reschool

Creation, growing and management of energy communities

Report and training material for intergenerational schools and energy feedbacks

Deliverable nº: D2.1

Deliverable name: D2.1 - Report and training material for intergenerational schools and energy feedbacks.

Version: v1.0 **Release date:** 30/01/2024. **Dissemination level:** PU

Author(s): Anaïs Varo, Albert Sabater and Ioanna-Mirto Chatzigeorgiou.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No

Disclaimer

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Commission. Neither the European Union nor the granting authority can be held responsible for them.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Document history

Version	Date	Comments	Beneficiary	Author(s)
Vo.1	04/12/2023	Table of contents draft sent to all contributors for input.	University of Girona	Anaïs Varo
Vo.2	12/12/2023	Approved table of contents.	University of Girona	Anaïs Varo Albert Sabater
Vo.3	09/01/2024	Full draft. Sent to all reviewers	University of Girona CERTH	Anaïs Varo Albert Sabater Ioanna-Mirto Chatzigeorgiou
V1	30/01/2024	Final version	University of Girona CERTH	Anaïs Varo Albert Sabater Ioanna-Mirto Chatzigeorgiou

Peer reviewed by

Partner	Reviewer
kmO	Javier Muñoz
University of Stavanger	Mathias Lindkvist

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Executive Summary

This report highlights the critical role that schools serve in advancing the energy transition and in championing the establishment of energy communities through the lens of intergenerational learning and knowledge exchange between generations. It advocates for the utilisation of intergenerational learning as an effective mechanism for the transfer of knowledge related to both the energy transition and energy communities from pupils (younger generation) to their parents (older generation) and family circles and subsequently, to the wider community. In this context, schools are identified as key platforms for the diffusion and transfer of knowledge, with the main goal of instigating shifts in practices and behaviours that extend beyond the confines of the educational sphere. Through this intergenerational approach, children (pupils) are re-envisioned from passive participants to proactive and transformative contributors within their respective communities.

This report initiates with a detailed exposition of key insights derived from an extensive literature review on intergenerational learning, specifically within the domains of energy and environmental studies. Leveraging the lessons learned from historical precedents of success, it then examines the essential elements necessary for developing an intergenerational educational unit. Based on previous findings, an innovative pedagogical proposal for intervention in schools to promote energy communities is proposed. Through an experiential pedagogical proposal that includes a theatrical process called "Creating Energy Communities", key concepts and competencies in the creation of energy communities are developed and implemented as a way to highlight the community dimension and the interaction of the actors involved. Further, the text delves into the practical application of this instructional approach within the framework of the RESCHOOL project pilots, with a special emphasis on the Girona pilot. Finally, the report provides an overview of the main challenges and barriers encountered, as well as a range of strategies developed to overcome them.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Table of contents

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Table of tables

Table of figures

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

1 Introduction

1.1 Community Engagement and Participation in Energy Communities

In the study of sustainable energy transitions, the role of citizen participation and citizen engagement is increasingly recognised as crucial (Wahlund and Palm, 2022). Generally, this is because it represents both a more democratic approach to the energy system and a practical approach to ensuring that these transitions are successful, inclusive and long-lasting (Angel, 2016; Wahlung and Palm, 2022; Lennon et al. 2019). Within this context, moving from passive energy consumers to active participants constitutes a profound shift towards a more engaged, informed, and empowered approach to energy (Beauchampet and Walsh, 2021; Tomasi, 2022; Wittmayer et al., 2021). In fact, in some recent studies (Frankowski and Tirado Herrero, 2021) take this concept further, suggesting that engagement should be integrated into everyday life, transforming individuals from simple users or passive consumers into dynamic 'energy citizens'.

Thus, the central idea is that putting citizens at the centre of the energy landscape empowers individuals and communities by taking control of their energy needs, communities can become more resilient, self-sufficient, and less vulnerable to external energy price fluctuations and supply disruptions (Bauwen, 2017). From this perspective, Bănică et al. (2024) call for a deeper understanding of the different forms of engagement within sustainable energy systems (SES). They highlight how different value perceptions influence these engagement behaviours. Their categorisation of citizen engagement includes diverse activities such as seeking information, actively managing energy solutions, sharing insights and experiences, helping, and participating in influencing or advocacy efforts. According to the same authors, these categories can be defined as follows (Bănică et al., 2024):

- Information seeking refers to gaining deeper knowledge about the energy system;
- Proactive management involves individual behaviour aimed at monitoring, controlling or optimising the energy system;
- Sharing insights and experiences from a consumer perspective with the energy supplier that can be used to improve the energy system;
- Helping is defined as providing support or assistance to other citizens;
- Advocating refers to 'strongly recommending SES to others, such as friends or family' (Yi & Gong, 2023).

This shift in perspective calls for a broadened vision in energy transition research, where active participation also means having a voice in how energy policies and systems are designed and implemented (Lennon et al., 2019). The proposed approach involves, among other things, participating in local energy communities, engaging in public consultations regarding energy projects, or advocating for renewable energy policies. Further, a crucial part of this broadened vision is energy communities, which are increasingly recognised as important tools not only for promoting renewable energy but also for fostering a sense of energy citizenship and promoting energy democracy (Devine-Wright, 2007; Wahlund and Palm, 2022).

Since 2019, the EU's Clean Energy Package includes provisions intended to empower local communities to take ownership of the energy transition through the concept of energy communities, recognizing the important role local actors play in the energy transition process. There are currently two legal definitions of energy communities at the EU level: 'Renewable Energy Communities' (Renewable Energy Directive (2018/2001/EU)) and 'Citizen Energy Communities' (Electricity Market Directive (2019/944/EU)).

As a result, citizens are able to invest together and participate in the energy system in a more collaborative and democratic manner. Energy communities, therefore, are able to act as one entity and access suitable energy markets on an equal footing, which helps contribute to a more decarbonized and flexible energy system. In this sense, it is worth emphasising that the notion of 'energy citizenship' applied to energy communities reaffirms the role of citizens as active agents in the transformation of the energy system through the creation and participation in energy communities. Similarly, 'energy democracy' reflects the growing desire for greater

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

citizen participation in the governance and policy-making of energy systems, including energy communities (Szulecki, 2018; van Veelen and van der Horst,2018).

In the European context, the introduction of two key legislative concepts, 'renewable energy communities' and 'citizen energy communities' , marks a significant evolution in the energy sector (Biresselioglu et al., 2021). These frameworks have broadened the potential range of participants to include not only individuals and local authorities but also a spectrum of businesses. Although the principle of open and non-discriminatory participation underpins these initiatives, the legal frameworks do not mandate citizen participation, allowing for various interpretations and implementations.

The study by Dudka et al. (2023) categorises citizen participation in these energy communities into four different models: 1) full citizen ownership, where citizens have full control and derive substantial benefits; 2) shared citizen ownership, characterised by collaborative governance with commercial and public entities; 3) citizen crowdfunding, where citizens hold equity mainly through online platforms; and 4) civic participation, where citizens usually do not own shares and they are mainly in hands of public authorities (often together with other actors, such as businesses).

In the RESCHOOL project, the conception of citizen engagement goes beyond an individualistic perception of citizens' membership in energy communities. Although the predominant focus so far has been in how individuals participate in energy communities as individuals, there are other social and community spaces and tools to contribute and participate in energy communities and energy transitions. A key example for the RESCHOOL project is shown in previous studies on how social institutions like schools can also be collective spaces to participate in the energy transition (Boulanger et al., 2021). With this in mind, the RESCHOOL project also sees schools as important collective spaces for such participation, not only because these can develop sustainable energy initiatives themselves (e.g. install solar panels to generate their own energy or implement energy saving measures in the school context), but also because they can promote an intergenerational approach to sustainable energy practices. This is because schools can become arenas where young minds are educated about and engaged in the principles of sustainable energy, ensuring continuity of commitment and understanding across generations.

Thus, schools can play an important role not just in educational settings but also in the community context where the spirit of shared and cross-generational commitment to the energy transition can be spread.However, there are still challenges that highlight the complex and multifaceted nature of transitioning to energy communities. Addressing them requires coordinated efforts from governments, the private sector, and communities, to create a more stable, equitable, and supportive environment for renewable energy development. Lennon et al. (2021, 2023) have explored the factors influencing citizen engagement in these energy communities. They identify several challenges, including the volatility of renewable energy policies, regulatory complexity, financial constraints, and the unintended exclusion of economically vulnerable groups due to the high costs of participation. These problems are exacerbated by widespread mistrust from citizens in both the private and public sectors, because of the inadequate institutional support and organisational capacity.

Increased citizen engagement in community energy projects is, at the same time, assisted by, for example, subsidy support, increased institutional recognition, provision of early-stage funding, improved information dissemination and the promotion of strong community links (Lennon et al., 2023). Promoting collaborative partnerships between different stakeholders and incorporating novel technical innovations and alternative business models are also recognised as key to facilitating more active citizen participation in community energy initiatives.

Looking more closely at the drivers, we see how improving communication and community relations can lead to increased citizen engagement in energy communities. In the same vein, the RESCHOOL project proposes schools as crucial and key spaces for promoting more sustainable, efficient, and collective forms of energy governance.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

1.2 Developing and Sustaining Energy-Conscious and Engaged Communities: the strategic role of schools for environmental action

Environmental Education (EE) is a pivotal component in driving the environmental and energy transition (Jorgenson et al., 2019). It serves as a foundational tool for raising awareness, spreading knowledge, and fostering attitudes that encourage responsible behaviour towards the environment. Through EE, learners of all ages gain a deeper understanding of environmental issues, the importance of sustainable living, and the impact of energy choices on the planet. This education is not limited to theoretical knowledge; it also involves practical learning, where students engage in activities like energy conservation projects, recycling initiatives, and studies on renewable energy sources. EE provides learners with the skills and knowledge necessary to make informed decisions and take action towards a more sustainable future. The emphasis on critical thinking, problem-solving, and active participation in EE encourages a sense of responsibility and empowerment among learners, making them more likely to adopt and advocate for sustainable practices in their personal and professional lives (Anderson, 2012).

Further, educational institutions, including schools and non-formal education settings, play a critical role in this process. Schools, as structured learning environments, have the unique opportunity to integrate EE into their curricula, providing a consistent and comprehensive approach to environmental learning. This integration can range from specific subjects focused on environmental science to incorporating sustainable practices into the school's operations and culture. Non-formal education institutions, such as community centres[1], museums, and environmental organizations, also offer valuable platforms for environmental education. They provide diverse and often more flexible learning opportunities, reaching a broader audience beyond the traditional classroom. These institutions can offer workshops, experiential learning programmes and community projects that provide hands-on experiences that reinforce the principles of environmental citizenship. Together, these educational spaces serve as important catalysts for nurturing a society that values and actively contributes to environmental and energy transition, promoting a culture of sustainability that can permeate community and society at large (Chawla & Cushing, 2007).

