycling). They know that energy can be recycled that heating homes with thermal power plants produces pollution and that burning gas leads to serious illnesses for people. They do not know much about the topic other than the need to use alternative energies, such as installing solar panels. Just a couple of them have houses with green energy solutions.

Our studies showed that, in general, children are not aware of the correlations between home construction and household savings. These topics are generally not covered in school classes due to the fact that there is a lack of comprehensive studies on the subject tailored for school-aged children. Few children have such



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knowledge because topics related to the technical modernization of buildings and financial topics related to the maintenance costs of buildings are rarely discussed in schools and families in the presence of children. The guidebook, lessons, and activities planned as part of this project will help teachers involved in the project and willing to implement this project, to fill the gap in this area.

Teachers' Needs

Based on surveys and individual talks with teachers, a list of teachers' needs has been created. Teachers are most interested in ready-made thematic courses and materials on STEAM methodology. Teachers need ready-made lesson plans, experiments, and other inspiring educational materials, developed in collaboration with experts, scientists, educators, and teachers who share practical knowledge and skills coming from experience. They need also systematic solutions and curricula.

To implement the STEAM approach into their classes they need:

- understanding of the general framework and best practices on how to integrate the interdisciplinary approach into the regular system;
- a real-life problem to be solved and collaboration with teachers who want to be involved in the project;
- good STEAM educational practices;
- exchange of good practices and projects on this topic, developed with schools in different countries;
- experience in using STEAM approach;
- examples of lessons, that they can apply in their lessons;



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- examples of activities, tools for experiments, tools for making models, collages, etc.;
- didactic material, CD, games, and thematic movies;
- creative solutions;
- space, larger classes, technology, and good time management.
- intuitive materials, more information, and time to create;

What knowledge would teachers like to get from this project?

The project should provide teachers with materials to increase understanding and awareness of the complexity of the whole climate change issue, offer students as many opportunities as possible to learn about energy efficiency at home, and help them to transfer this knowledge into practical solutions for use in everyday life, specifically:

- way to help students better understand the concept of climate change;
- how to live better to save the planet;
- learn about the energy efficiency of buildings;
- how to achieve proper energy efficiency in the house, and how to use renewable energy sources;
- how to improve their current home to make it more economical;
- how to understandably explain the benefits of energy saving to students, and what practical tasks to perform so that they can apply the acquired knowledge themselves;
- how to integrate knowledge about energy-efficient homes into activities focused on developing useful life skills for students;
- practical information, for example how to make a layout of such a energy-



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efficient house;

- learning ideas that have worked well in activities with students;
- practical solutions regarding green energy;
- learning activities that could be introduced in science classes, what energy efficiency means;
- best practices on school-community projects that can be replicated locally.

What do pupils need in this respect?

Based on the data collected by teachers pupils are aware of the necessity to live more eco-friendly, but they lack knowledge and practical habits to save energy and water at school and home.

To implement some resource-saving solutions into their daily routine, they need:

- age-appropriate handouts, and knowledge about the energy efficiency of houses (buildings);
- interest, saving skills, and responsible approach to energy saving;
- various teaching tools using artistic creative activities;
- appropriate projects and strategies, exchanges of good practices;
- practical ideas that the students can take home;
- talk to people who work in the field of green energy and tell them how important it is to recycle;
- activities outside the classroom with the help of people who activate in the domain of sustainability and environmental protection;
- educational activities in nature;
- practical and material activities to be directly involved in the production of



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- efficient energy, after which they can see the results of their work;
- innovative materials and practical activities prepared according to the STEAM approach.

Response to the ComfyHouse project

The overall Training about the energy efficiency of houses will have the name: "The house of my dreams! Where and how would I like to live?"

The program assumes that we show kids the Earth and we tell them about the different climate zones, saying that in different zones, different types of houses are used, from different materials, for different needs, and different protection. Kids will choose the place where they want to live.