It is important to distinguish between environmental action and environmental behaviour (Jensen, 2012). According to this author's proposal, environmental action can be understood as any action taken to address environmental issues that are determined by the individuals involved collectively. This distinguishes it from the narrower concept of environmental behaviour, which is limited to individual practices and predefined outcomes. This distinction is important because the latter does not capture the wide range of actions and actors involved in the sustainability transition (Avelino & Wittmayer, 2016; Farla et al., 2012).

However, through a rigorous literature review on environmental education and energy transitions, Jorgeson et al. (2019) point out that the majority of EE approaches focus on an individualistic perspective of energy transitions, that is, on changing environmental behaviour at the individual or personal level. While these methods are essential, as changing individual practices is inevitable to promote societal change, they are not sufficient to drive a broader and deeper transition to renewable energy systems.

This individualistic approach in EE (and mostly in schools and formal educational contexts) can be explained by several factors. The main one would be that the logic behind these ideas is that young generations (children and youth), as the demographic group most affected by climate change, will bear the responsibility as future leaders, community members and policymakers to make difficult energy choices in the context of climate change (Jorgenson et al. 2019). This means that the logic is to transform individuals today to promote change

[1] Community Centres is a broad concept that covers all types of open centres where people from a particular area can meet and organise educational projects, social events or recreational activities.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

tomorrow and that children and young people are not seen as dynamic and active current members of the community, but as future actors to be taken into account, albeit without much agency nowadays.

In contrast, in the RESCHOOL project, we favour an approach to environmental action that positions children and young people as active agents in the energy transition. This means that children and youth can directly influence and be dynamic and relevant actors in the community to promote and strengthen environmental action. This approach is also aligned with the UN Convention on the Rights of the Child (1989) which highlights that children should be seen as active, competent, responsible and influential members of their families and communities. Therefore, our approach rejects an adult-centred perspective and recognises the value of all members of the community in making socio-technical transitions and changes possible (Geels, 2012).

The approaches are particularly relevant in energy communities since the aim to assist inclusive and effective participation has been seen as a both a core opportunity and a challenge for energy communities. Such a shift would increase the impact of environmental action by empowering groups to contribute collectively to solving environmental issues. This collective effort is essential to thoroughly consider further to address opportunities to drive substantial changes in energy systems.

1.3 Objectives

This report explores how engaging different generations in promoting energy communities and energy transition practices and behaviours can make a difference, especially from a knowledge-transfer point of view from younger to older generations. This basically means that we are looking at whether sharing knowledge, practices and experiences between older and younger generations can help build stronger local energy communities. This idea ties in with one of the main objectives of the RESCHOOL project: "to define, implement and validate a set of intergenerational training, transfer and engagement programmes for the dynamisation (creation, awareness, participation, management) of local energy communities". In this case, the place chosen to contextualise and develop the set of training materials was schools, understood as central social institutions in communities.

Our report has three main objectives:

A. To review what has already been written about intergenerational learning, especially concerning energy communities.
B. To develop educational material and teaching methods that promote intergenerational learning about energy communities.
C. To propose a research design to collect and study data on how people from different generations share and transfer knowledge and skills.

More specifically, the RESCHOOL project envisages two ways of engaging people and supporting the growth of energy communities. One is through school-based training programmes to facilitate intergenerational transfers. These programmes aim to use the exchange of ideas and experiences between younger and older generations to increase energy efficiency behaviours and public engagement in just energy transitions, particularly through participation in energy communities. This intergenerational approach is especially important in societies such as the western European ones which are characterised by an ageing population (Christensen et al., 2009), widespread compulsory education and, in some cases, vibrant and innovative education programs to prepare people for the new challenges ahead such as climate change. The second one is through gamification. The RESCHOOL project looks at how games and 'serious games' could play a role in this intergenerational exchange, suggesting that experiential and interactive ways of learning could be key in bringing different age groups together to learn about and work on the energy transition. However, it needs to be noted that the analysis of how these gamification tools can interact with intergenerational processes is beyond the scope of this specific report and will be addressed in future publications.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

1.4 Contribution of Partners

Table 1 Contribution of partners to this deliverable

Partner	Contribution
University of Girona	Anaïs Varo led the literature review process, the data collection and analysis process; led and co-coordinated the report writing, led the first drafting of sections 1, 2, 4, 5 and 6 , led and participated in the subsequent drafting process for the report, and approved of the final report. Albert Sabater participated in the literature review process, co-led the data collection and analysis process; co-coordinated the report writing, participated in the drafting process of sections 1, 2, 4, 5 and 6, participated in the subsequent drafting process for the report, and approved of the final report.
Centre for Research & Technology Hellas	Ioanna-Mirto Chatzigeorgiou wrote the drafts of section 3, participated in the subsequent drafting process for the report, and approved of the final report.

1.5 Report Structure

This report offers an in-depth exploration of the integration of intergenerational learning (IGL) in energy communities, emphasizing educational methodologies and the implementation of pedagogical strategies.

Chapter 1 starts with an introduction which sets the scene for community engagement and the role of education in an energy transition scenario. It defines the objectives, outlines partner contributions, and explains the structure of the report. **Chapter 2** delves into Intergenerational Learning (IGL) in Energy Communities through a literature review. First, we present the research gap in this area, the literature review methods employed, and a discussion of the results. This includes defining IGL, understanding its processes related to environmental issues, energy communities and the energy transition, and exploring educational approaches that can enhance these intergenerational transfers. **Chapter 3** focuses on Serious Games and Gamification for Sustainability, presenting an overview of the topic, as well as the main concepts and definitions, which will be a basis for further actions and research within the RESCHOOL project.

In **Chapter 4**, the report proposes a pedagogical framework and a learning unit for boosting intergenerational transfers. This section includes a justification of the learning unit based on scientific evidence, it states the learning objectives, key competencies and basic skills of the proposal, and it presents the learning unit sequence, as well as the training materials. **Chapter 5** addresses the implementation process of the pedagogical proposal, identifying barriers and opportunities. It outlines the general steps of implementation and provides insights from the application of these steps in the Girona pilot in RESCHOOL, including the adaptation of educational resources, training for teaching staff, and the application of surveys. Finally, **Chapter 6** integrates some concluding notes, reflecting on the insights gained and the potential implications of the findings.

The report closes with Chapter 7, listing Acronyms and Abbreviations, Chapter 8 with References, and a final section with the Annexes.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

2 Intergenerational Learning and Energy Communities

2.1 Research Gap on Intergenerational Learning in the Energy Transition

A review of the state of the art on intergenerational learning in energy communities is strategically oriented towards the development of a novel pedagogical approach for energy communities in Europe, as well as innovative policy proposals to encourage and support public and citizen engagement and the creation of energy communities. While there have been several recent attempts to develop energy community frameworks (i.e. Lindkvist et al., 2024), no specific literature reviews have embodied intergenerational learning and transfer as a main focus.

The literature review undertaken had two specific sub-objectives:

1. To locate and situate the existing knowledge on intergenerational learning and processes related to energy communities and, more broadly, to energy transitions and eco-social transformations.
2. To identify the main educational approaches to promote intergenerational transfer outside schools, both at household and community levels and to identify the key elements.
3. Identify the most successful research approaches and designs for collecting and analysing relevant data to determine the impacts, barriers and opportunities of intergenerational learning processes.

2.2 Methods

To present readers with an up-to-date overview of current knowledge on intergenerational learning in the field of energy transitions and energy communities, including potential areas for future research, we have conducted our study as a "state-of-the-art review" (Grant & Booth, 2009). In this part, our focus was not on conducting a comprehensive or exhaustive search, but on presenting a broad vision of the existing knowledge, detecting gaps and future lines of research and documenting learnings and practices on specific topics.

These specific themes, linked to the specific objectives of the literature review, were

a. Defining intergenerational learning and its basic elements, particularly concerning school and formal educational settings.
b. Identification and description of evidence-based educational or pedagogical interventions to promote and support intergenerational learning.
c. Research designs and methods for testing and analysing intergenerational transfers.

Regarding the selection criteria for the final sample of papers for review, empirical research papers were prioritised, although a few relevant review papers were included as useful tools to detect relevant literature out of the initial search results. As for the methods, the literature review employed a multi-stage search strategy. Initially, electronic databases were used as primary sources for literature collection. The databases used were Google Scholar and Science Direct.

The search was conducted using a combination of appropriate keywords, particularly focusing on intergenerational learning, intergenerational influence/effects, energy behaviour, nudges, and environmental behaviour. Boolean operators ("AND", "OR") were used to combine these terms, enhancing the search's precision and relevance for our study. In this first stage, the time frame for the literature was not defined as a way to capture all the relevant entries directly or indirectly connected to our topic without period restriction.

The initial search yielded 46 relevant empirical papers. From this initial set of literature, a manual screening was carried out through abstract revision and analysis of the main section of the manuscripts (including methods and conclusions) , resulting in a final selection of 27 papers for the final review.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

2.3 Results and Discussion

2.3.1 Intergenerational Learning: a Definition

The concept of learning across generations has been extensively explored in a variety of studies (Martins et al., 2019; Stephan, 2021), focusing on the transfer of knowledge and practices across age groups within families and, less often, within communities. Intergenerational learning can be defined as:

> *Intergenerational learning arises from activities which purposely involve two or more generations with the aim of generating additional or different benefits to those arising from single generation activities. It generates learning outcomes, but these may or may not be the primary focus of the activity. It involves different generations learning from each other and/or learning together with a tutor or facilitator* (Thomas, 2009, p. 5).

Schmidt-Hertha (2014) identifies three key principles for such learning within families: intergenerational understanding, mutual exchange, and shared commitment. Stephan (2021) contributes to this conceptualization, adding a fourth principle to the initial three, that focuses on the role of relationship building in developing strong relationships among family members. Following this perspective, intergenerational learning typically involves the older generation passing on social and cultural knowledge to the younger generation (Newman & Hatton-Yeo, 2008; Wang, 2022). This concept has evolved to encompass two-way learning or collaborative learning between at least two generations (Bottery, 2016). In the same vein, authors such as Watts (2017) argue for the need for a multigenerational approach to learning rather than intergenerational learning, which often limits the focus to just two generations. Other authors such as Boström & Schmidt-Herta (2017), emphasise that intergenerational learning goes beyond just intergenerational interaction. It acts as a two-way channel for the transfer of knowledge, skills, attitudes, and practices, flowing from younger to older generations and vice versa. This learning process is shaped by interactions in these educational contexts and is intricately linked to the development of intergenerational relationships.

Thus, intergenerational learning in the context of energy communities refers to the process where knowledge, skills, and values related to energy—such as renewable energy sources, energy efficiency, and sustainable practices—are shared and transmitted between different generations within a community. Whilst this concept recognizes that each generation has unique experiences and perspectives that can contribute to a more comprehensive understanding of energy issues, the RESCHOOL project emphasizes that younger people, often more attuned to new technologies and contemporary sustainability practices, can educate through shared knowledge older generations about innovative energy solutions, digital tools for energy management, and modern sustainable practices.

Our approach is also aligned with the argument that intergenerational relationships play an important role in developing and maintaining trust, especially in an era of rapid decline in trust and social capital. Intergenerational learning and education is seen as an important force in bridging this divide, paving the way for further cooperation and trust between younger and older generations (Kaplan, Sánhez & Hoffman, 2017; Schmidt-Hertha, Krašovec, & Formosa, 2014).

2.3.2 Intergenerational Learning Processes related to Environmental Issues

Focusing now on environmental knowledge and environmental education in the broadest sense, the so-called 'science capital' is key to building environmentally conscious societies. Science capital can be defined as the sum of all science-related resources (capital) that a person builds up over the course of his or her life (Archer et al., 2015). This includes their knowledge of science, their opinions about science, the people they know who understand science, and their daily engagement with science (DeWitt, Archer & Mau, 2016, cited by Gilleran et al., 2021). Despite its importance, and now turning to the more specific area of energy as a dimension of science capital, current knowledge of how energy systems work is inadequate (Martins et al., 2020). A comprehensive

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

understanding of resource-related science capital is needed, which should include not only knowledge but also everyday practices and engagement tools, in line with Shove & Walker's vision that energy demand and energy behaviour are the result of social practices (2014).

The origins of intergenerational learning on environmental issues date back to the early 1990s (Duvall & Zint, 2017). Pioneering research by Shuterland and Ham (1992) examined the transfer of knowledge from children to parents through environmental education programmes in Costa Rican schools. Uzzel (1994) further explored this transfer of knowledge from children to parents, emphasizing the role of children in promoting environmental action. Initially, intergenerational learning was recognised for its ability to transfer knowledge, but it soon became clear that it could also lead to changes in environmental practices and increase community participation (Uzzell, 1994). Such learning occurs not only with families but with children in their communities It can empower, educate and motivate (Vaughan et al., 2003). Although this learning often occurs informally, school-based activities can significantly increase its impact (Istead & Shapiro, 2014), making educational contexts important for such programmes.

While previous research on younger to older intergenerational transfers has primarily examined knowledge transfer from children to their parents, some studies have extended their work to include other community members such as elders, grandparents and neighbours (D'Abundo et al., 2011). This inclusive approach recognises the potential for intergenerational learning to extend beyond the family unit and facilitate local change (Vaughan et al., 2003). However, it is clear that research on intergenerational learning about the environment is diverse and uses a range of methodologies, including quantitative (e.g. Vaughan et al., 2003; D'Abundo et al., 2011; Boudet et al. et al. 2016; Gill & Lang, 2018) and qualitative (e.g. Lawson et al., 2019; Mikami et al., 2022) methods. Although quantitative methods are robust, mixed methods provide a comprehensive perspective and allow data to be triangulated for a better understanding of intergenerational effects. To deepen the research done in the field of intergenerational learning from an environmental perspective, we refer to existing published work on literature reviews on the topic (Duvall & Zint, 2017), albeit we also refer to more general literature reviews on intergenerational learning programmes not only focused on environmental issues (Martins et al., 2019; Stephan, 2021).

2.3.3 Intergenerational Transfers from Children to Older Generations: Which is the Best Age Period for Children?

Reviewing which age is best for intergenerational transfers from children to older generations is important in order to carry out such transfers more effectively. In this part of the report, we review the literature on this specific issue from the point of view of the younger generation, which is the one triggering the transfer of knowledge. What we see is that most studies focus on children in elementary and early secondary schools, typically between the ages of 6 and 14 (see Table 2). This age group includes elementary school children (from third through fifth grade) and middle school students. However, some studies point out how more specific age ranges might be the most successful ones, like the period from 6 to 10 years according to Isabelle (2011).

Furthermore, some studies, such as those of Isabelle (2011), Chineka & Yasukawa (2020) or D'Abundo et al. (2011) included multiple populations, covering both young adults and other age groups. This diversity suggests an intergenerational learning component that can be applied to many different ages. For example, Deng et al. (2022) affirm that children around 7-8 years old are more likely to discuss environmental concerns with their parents than older students. On the contrary, authors like Agarwal et al. (2017) highlight how teenagers' nudging impacts are more stable than school children's. Despite the diversity, the reviewed studies suggest that primary school and early years of secondary school are the best time to implement such programmes. During these years, students have a critical period in their education where foundational knowledge, attitudes, and behaviours are formed (Otto et al., 2019). Introducing intergenerational learning at this stage can contribute to a deeper understanding and respect for different perspectives, and encourage empathy and social skills, which are important in education and later in life.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Table 2 IGL Studies and participants age

Reference	Participants' Age
Vaughan et al. (2003)	8-10 years old (third and fourth graders)
Duvall & Zint (2007)	6-12 years old
D'Abundo et al. (2011)	College students (typically 18-22 years old)
Isabelle (2011)	Broad range (children to adults)
Boudet et al. (2016)	9-11 years old (fourth and fifth graders)
Agarwal et al. (2017)	7-17 years old (primary and secondary schools)
Williams et al. (2017)	7-9 years old
Dutta & Chandrasekharan (2018)	13-14 years old (grade VIII students)
Gill & Lang (2018)	9-11 years old (fourth and fifth graders)
Lawson et al. (2019)	10-14 years old (middle school children)
Chineka & Yasukawa (2020)	14-18 years old
Deng et al. (2022)	7-8 years old
Jaime et al. (2022)	9-10 years old (fourth-grade students)
Mikami et al. (2022)	13-18 years old.
Gilleran Stephens et al. (2021)	7-10 years old
Harmon & Gauvain (2019)	10-11 years old (fifth graders)
Istead & Shapiro (2014)	10-12 years old
Williams et al. (2017)	7-9 years old

2.3.4 Evidence-based Educational Approaches to Boosting Intergenerational Transfers

Intergenerational learning (IGL) plays an important role in promoting environmental awareness and social change. Educational interventions designed to promote intergenerational learning are increasingly recognised as effective and are gaining policy prominence. These interventions, as described by Lawson et al. (2019) and Duvall & Zint (2007), focus on local issues to ensure relevance and engagement. Parental and community involvement in educational activities is essential, for example through joint action activities, as suggested by Datta & Chandrasekhara (2018).

Different approaches to learning activities are also recommended. Williams et al. (2017) emphasise the importance of action and service-learning activities[2], while Mikami et al. (2022) argue that experiential activities are meaningful teaching tools to promote intergenerational processes. Serious games, such as the examples proposed by Ypsilanti et al. (2014), can also significantly enhance IGL if certain criteria are met by the gaming projects such as personal relevance of the contents, authentic context, access to information and clear, and

[2] Service-learning, as a pedagogical approach, integrates experiential education with community service, enabling students to develop academic, social, career, and personal skills through active participation in thoughtfully organized service projects within the community (Wade, 2008; Furco, 1996).

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

measurable objectives. It should be noted, returning now to a more general approach to learning strategies, that one-day or short-term activities are less effective than long-term instructional programmes in ensuring student retention and engagement (Deng et al., 2022).

In terms of nudging as a behaviour change mechanism, Agarwall et al. (2017) note the potential intergenerational effects of nudging from children to parents, particularly at the primary and secondary school stages. However, the effectiveness of nudging varies and depends on several factors, including the socio-economic status of the household. For example, it is less effective for low-income families living in buildings that are less energy-efficient and higher-income families living in buildings with more energy-efficient homes (Agarwal et al. 2017).

Sociocultural factors also play an important role in the success of these educational interventions. Cocco-Klein & Mauger (2018) discuss how children's leadership can be a way of accessing other vulnerable groups, such as the disabled and the elderly, who are disproportionately at risk in the context of environmental crises. In addition, Chineka & Yasukawa (2020) argue that there is a need to consider the impact of cultural resistance and parental strategies in the development of educational programmes, as they directly affect their effectiveness. Finally, Freeman et al. (2020) show that informal intergenerational educational relationships between those with pre-existing relationships may be more effective in terms of knowledge and information exchange.

2.3.5 Methods for the Study of Intergenerational Learning Processes

Reviewing the different methods for the study of intergenerational learning processes is important as they offer various ways in which research designs and methods are used in the field of investigating intergenerational transfers. Qualitative and mixed-methods approaches are predominant and they mainly collect data through personal and qualitative interviews. These interviews are usually more centred on individual perceptions rather than the power of community and/or intergenerational interactions (Isabelle, 2011; Williams et al., 2017; Dutta & Chandrasekharan, 2018; Williams, 2017). Some qualitative investigations include discussion and focus groups with parents or children separately (Freeman et al., 2020; Chineka & Yakusawa, 2020).

Nonetheless, we also find some studies based on a quantitative approach. These studies mainly use two types of data. The majority of investigations use survey data, normally with a pre-test and post-test, to measure impacts and changes on knowledge, perceptions and practices (Vaughan et al., 2003; D'Abundo et al., 2011; Boudet et al., 2016; Lawson et al., 2019; Salazar et al., 2022; Mikamo et al., 2022; Wang et al., 2022). The second main type of research data is consumption or direct data from the utilities (Gill & Lang, 2018) or direct data from the households through school projects and activities (Deng et al., 2022).

Further, there is also a significant amount of studies on intergenerational learning in the environmental field that uses experimental or quasi-experimental research designs to measure the impacts of IGL (Vaughan et al., 2003; D'Abundo et al., 2011; Boudet et al., 2017; Agarwal et al., 2017; Gill & Lang, 2018; Lawson et al. 2019; Deng et al., 2022; Salazar et al. 2022). This type of research provides useful examples of tools and methods for analysing the success or otherwise of educational programmes and interventions in very specific contexts. However, as is widely recognised in the social sciences, experimental and quasi-experimental methods are difficult to evaluate in terms of controlling for variables, because people and communities always act and behave in real social contexts in which the intervening factors are not controllable (Falk & Heckman, 2009).

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

3 Serious Games and Gamification for Sustainability

So far, we have seen in the previous chapter how the previous literature has explored and analysed the potential of intergenerational learning and impact through active pedagogical methods. As we have seen, the use of games and gamification tools is one of the ways in which these intergenerational transfers can be facilitated (Ypsilanti et al., 2014). In this section, we focus on how serious games and gamification approaches can become strategic and useful tools to work and progress towards a more sustainable future.

As we mentioned in the introduction, the RESCHOOL project aims to increase and promote citizen participation and engagement in energy communities through various strategies, of which serious games are one. Although this is not the main focus of this report, we feel it is necessary to introduce some key concepts and definitions on this topic in order to establish a common ground for building future knowledge and innovative practices within the RESCHOOL project.

Various strategies have been implemented to enhance public awareness of environmental issues, encourage citizens' adoption of pro-environmental behaviours and active engagement in the clean energy transition. One of the increasingly employed strategies involves the creation and utilisation of serious games and gamification approaches (Huttunen et al., 2022).