Starting from there, lesson by lesson we are going to teach them how to build their dream house based on energy efficiency solutions needed for different climate zones. We explained to the children what exactly makes a building eco-friendly and what kind of materials and techniques should be used in ComfyHouse.

This guide collects in one study the most important information on energy-efficient homes and provides resources for school teachers on how to make our homes more environmentally friendly. In particular, it discusses the following topics:

- How to build the house using ecological materials?
- How to place the house on your land?
- How to use natural light, water, and plants to improve house efficiency?
- Renewable energy sources.



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- Environmental savers.

The program consists of 5 sessions (topics), and each session is accompanied by two lessons that teachers can use to work with students. Each lesson includes one educational tool and five additional tools, in the form of a YouTube video, math exercises, geography information, art exercises, etc. prepared by STEAM methodology.

The guidebook prepared within the framework of the project provides an excellent base for teachers with examples of modern practical solutions in green homes. The chapters included in the manual have been prepared in a way that teachers can use them to supplement the knowledge for the topics included in the lessons and are grouped as follows:

- Session 1: How to build the house - exemplary topics covered in this part: energy efficient materials for construction, wall insulations, windows, roof, flooring, etc.
- Session 2: How to place the house in your land - and in particular how to take advantage of the environment, climate, topography, and orientation taking into account the different geographical zones and needs of the residents.
- Session 3: How can we use natural light, water, and plants to improve house efficiency – including green roofs, planting trees, harvesting and recycling rainwater, water savers, filtration systems for drinking water, water heating systems, rainwater tanks, etc?
- Session 4: Renewable energy sources, including among others heat pumps to heat and cool; photovoltaic solar panels, solar thermal panels, wind



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power, and other modern ecological solutions.

- Session 5: Environmental saving measures in households, including:
 - starting with the habits that determine energy consumption (behavioral transformation);
 - review energy consumption;
 - reducing consumption (fixing up what's messy or worn out);
 - install small and medium improvements;
 - upgrade and substantially improve efficiency.

Conclusions

This Conceptual Framework aimed to better understand local needs in terms of developing and implementing an innovative educational program for teachers and pupils based on the STEAM approach, that will increase kids' understanding of the renovation of houses for their energy efficiency purposes. Research has shown that teachers are interested in conducting classes by STEAM methodology, but do not have enough knowledge and time to prepare elaborate materials that are interesting to children. Students are generally eager to get involved and participate in projects, and teachers are committed to providing them with these opportunities, so there is a high level of interest and involvement.

Our studies showed, that students can name the main environmental problems of the world around them, but they can't often identify ways in which they can contribute to improving the situation. They have theoretical skills but do not follow the rules established at school, such as turning off the water when



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washing their hands. Unfortunately, nowadays a large proportion of students see the curriculum as boring and irrelevant to life outside of school. When concepts are explained through hands-on activities, students find it easier to create a connection between theories, observations, and everyday habits.

The materials and lessons prepared as part of the project show the aspect of environmental protection that is closest to the children, namely their family homes, the place where they live and perform their daily activities. Educating children in this area in the future will make them aware of the need to save resources, the importance of building energy-efficient homes, and using environmentally friendly and resource-saving solutions.

The guide prepared within the framework of this project will respond to the needs of teachers to organize and collect in one study the most important information on energy-efficient homes. Systematizing this information and collecting it in the form of a study will allow it to be reused in many educational projects.

The STEAM approach in climate change education has the potential to develop practical skills among students and, most importantly, develop values and attitudes towards individual climate action that leads to global change.

STEAM places students in authentic situations and requires them to solve concrete problems. Examples drawn from everyday life discussed in school lessons require students to communicate, collaborate, think critically and be creative. Relating theory to concrete actions makes their climate action more personal and shows them the personal benefits as well. In addition, the project will help to ensure that our students have sufficient practical knowledge and learn how to act meaningfully now, without need to first understanding the



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complex processes of our Earth's environment. Their concrete actions will ultimately translate into global environmental benefits.



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