> **Games** are defined as "systems in which players engage in an artificial conflict, defined by rules, that results in a quantifiable outcome" (Katie Salen Tekinbas & Eric Zimmerman, 2003) and have been recognized as a crucial aspect of human culture and society and promote motivation and engagement (Bozkurt & Durak, 1 C.E.).
>
> **Serious games** are defined as "games or game-like interactive systems designed with the primary purpose of providing an engaging, enjoyable context in which users can learn, practice, and master educational, professional, or problem-solving content" (Michael & Chen, 2006)
>
> **Gamification** is defined as "the use of game design elements in non-game contexts to engage and motivate individuals, solve problems, improve user experiences, and drive desired behaviours" (Lee & Hammer, 2011).

In recent years, game-based learning has gained recognition as potentially more effective than conventional teaching methods, such as lectures and discussions, in engaging students, promoting recall, and understanding, cultivating higher-order thinking, and facilitating the retention and transfer of practical skills (Hallinger et al., 2020). Meta-analysis studies have highlighted the encouraging and widely positive impact of gamification as a learning strategy (Hamari et al., 2014; Majuri et al., 2018) and identified additional pathways to increase the effectiveness of game-based learning strategies. Games offer 'designed experiences,' enabling players to learn by actively engaging in activities and experiences rather than passively absorbing information from readings and traditional lecture formats10. This holds significant potential, as it has been demonstrated that firsthand experience serves as a more effective teacher compared to exposure to information, thanks to the emotional pathways it triggers (Wu & Lee, 2015).

Serious games and gamification have been effectively employed in different sectors, including healthcare (Sardi et al., 2017), and business (Wünderlich et al., 2020). They have also been widely identified as an effective tool in the field of sustainability. More specifically, they have been used to educate players about sustainability concepts, environmental issues, and social challenges, to encourage sustainable practices such as recycling, energy conservation, and sustainable consumption, to engage users in sustainability issues and motivate them towards taking action and in some cases, these games are used to collect data on user behaviour and preferences for sustainability research (Prestopnik & Crowston, 2011). Different types of mediums have been

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

used to develop serious games and gamification strategies for sustainability including digital games on various platforms (PC, consoles, mobile devices), board/card games, mobile apps and VR/AR applications. Furthermore, the creators have adopted several design principles, which span from those that are more universally applicable to others that are context-specific (Krath & von Korflesch, 2021).

It is crucial to design these games and gamified systems in a way that they are not only engaging but also accurately convey the complexity of sustainability issues. The design should not oversimplify or trivialise the complexity of environmental, social, or economic issues related to sustainability. Instead, it should strive to present a nuanced and realistic portrayal of these challenges, allowing players to gain a deeper understanding of the complexities involved. Moreover, it's important to actually make them gameful and engaging by integrating more game mechanics (Beck et al., 2019).

Pandemic[3] is an example of a very popular serious game for sustainability, as it simulates the global outbreak of four deadly diseases and the efforts to contain them. The game aims to educate players about the causes and consequences of pandemics, as well as the strategies and challenges of preventing and curing them. The game also fosters collaboration, communication, and coordination among players, as they work together as a team of specialists with different roles and abilities.

Daybreak[4] is another example of a serious game for sustainability, as it simulates the global response to climate change. The game aims to inspire players to imagine and create the technologies and societies that can help mitigate and adapt to the climate crisis. Players collaborate, communicate, and negotiate with each other as different regions and countries with various traits and goals. The game reproduces the real-world problems and uncertainty of handling climate change, and the necessity of coordination and commitment.

An exemplary application of gamification is the development of energy management platforms that employ game mechanics to provide users with real-time feedback on their energy consumption. Through interactive interfaces, users can track and optimise their energy usage, turning the process into a rewarding and enjoyable experience. Features such as personalised challenges, progress tracking, and virtual rewards create a sense of achievement and motivation, encouraging consumers to adopt energy-efficient behaviours. Additionally, social sharing elements and friendly competitions further amplify consumer engagement, transforming energy conservation into a communal effort. The game mechanics used in these applications include feedback, levels, social sharing, points, rewards, tips, challenges, rankings, avatars, leaderboards, points, user-generated content, and badges (Johnson et al., 2017).

RESCHOOL is developing and applying several gamified strategies in different pilots, targeted to the members of the energy communities or the public outside of the energy communities. The mobile apps for the real-time feedback of energy community members, led by OPENREMOTE (OR) and Local Life (LCLF), include a variety of gamification elements. A serious mobile app game with the same engagement goal is also being co-designed under T2.2, led by Utrecht University (UU). The aforementioned approaches will be all , presented, analysed and compared in the upcoming WP2 deliverables. In addition, a serious card game for the wider public engagement, outreach, and expansion of the energy communities is being co-designed under T2.3 and will be presented in D2.2. Finally, D2.2 will also include a template targeted to energy communities that would like to assess or develop gamification options for public engagement.

[3] The Conversation. (2020, April, 29). Playing Pandemic - the hit board game about the very thing we're trying to avoid. *The Conversation*. https://theconversation.com/playing-pandemic-the-hit-board-game-about-the-very-thing-were-trying-to-avoid-137009

[4] https://www.daybreakgame.org/

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

4 IGL for Energy Communities: a Pedagogical Proposal

4.1 Introduction

Energy communities are understood as collaborative projects for the shared production and consumption of renewable energy and this educational proposal, which is part of the RESCHOOL project, an innovation initiative funded with European funds to encourage the creation, growth and governance of energy communities. As mentioned in section 1.3, two important aims are to develop educational materials and teaching methods that promote intergenerational learning about energy transitions and energy communities, and to propose a research design to collect and study data on how people from different generations share and transfer knowledge and skills. These objectives are in line with previous findings and the extensive literature review reported in Chapter 2.

In order to accomplish these objectives, we first develop the proposed educational activity for schools as a learning unit to promote intergenerational transfer and impact to improve knowledge and participation in energy communities and, second, we propose a research design to capture how these intergenerational impacts occur in order to assess the level of success of the educational strategies. The teaching unit is designed for the third cycle of primary education or the first year of high school (that is, for children between 10 and 12 years old). The activities on energy communities are understood from the perspective of the relevance of community projects to advance the energy transition and sustainability. In addition, a key feature of the unit is its modular structure, which allows each school to choose to implement the whole unit or to shorten it by implementing only some of its modules.

The full version of the teaching unit "Creating Energy Communities" can be accessed via Annex 1.

4.2 Scientific Background and Preliminary Studies

In this section we present the ground and foundation from where we build our pedagogical intervention proposal in schools. As we have seen in the results section of the literature review on IGL, experiential activities are key for the success of intergenerational transfers from younger to older generations.

Our proposal is based on experience-oriented approaches where pedagogical theatre strategies are used as a pedagogical tool. In particular, the proposal is built from a "process theatre" approach. It focuses on the process or activities involved in the development of the play and not so much on the final result and takes different ways of approaching theatre from a 'process' perspective. For instance, it is possible to provide a partially developed script for further development or simply provide some introductory information to stimulate the imagination of the participants (Curtis et al., 2013). A positive element for prioritising process theatre over other approaches is that it allows for different learning styles to be combined, thus facilitating inclusive and meaningful learning processes. Our methodological approach follows previous experiences that incorporate theatre as a pedagogical tool in connection with environmental education (Wake & Birdsall, 2020; McNaughton, 2004, 2014).

Some interesting details about theatre as an educational tool is that it allows for the incorporation of essential elements from the field of sustainable development into the learning process:

- The ability of students to move from particular aspects (the specific history) to a more general view linked to the real world and complex problems (McNaughton, 2014).
- The ability of students to empathise with different visions and situations in the real world through their own experience (McNaughton, 2014).

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

- The opportunity to explore and evaluate different ideas and perspectives (Caldwell, 2011; McNaughton, 2010).

Although using theatre as a pedagogical strategy does not necessarily seek to provide answers or a direct result, it facilitates and encourages engagement and involvement through the formulation - implicitly or explicitly - of appropriate questions and critical thinking (Eaves, 2014; Chamberlain et al., 2018). In addition to the introduction of process theatre strategies to the pedagogical proposal, the activities of our learning unit also incorporate an element of "artificial intelligence literacy" (Ng et al., 2021). Generative artificial intelligence is defined as "the field of science which studies the (fully) automated construction of intelligence" (van der Zant, Kouw & Schomaker, 2013).

While it is still a relatively new field of study, previous work has already given evidence of the potential of incorporating artificial intelligence tools at the primary school level, highlighting both the challenges and opportunities this offers at the pedagogical level (Rizvi et al., 2023). Some authors point out that the introduction of generative artificial intelligence tools, such as the already well-known ChatGPT in its various versions, among others, will 'revolutionise' both the way we design and implement learning activities (Ruiz-Rojas et al., 2023). Using a critical standpoint, our proposal incorporates generative artificial intelligence in a dialogical way through activities that allow students to interact through questions with generative artificial intelligence tools to facilitate the conversation and co-create knowledge and learning (Rospigliosi, 2023).

4.3 Learning Objectives of the Learning Unit

In the following lines we expose the four learning objectives of the learning unit 'Creating Energy Communities':

1. To learn the basic structure and functioning of a local energy community.
2. To identify and recognise the different actors involved in the creation, functioning and decision-making processes in local energy communities.
3. To explain the individual and collective benefits of participating in an energy community.
4. To gain expertise in the critical use of artificial generative intelligence tools with natural language to co-construct knowledge and learning on the topic of energy communities..

4.4 Key Competences

In this section we focus on the key competences that are expected to be integrated through the implementation of the unit in schools. In order to do this, we have chosen a common framework as a reference while bearing in mind that this unit should be applicable to any European context regardless of whether or not they are part of the RESCHOOL project.

In May 2018, the Council of the European Union established a comprehensive framework outlining key competencies necessary for lifelong learning in the rapidly evolving global landscape. This framework, detailed in the Council of the European Union Recommendation on 'Key competences for lifelong learning' (European Commission & Directorate-General for Education, 2019), identifies eight areas of competence relevant for personal development, active citizenship, employability, and social inclusion. Among these, the framework emphasises the importance of digital competence, citizenship competence, and a robust understanding of science, technology, and engineering. These competences collectively seek to build an environment where individuals are equipped to navigate digital landscapes, critically assess the impact of human activities on the environment, and engage with technological advancements ethically and sustainably.

According to the document on key competencies for lifelong learning, as a common document of reference for all countries in the European Union, this teaching unit is aligned with the following competences:

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

- **Digital Competence:** This involves the confident,critical, and creative use of Information Society Technologies (IST), as well as an understanding of the digital world, which is essential for describing and exchanging ideas on technological or digital problems. This also involves an understanding of the ethical principles and practices of the digital world, which is essential for using technology ethically and sustainably.
- **Citizenship Competence:** This involves an understanding of the concepts of democracy, justice, equality, citizenship, and civil rights. It includes critical thinking and integrated problem-solving skills, which could relate to understanding the consequences of human intervention in the environment.
- **Science, Technology, and Engineering Competence:** This involves an understanding and knowledge of the natural world, which is fundamental for interpreting changes in the environment.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

4.5 Didactic Sequence

As we mentioned at the beginning of this section, the 'Creating Energy Communities' unit has a modular structure, which implies a high degree of flexibility in terms of combining activities and adapting them to educational contexts. In this line, we propose two pre-configured options for the implementation of the unit: an option designed to be implemented in four or more sessions and a shorter option to be implemented in two sessions.

Option A: Teaching Unit of 4 Sessions

Table 3 Didactic sequence – Option A

Session	Duration	Description of the activity	Social organisation	Materials and resources

Teaching session 1	50'	• Activity 1 Preliminary ideas on energy communities
		• Introduction of key concepts:
		  ○ Energy transition and renewable energy sources
		  ○ Local energy communities
		  ○ Examples of energy communities
		  ○ Key actors in the creation of energy communities
		• Introduction to the educational theatre activity
			Classroom	• Presentation with the contents
				• Computer and projector

Teaching session 2	50'	• Introduction of the key characters and possible roles. • Activity 2 Initiation of the work on characters and potential dilemma situations.	Cooperative groups of 5-6 students	• Activity cards of the characters, positions and points of view of the agents involved, and scenes and dilemmas.
Activity at home	15'	• Activity 3: Activity at home.	Individual (with the support of families)	• Worksheet
Teaching session 3	50'	• Activity 4: Introduction of the activity to create a dialogue between the characters in a specific setting. Exploration of Examples. Creation of a brief script to respond to the dilemmas presented. • Activity 5: Guided activity to recreate an alternative script to the one proposed by the students with an AI. Small group exercise to compare the two scripts. The group	Cooperative groups of 5-6 students.	• Computers and internet connection. • Projector • Generative AI App: ChatGPT

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

		must choose the script they think is more plausible or appropriate (self-created script, AI script or a hybrid proposal).		

Teaching session 4	50'	• Activity 6: Performance of the theatre scenes by the students. This performance will be combined with discussing the script with the rest of the class.
		Debate activity:
		  • The different groups have generated different scripts depending on the actors involved and their positions.
		  • Human-created scripts .vs. AI-created scripts.
		• Activity 7: Time for reflection: What have we learned?
			Classroom	• Guide for the debate
				• Evaluation rubric

Option B: Teaching Unit of 2 Sessions

Table 4 Didactic sequence – Option B

Session / Activity	Duration	Description of the activity	Social organisation	Materials and resources
Session 1	25'	Activity 1: Introduction to key concepts and key actors in Energy Communities	Classroom	Annex 1 and Annex 2
	25'	Activity 2: Actors involved in Energy Communities	Cooperative groups of 5-6 students.	Annex 3
	10'	Reflection and debate	Classroom	
Activity at home	15-20'	Activity 3: How do neighbours position themselves?	Individual (with the support of families)	Annex 4
Session 2	5'	Wrap-up of the results of the activity at home and discussion	Classroom	
	20'	Activity 4: Let's create a dialogue!	Cooperative groups of 5-6 students.	Annex 5
	35'	Activity 6: Let's do some theatre!	Classroom	

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Activity at home	10'	Self-evaluation (adaptation of Activity 7)	Individual	Annex 6

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

4.6 Assessment: Criteria and Instruments

The proposal assessment criteria to evaluate the achievement of basic competencies and skills are as follows:

Table 5 Assessment criteria

Digital Competence	1. *Information Management:* Evaluate and select appropriate information from diverse digital sources, ensuring the reliability of the content based on the source and author's credibility. 2. *Resource Use:* Employ digital devices and resources effectively for information analysis, organization, and communication. 3. Digital Communication: Utilise digital tools to articulate ideas, share learning outcomes, and engage in discussions, emphasizing clear and reasoned argumentation.
Citizenship Competence	1. *Eco-Social Analysis:* Critically assess human interventions, formulating well-reasoned opinions and actively participating in addressing and resolving eco-social challenges. 2. Adopt a *critical perspective* towards widespread societal attitudes, particularly in terms of equality and gender, analyzing diverse models and advocating for non-discriminatory practices.
Science, Technology, and Engineering Competence	1. Examine the *historical impact* of technological activities on society and the environment, evaluating both positive contributions and potential impacts in the context of sustainable development. 2. Engage with *emerging technologies in an ethical and responsible manner*, identifying their advantages and shortfalls in contributing to well-being, social equality, and environmental sustainability.

The assessment of the learning unit is structured around the assessment criteria defined above. In the following lines, we detail the evaluation tools to be implemented.

The evaluation instruments to be used are:

- Classroom monitoring and observation by the teacher or teaching team
- Follow-up of the interventions and activities carried out by each student and in small groups by the teacher or teaching team.
- Self-assessment and co-assessment of group work through a final activity.

These assessment instruments are supported by two didactic support materials. On the one hand, there is a proposal for an evaluation rubric for teachers as support material for the activities of classroom monitoring and observation. In addition, a self-assessment and co-assessment guide (Activity 7 in the learning unit) is provided for students through a specific activity which is accompanied by supporting didactic material to guide the individual and group reflection processes on their own learning.

4.7 The Research Process

In parallel with the implementation of the pedagogical proposal, the University of Girona coordinates the data collection for the research through short online surveys related to the educational activity proposal on energy communities. The analysis of this information allows us to assess to what extent the activities and interventions carried out in schools have an impact on the knowledge and practices of families.

The research process consists of 6 sequential steps (see Figure 1). The first step includes a research process design phase in which the data collection instruments (in particular the survey design and the questionnaire)

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

were created. This process was informed by the findings from the literature review on intergenerational learning research presented in Chapter 2 of this report.

In the second step, the data collection begins with the application of a pre-intervention or baseline survey, with the aim of collecting data on the initial situation of the households, before being affected by the educational intervention. The quantitative data from the baseline survey serve as a reference point for evaluating and measuring intergenerational effects and learning.

This step is followed by the educational intervention through the implementation of the learning unit in schools. The implementation of the pedagogical proposal is carried out directly by the teachers of the participating schools. In this phase, the team's role is to provide support and to monitor the implementation of the training that involves the children. An important task is to maintain consistency in the pedagogical methods used in the schools and pilots for research coherence.

This is followed by a fourth step of data collection. In this step, we collect data on aspects equivalent or corresponding to those covered in the first survey through a post-intervention survey. The aim of this second survey is to collect information well suited for comparison to the results from the baseline survey to validate whether and to what extent intergenerational transfers related to energy communities exist. The survey will mainly collect information on the attitudes and behaviour of the older generation to assess if there are changes in the older generation with respect to the results of the baseline survey caused by the effects of the educational intervention on children.

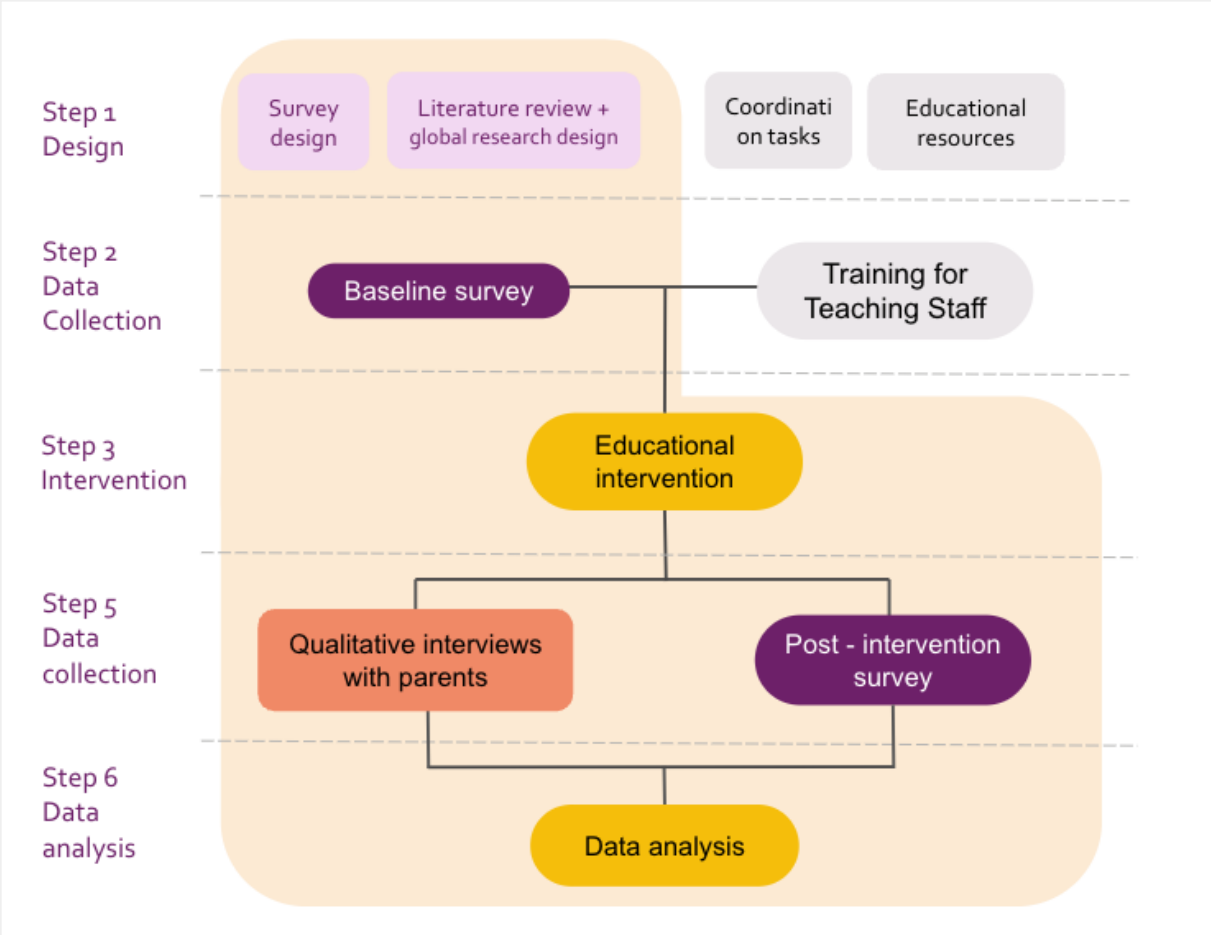
This quantitative approach will be complemented with qualitative data collected through face-to-face interviews with selected volunteer participant households[5]. These interviews may take place in the home and may involve not only parents or adult family members, but also children. The main objective of this data collection technique is to gain meaningful insights into how the older generation receives the message from the younger generation and what factors motivate their positive and negative reactions. The final step is to analyse the data. The data analysis will include descriptive and inferential statistical analysis for the quantitative data collected through the two surveys, and content and thematic analysis of the personal interviews. There will also be a phase of triangulation of the different types of data to ensure the consistency and coherence of the results obtained (Mertens & Hesse-Biber, 2012).

The primary data collected in this process will be supplemented with quantitative contextual data. At this stage, once the final selection of schools has been achieved, demographic data on the age and gender structure of the communities participating in the programme through the schools is collected. If this data is not readily available at the municipal level, it will be collected at the regional level.

[5] Volunteer families and households who have agreed to participate in the qualitative interview phase and have expressed this in the post-intervention survey.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Figure 1 Research Process



5 Implementation Process: Barriers and Opportunities

5.1 General Steps of Implementation

This section describes, step by step, the process of implementing the pedagogical proposal presented in Chapter 4. The following sections examine how the proposal was implemented in one of the pilot sites of the RESCHOOL project, the Girona pilot site, as a first experience. The information provided in this chapter is based on internal guidelines, know-how and personal experience of the research team coordinating the implementation process. The goal of this section is to identify barriers, opportunities and strategies learned during this first implementation phase that may be useful for further application in other contexts.

The process of implementation is divided in five steps that have been implemented sequentially:

Table 5 Implementation process step-by-step

Step 1	Adaptation of the educational resources Coordination tasks with schools
Step 2	Training for teaching staff
Step 3	*Research: application of survey 1*

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Step 4	Educational Intervention
Step 5	*Research: application of survey 2 and qualitative interviews*

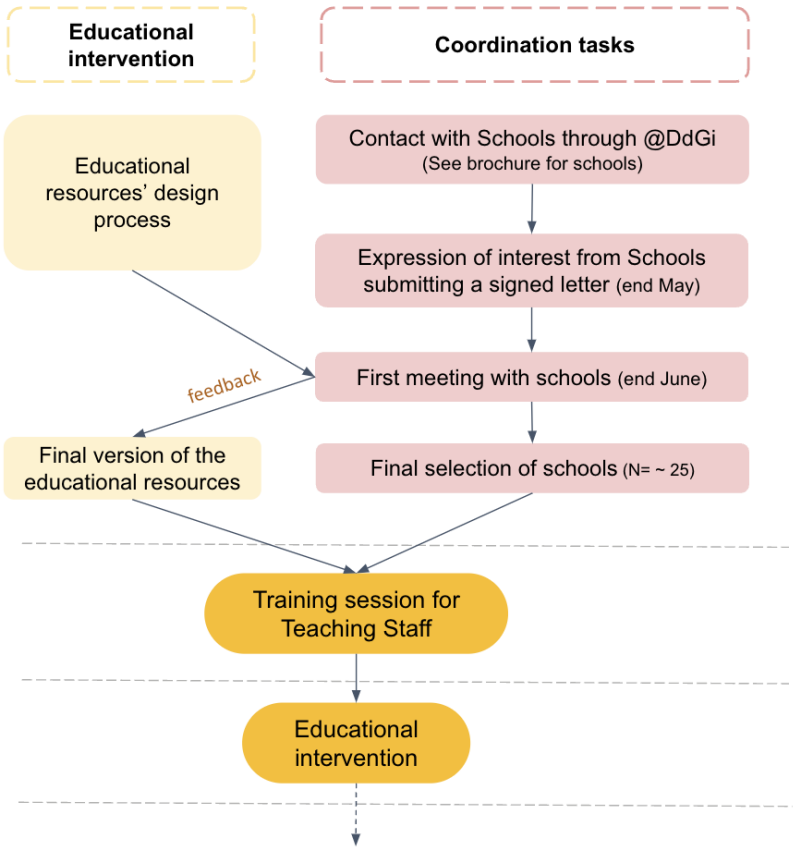
5.2 Application in the Girona Pilot: First Learnings

In this section we present the first lessons learned from the monitoring and analysis of the first round of implementation of the pedagogical programme in schools and educational centres in the Girona pilot area. In the following subsections, we describe in detail how each of the tasks needed to complete the five steps was developed, as well as the barriers and opportunities identified.

5.2.1 Step 1: Adaptation of the Educational Resources and Coordination Tasks

Any implementation process of the pedagogical proposal will need an adaptation phase oriented to translate (if needed), adapt and tailor the materials according to the characteristics of each of the educational contexts where it will be applied. During the initial phase, essential coordination tasks must be carried out to ensure the smooth progression of the program. These tasks involve identifying potential participating schools, establishing communication with schools and, finally, determining the sample of participating schools for each pilot. Each pilot will have its unique requirements regarding the selection of participating schools, coordination of program interventions, and program implementation. The following steps outline the approach taken by the UdG team for the Girona pilot. Similar steps may be necessary to coordinate a similar process for other pilots.

Figure 2 Implementation process for the pedagogical proposal



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

The first stage involved contacting potential participating schools to provide a brief introduction to the project and issue a call for participation. In the case of the Girona pilot, the call for participation was disseminated through the Diputació de Girona, using their usual channels of communication with schools. Additionally, we created an informational brochure for schools, as well as an expression of interest letter for schools to indicate their commitment to participate.

Based on the initial list of interested schools, a first informative meeting was held in June, where project details were explained to the participating schools and the educational materials were presented. Following this initial meeting, additional feedback was collected from the schools to make final adaptations and modifications to the educational materials. After this first meeting, the final group of participating schools was confirmed.

If the number of school-groups would have exceeded an agreed limit during the call of interest phase[6], the final group of participating schools would have been selected through a collaborative process between the University of Girona and the Diputació of Girona. The selection criteria would have prioritized territorial balance, and heterogeneity.

Complementary materials

- The communication and dissemination materials used to contact Schools can be accessed via Annexes.
  - Annex 2: Letter of interest from Schools.
  - Annex 3: RESCHOOL project information brochure for schools
  - Annex 4: RESCHOOL project information brochure for families
- The slides presented in the first informative meeting with Schools and teaching staff can be accessed via Annex 5.

5.2.2 Step 2: Training for Teaching Staff

The second step in the process was to provide training for the teachers. It consisted of an online session with all the teachers who would actually be in contact with the children and directly implement the activities.

The first part of the session focused on contextualising the pedagogical proposal in the framework of the RESCHOOL project as an innovation project, as well as situating the implementation process of the pedagogical proposal in parallel with a research process to gather valuable data on intergenerational transfers between children and adults.

The second part focused on the presentation of the pedagogical proposal and the training materials. In this part of the session, the teachers presented their comments and suggestions for further adaptations.

Complementary materials

The slides used in the training session for teaching staff can be accessed via Annex 6.

[6] Each of the pilots need to establish a limit of schools that can participate in the implementation process. In the case of the Girona Pilot, the agreed number was 25 considering factors such as the capacity of the research team to monitor and provide support in the implementation process, data saturation, and also the human resources available to collect and analyse the data.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

5.2.3 Step 3: Application of Survey 1

As detailed in a previous section, the implementation process of the pedagogical proposal in schools is intertwined with a research process to analyse and assess the impacts of the intergenerational transfers promoted by the pedagogical activities.

Therefore, in this step of the implementation process, and in parallel with the training of the teaching staff, the schools sent an email to the families of the children who would be involved in the RESCHOOL project (i.e. the children who would be part of the groups in which the learning unit would be implemented). In this email, besides presenting again the objectives of the project and informing on the process, a link to the first survey is included. This first survey collects basic data about the family units in terms of their socio-demographic characteristics, as well as their knowledge and practices concerning climate change, energy transition or energy communities. In the first survey, there is also a section dedicated to recruiting voluntary households to be interviewed by the RESCHOOL researchers.

Complementary materials

The Template email body text for the families can be accessed via Annex 7.

5.2.4 Step 4: Educational Intervention

The fourth step consists of the direct implementation of the pedagogical proposal, that is, the different activities, directly in the classrooms. The implementation was the responsibility of the teaching staff of each school, with the external support of RESCHOOL members.

After the implementation of the learning unit, the teachers in charge of the activities are asked to send an email to a RESCHOOL reference person to inform them about any changes, incidents or other problems that may have occurred during the implementation process.

5.2.5 Step 5: Application of Survey 2 and Qualitative Interviews

After the educational activities have been carried out in the classroom, a second survey is sent to the families. The purpose of this post-intervention survey is to obtain data and information to analyse some of the transfer effects of the classroom activities.

In addition, during this final stage, those families who have agreed to be contacted by the research team for a more in-depth interview with one of the researchers are expected to be interviewed.

5.3 Application across RESCHOOL Pilot Cases

This report, and in particular this chapter, has focused on the implementation phase of the Girona pilot project. This phase has served as a fruitful setting for the co-creation of the pedagogical proposal (with the schools and teaching staff of the Girona pilot) and the incorporation of improvements through input from schools. From this first phase of implementation, a process of transferring knowledge, improvements and good practices has been initiated to apply the pedagogical proposal in the remaining RESCHOOL pilots.

In order to enable the replication of the pedagogical proposal, a number of steps were taken. The tasks necessary for the adaptation and transfer of the materials and the didactic unit were listed. An essential first

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

step was to translate the pedagogical proposal into English, as a first step towards translation into each of the languages of the participating countries. During this initial English translation process, the first adaptations were made in order to decontextualise the original proposal (since it was focused on the Catalan context), both in terms of the activity context and the scientific and pedagogical justification. For this purpose, the common European framework of competences was adopted, which, although not obligatory for the Member States, provides a common starting point.

After the initial translation, each of the pilots studied the proposal to continue the adaptation to the cultural, social and educational contexts of the participating countries. To ensure comparability and a minimum of homogeneity, the major changes proposed by the pilots were negotiated with the academic institution coordinating the process, the University of Girona.

The University of Girona has also provided different support and guidance materials in this process of adapting the pedagogical proposal to each of the pilots. On the one hand, there is an implementation guide[7] that describes in a step-by-step manner the different phases of implementation, including the problems, the obstacles and the solutions that were encountered in the Catalan case. This is valuable as it can help to guide those facing similar issues in other contexts. Furthermore, in addition to the proposal itself, all communications such as emails, communication and dissemination materials were translated into English and disseminated.

[7] Internal document of the RESCHOOL project. Not publicly available.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

6 Concluding Notes

This report explores how engaging different generations in promoting energy communities and energy transition practices and behaviours can make a difference, especially from a knowledge-transfer point of view from younger to older generations. To do so, we have proposed several objectives that have been addressed throughout the text. The first objective was to review what has already been written about intergenerational learning, especially concerning energy communities. This goal has been addressed through the literature review described in Chapter 2. The second and third objectives were, on the one hand, to develop an educational proposal to promote intergenerational learning about energy communities, and, on the other hand, to propose an investigation process to analyse how these intergenerational learning and transfers happen. In the following lines we present a few concluding notes on each of the initial objectives.

We begin by highlighting the **importance of intergenerational learning in the context of energy communities.** The value of intergenerational learning (IGL) as a means of transferring and promoting sustainable energy knowledge, practices and behaviours between different generations is underlined by the findings of our literature review on IGL in the energy field. These intergenerational exchanges are particularly relevant from a public policy perspective, as they allow us to broaden the focus of the target population when designing and implementing measures and programmes to advance the energy transition, and in particular to increase citizen involvement and participation in initiatives such as Energy Communities.

A key conclusion of the report is the **strategic role of schools and other formal and non-formal educational contexts**. Schools are identified as key spaces for promoting environmental and energy awareness and, subsequently, for promoting attitude changes regarding the environment and energy. Although intergenerational learning usually takes place informally, schools can boost the potential of IGL (Istead & Shapiro, 2014). Therefore, schools should not be seen as isolated from the community, but rather as mediators and facilitators among different actors in the community, promoting the creation of networks of influence and environmental action. In order for schools to act as community learning centres in a lifelong learning context, it is particularly important to integrate learning on energy from a perspective that views children as active citizens into the curriculum, but also in extracurricular settings. Among others, children's leadership can be understood as a tool to open doors for other groups that are disproportionately at risk in a changing climate, such as people with disabilities and older people (Cocco-Klein & Mauger, 2018).

The second part of the report focuses on the **relevance of designing and implementing innovative educational programmes that promote intergenerational learning** around energy communities, given the important role of schools in intergenerational learning. Building on previous experiences and success stories in the field of intergenerational transfer, a pedagogical approach is proposed that is based on key elements such as experiential education and adaptation to local needs. Following this thread, we highlight the following features as essential to effectively promote intergenerational learning:

1. The **age of the children** participating is important in the process of designing and implementing educational programmes to promote intergenerational learning in the field of environment and energy. According to the literature, it is after the age of seven that children build their environmental attitudes (Deng et al., 20-22; Isabelle, 2011). In addition, there are studies that show the 10-14 years range as most effective (Lawson et al., 2019) to increase the success of intergenerational effects, narrowing down the age range.
2. It is important to incorporate the **local context** into educational activities. This can be done in two ways: by focusing the activities on local issues and concerns (Lawson et al., 2019; Duvall & Zint, 2007), but also by involving parents, relatives and other community members in the dynamics of the activities (Dutta & Chandrasekharan, 2018).
3. The pedagogical approach or methodological philosophy behind the educational activities is also relevant. Research highlights the importance of **action-oriented and experiential activities** (Mikami et al., 2022), for example using service learning approaches (Williams et al., 2017), which can even link

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

innovative pedagogical methods to the local context mentioned in the previous paragraph. Finding strategies to connect children and community in creative and meaningful ways is therefore essential for the success of the learning process and subsequent intergenerational transfer.

As an outcome of these considerations, in this report we propose a pedagogical proposal characterised by the following aspects. It is a flexible pedagogical proposal, with a modular structure that allows it to be adapted to each specific educational context. The diversity of educational contexts in which this pedagogical proposal can be potentially applied is broad: from small schools in rural areas to large educational centres in urban areas. In the same way, the pedagogical proposal, designed for students aged between 10 and 13, can be applied in the last years of primary education (up to the age of 12) as well as in the first year of secondary education.

The pedagogical proposal is provided as a teaching unit that includes all the activities and complementary materials necessary for teachers to adapt and implement the activities on their own[8]. The aim of this pedagogical proposal is to be replicable, which means that it can be used in very different contexts and is not limited to the specific educational context in which it was originally conceived. To ensure this, the pedagogical proposal is presented as modular, flexible and adaptable materials that can be directly implemented by teachers.

Finally, it is important to include in these final reflections the lessons we have learned from the process of implementing the pedagogical proposal in the Girona pilot, which has served as a test field for identifying barriers, obstacles and incorporating improvements.

The first consideration is the difference in pace and timing between the innovation projects of universities and research centres, especially those with external and European funding, which are subject to tight and coordinated schedules, and the timing and schedules of schools. A significant lesson learned is that many schools need wider timeframes and more staggered application in order to properly integrate innovative proposals. This is partly due to the lack of preparation, resources and structures for innovation on the part of schools, which means that participation in this type of project depends more on the willingness of the school and teachers involved than on a strategic commitment to innovation.

It is also relevant to stress the importance of continuous communication and support for schools, both in the initial approach to the proposal and in the process of adaptation and implementation in the specific context. For reasons similar to those mentioned above, teaching teams sometimes do not have the material, human and time resources to adapt the materials completely autonomously. On the basis of this initial learning, the aim is to incorporate tools into the pedagogical proposal that can facilitate this autonomous implementation.

In light of these observations, the importance of diverse contexts cannot be overstated. The Girona pilot has shed some light so far of the various challenges and needs inherent in tailoring educational innovations to suit varied educational landscapes. Each school, with its unique set of resources, cultural backdrop, and institutional priorities, presents a distinct context that demands careful consideration and adaptation of pedagogical strategies. Recognizing and respecting this diversity not only enriches the implementation process but also enhances the relevance and impact of educational innovations with regard to intergenerational transfers on energy communities. It also highlights the need for a flexible, context-aware approach that values the specificities of each educational setting, ensuring that pedagogical proposals do not just fit in but thrive.

[8] Although schools were supported by the research team in the first implementation rounds of the RESCHOOL project, this support was only offered to gain knowledge about the barriers and difficulties in implementation. This information was crucial in improving the structure of the units, activities and support materials to ensure that teachers could implement them autonomously.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

7 Acronyms and abbreviations

Table 6 Deliverable Acronyms

Ex	Example
IGL	Intergenerational Learning
CEC	Citizen energy community
CEP	Clean Energy Package
DSO	Distribution system operator
EC	Energy community
SES	Sustainable Energy System
EE	Environmental Education
RED	Renewable Energy Directive
UdG	University of Girona
DdGi	Diputació de Girona

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

8 References

Agarwal, S., Rengarajan, S., Sing, T. F., & Yang, Y. (2017). Nudges from school children and electricity conservation: Evidence from the "Project Carbon Zero" campaign in Singapore. *Energy Economics*, 61, 29-41. https://doi.org/10.1016/j.eneco.2016.10.014

Angel, J. (2016). Towards energy democracy: Discussions and outcomes from an international workshop. Working Report, 11–12. https://www.tni.org/files/publication-downloads/energy_democracy_workshop_report_for_web-2.pdf

Archer, L., Dawson, E., DeWitt, J., Seakins, A., & Wong, B. (2015). "Science capital": A conceptual, methodological, and empirical argument for extending bourdieusian notions of capital beyond the arts. *Journal of Research in Science Teaching*, 52(7), 922–948. https://doi.org/10.1002/tea.21227

Avelino, F., & Wittmayer, J. M. (2016). Shifting power relations in sustainability transitions: A multi-actor perspective. *Journal of Environmental Policy and Planning*, *18*(5). https://doi.org/10.1080/1523908X.2015.1112259

Bănică, B., Patrício, L., & Miguéis, V. (2024). Citizen engagement with sustainable energy solutions—Understanding the influence of perceived value on engagement behaviors. *Energy Policy*, 184, 113895. https://doi.org/10.1016/j.enpol.2023.113895

Bauwens, T. (2017). Polycentric Governance Approaches for a Low-Carbon Transition: The Roles of Community-Based Energy Initiatives in Enhancing the Resilience of Future Energy Systems. In: Labanca, N. (eds) Complex Systems and Social Practices in Energy Transitions. Green Energy and Technology. Springer, Cham. https://doi.org/10.1007/978-3-319-33753-1_6

Beauchampet, I., & Walsh, B. (2021). Energy citizenship in the Netherlands: The complexities of public engagement in a large-scale energy transition. *Energy Research and Social Science*, 76, 102056. https://doi.org/10.1016/j.erss.2021.102056

Beck, A. L., Chitalia, S., & Rai, V. (2019). Not so gameful: A critical review of gamification in mobile energy applications. *Energy Research & Social Science*, *51*, 32–39. https://doi.org/10.1016/J.ERSS.2019.01.006

Biresselioglu, M. E., Limoncuoglu, S. A., Demir, M. H., Reichl, J., Burgstaller, K., Sciullo, A., & Ferrero, E. (2021). Legal Provisions and Market Conditions for Energy Communities in Austria, Germany, Greece, Italy, Spain, and Turkey: A Comparative Assessment. *Sustainability*, *13*(20), 11212; https://doi.org/10.3390/su132011212

Boström, A. K., & Schmidt-Hertha, B. (2017). Intergenerational Relationships and Lifelong Learning. *Journal of Intergenerational Relationships*, *15*(1), 1-3,. https://doi.org/10.1080/15350770.2017.1260408

Bottery, M. (2016). The Future of Intergenerational Learning: Redefining the Focus? *Studia Paedagogica*, 21(2). https://doi.org/10.5817/sp2016-2-2

Boudet, H., Ardoin, N. M., Flora, J., Armel, K. C., Desai, M., & Robinson, T. N. (2016). Effects of a behaviour change intervention for Girl Scouts on child and parent energy-saving behaviours. Nature Energy, 1(8), 16091. https://doi.org/10.1038/nenergy.2016.91

Boulanger, S. O. M., Massari, M., Longo, D., Turillazzi, B., & Nucci, C. A. (2021). Designing collaborative energy communities: A European overview. Energies, 14(24), 8226;. https://doi.org/10.3390/en14248226

Caldwell, K. (26th July 2011). *Drama as a Teaching Tool*. Teaching through the art. http://teachingthroughthearts.blogspot.com/2011/07/drama-as-teaching-tool.html

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Chamberlain, K., McGuigan, K., Anstiss, D., & Marshall, K. (2018). A change of view: Arts-based research and psychology. *Qualitative Research in Psychology*, *15*(2-3), 131-139. https://doi.org/10.1080/14780887.2018.1456590

Chawla, L., & Cushing, D. F. (2007). Education for strategic environmental behavior. *Environmental Education Research*, 13(4), 437-452. https://doi.org/10.1080/13504620701581539

Chineka, R., & Yasukawa, K. (2020). Intergenerational learning in climate change adaptations; limitations and affordances. *Environmental Education Research*, 26(4), 577-593. https://doi.org/10.1080/13504622.2020.1733494

Cocco-Klein, S., & Mauger, B. (2018). Children's Leadership on Climate Change: What Can We Learn from Child-Led Initiatives in the U.S. and the Pacific Islands? *Children, Youth and Environments*, 28(1), 90-103. https://doi.org/10.7721/chilyoutenvi.28.1.0090

Christensen, K., Doblhammer, G., Rau, R., & Vaupel, J. W. (2009). Ageing populations: The challenges ahead. The Lancet, 374(9696), 1196–1208. https://doi.org/10.1016/S0140-6736(09)61460-4

Curtis, D. J., Howden, M., Curtis, F., McColm, I., Scrine, J., Blomfield, T., Reeve, I., & Ryan, T. (2013). Drama and environment: Joining forces to engage children and young people in environmental education. *Australian Journal of Environmental Education*, 29(2), 182-201. https://doi.org/10.1017/aee.2014.5

D'Abundo, M. L., Fugate-Whitlock, E. I., & Fiala, K. A. (2011). Recycling mentors: An intergenerational, service-learning program to promote recycling and environmental awareness. *Journal of Public Health Management and Practice*, 17(4), 373-5. https://doi.org/10.1097/PHH.0b013e3182159674

Deng, J., Tang, J., Lu, C., Han, B., & Liu, P. (2022). Commitment and intergenerational influence: A field study on the role of children in promoting recycling in the family. *Resources, Conservation and Recycling*, 185, 106403. https://doi.org/10.1016/j.resconrec.2022.106403

Devine-Wright, P. (2007). *Energy citizenship: Psychological aspects of evolution in sustainable energy technologies*. In J. Murphy (Ed.), *Governing technology for sustainability*. Routledge.

Dudka, A., Moratal, N., & Bauwens, T. (2023). A typology of community-based energy citizenship: An analysis of the ownership structure and institutional logics of 164 energy communities in France. *Energy Policy, 178,* 113588. https://doi.org/10.1016/j.enpol.2023.113588

Dutta, D., & Chandrasekharan, S. (2018). "I told my mother to mulch the plants!": Exploring intergenerational influence in generating pro-environmental actions, through the development of a 'joint-action space' in an urban farm. *XVIII Symposium of the International Organization for Science and Technology Education*.

Duvall, J., & Zint, M. (2007). A review of research on the effectiveness of environmental education in promoting intergenerational learning. *Journal of Environmental Education, 38(4),* 14-24. https://doi.org/10.3200/JOEE.38.4.14-24

Eaves, S. (2014). From art for arts sake to art as means of knowing: A rationale for advancing arts-based methods in research, practice and pedagogy. *Electronic Journal of Business Research Methods, 12(2),* 147-159.

European Commission, & Directorate-General for Education, Youth, Sport and Culture. (2019). Key competences for lifelong learning. *Publications Office*. https://doi.org/10.2766/569540

Falk, A., & Heckman, J. J. (2009). Lab Experiments Are a Major Source of Knowledge in the Social Sciences. *Science*, 326(5952), 535–538. https://doi.org/10.1126/science.1168244

Farla, J., Markard, J., Raven, R., & Coenen, L. (2012). Sustainability transitions in the making: A closer look at actors, strategies and resources. *Technological Forecasting and Social Change*, 79(6), 991-998. https://doi.org/10.1016/j.techfore.2012.02.001

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Frankowski, J., & Herrero, S. T. (2021). "What is in it for me?" A people-centered account of household energy transition co-benefits in Poland. *Energy Research and Social Science*, 71, 101787. https://doi.org/10.1016/j.erss.2020.101787

Freeman, S., Marston, H. R., Olynick, J., Musselwhite, C., Kulczycki, C., Genoe, R., & Xiong, B. (2020). Intergenerational effects on the impacts of technology use in later life: Insights from an international, multi-site study. *International Journal of Environmental Research and Public Health*, 17(16), 5711. https://doi.org/10.3390/ijerph17165711

Furco, A. (1996). Service-learning: A balanced approach to experiential education. https://digitalcommons.unomaha.edu/slceslgen/128/

Geels, F. W. (2012). A socio-technical analysis of low-carbon transitions: Introducing the multi-level perspective into transport studies. *Journal of Transport Geography*, 24, 471–482. https://doi.org/10.1016/j.jtrangeo.2012.01.021

Gill, C., & Lang, C. (2018). Learn to conserve: The effects of in-school energy education on at-home electricity consumption. *Energy Policy*, 118, 88-96. https://doi.org/10.1016/j.enpol.2018.03.058

Grant, M. J., & Booth, A. (2009). A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Information and Libraries Journal*, 26(2), 91-108. https://doi.org/10.1111/j.1471-1842.2009.00848.x

Hallinger, P., Wang, R., Chatpinyakoop, C., Nguyen, V. T., & Nguyen, U. P. (2020). A bibliometric review of research on simulations and serious games used in educating for sustainability, 1997–2019. *Journal of Cleaner Production*, *256*, 120358. https://doi.org/10.1016/J.JCLEPRO.2020.120358

Hamari, J., Koivisto, J., & Sarsa, H. (2014). Does gamification work? - A literature review of empirical studies on gamification. *Proceedings of the Annual Hawaii International Conference on System Sciences*, 3025–3034. https://doi.org/10.1109/HICSS.2014.377

Harmon & Gauvain. (2019). Sharing Science Knowledge across Generations: Do Children Tell Caregivers What They Learn in School about Water Conservation? *Children, Youth and Environments*, 29(1), 20-41. https://doi.org/10.7721/chilyoutenvi.29.1.0020

Huttunen, S., Ojanen, M., Ott, A., & Saarikoski, H. (2022). What about citizens? A literature review of citizen engagement in sustainability transitions research. *Energy Research & Social Science*, 91, 102714. https://doi.org/10.1016/J.ERSS.2022.102714

Isabelle, G. M. (2011). Energy-related logics of action throughout the ages in France: Historical milestones, stages of life and intergenerational transmissions. *Energy Efficiency*, 4(4), 493–509. https://doi.org/10.1007/s12053-011-9124-8

Istead, L., & Shapiro, B. (2014). Recognizing the child as knowledgeable other: Intergenerational learning research to consider child-to-adult influence on parent and family eco-knowledge. *Journal of Research in Childhood Education*, 28(1), 325-334 . https://doi.org/10.1080/02568543.2013.851751

Jaime, M., Salazar, C., Alpizar, F., & Carlsson, F. (2023). Can school environmental education programs make children and parents more pro-environmental? *Journal of Development Economics*, 161, 103032. https://doi.org/10.1016/j.jdeveco.2022.103032

Jensen, B. B. (2002). Knowledge, action and pro-environmental behaviour. *Environmental Education Research*, 8(3), 325-334 . https://doi.org/10.1080/13504620220145474

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Johnson, D., Horton, E., Mulcahy, R., & Foth, M. (2017). Gamification and serious games within the domain of domestic energy consumption: A systematic review. *Renewable and Sustainable Energy Reviews*, 73, 249–264. https://doi.org/10.1016/J.RSER.2017.01.134

Jorgenson, S. N., Stephens, J. C., & White, B. (2019). Environmental education in transition: A critical review of recent research on climate change and energy education. *The Journal of Environmental Education*, 50(3), 160–171. https://doi.org/10.1080/00958964.2019.1604478

Kaplan, M., Sanchez, M., Hoffman, J. (2017). Intergenerational Strategies for Promoting Lifelong Learning and Education. In: Intergenerational Pathways to a Sustainable Society. Perspectives on Sustainable Growth. Springer, Cham. https://doi.org/10.1007/978-3-319-47019-1_5

Katie Salen Tekinbas, & Eric Zimmerman. (2003). *Rules of Play: Game Design Fundamentals* . MIT press.

Krath, J., & von Korflesch, H. (2021). Designing gamification and persuasive systems: A systematic literature review. *GamiFIN*, 100-109.

Lawson, D. F., Stevenson, K. T., Peterson, M. N., Carrier, S. J., Strnad, R. L., & Seekamp, E. (2019). Children can foster climate change concern among their parents. *Nature Climate Change*, 9(6). https://doi.org/10.1038/s41558-019-0463-3

Lee, J., & Hammer, J. (2011). Gamification in Education: What, How, Why Bother? *Academic Exchange Quarterly*, 15, 1–5.

Lennon, B., Dunphy, N. P., & Sanvicente, E. (2019). Community acceptability and the energy transition: A citizens' perspective. *Energy, Sustainability and Society*, 9(1), 35. https://doi.org/10.1186/s13705-019-0218-z

Lennon, B., Dunphy, N., Quinlivan, L., Velasco-Herrejón, P., Gaffney, C., & Tanulku, B. (2021). Report on Existing European Energy Communities and Success Factors. Deliverable.

Lennon, B., Velasco-Herrejón, P., & Dunphy, N. P. (2023). Operationalizing participation: Key obstacles and drivers to citizen energy community formation in Europe's energy transition. *Science Talks*, 5, 100104. https://doi.org/10.1016/j.sctalk.2022.100104

Lindkvist, M., Sareen, S., Varo, A., Sabater, A., & Vollmer, J. (2023). Energy management framework for communities in the EU (RESCHOOL Project Deliverable No. D1.1). [Report].

Majuri, J., Koivisto, J., Hamari, J., & Fi, J. H. (2018). Gamification of education and learning: A review of empirical literature. Proceedings of the 2nd International GamiFIN Conference , 11–19. http://ceur-ws.org/Vol-2186/paper2.pdf.

Martins, A., Madaleno, M., & Dias, M. F. (2020). Energy literacy: What is out there to know? *Energy Reports*, 6, 454–459. https://doi.org/10.1016/j.egyr.2019.09.007

Martins, T., Midão, L., Veiga, S. M., Dequech, L., Busse, G., Bertram, M., McDonald, A., Gilliland, G., Orte, C., Vives, M., & Costa, E. (2019). Intergenerational Programs Review: Study Design and Characteristics of Intervention, Outcomes, and Effectiveness: *Research. Journal of Intergenerational Relationships*, 17(1). https://doi.org/10.1080/15350770.2018.1500333

Mertens, D. M., & Hesse-Biber, S. (2012). Triangulation and Mixed Methods Research: Provocative Positions. *Journal of Mixed Methods Research*, 6(2), 75–79. https://doi.org/10.1177/1558689812437100

McNaughton, M. J. (2004). Educational drama in the teaching of education for sustainability. *Environmental Education Research*, 10(2). https://doi.org/10.1080/1350462042000198140

Mikami, A., Akaishi, N., Hirayama, S., Yata, M., & Nagao, K. (2022). Development of a climate change education program using knowledge of behavioral science such as nudges and verification of its effects in decreasing CO_2 at home. *International Journal of Home Economics*, 15(1), 157–170.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Michael, D. R., & Chen, S. L. (2005). Serious games: Games that educate, train, and inform. Muska & Lipman/Premier-Trade.

Newman, S., & Hatton-Yeo, A. (2008). Intergenerational Learning and the Contributions of Older People. Ageing Horizons, 8.

Ng, D. T. K., Leung, J. K. L., Chu, K. W. S., & Qiao, M. S. (2021). AI Literacy: Definition, Teaching, Evaluation and Ethical Issues. *Proceedings of the Association for Information Science and Technology*, 58(1). https://doi.org/10.1002/pra2.487

Otto, S., Evans, G. W., Moon, M. J., & Kaiser, F. G. (2019). The development of children's environmental attitude and behavior. *Global Environmental Change*, 58, 101947. https://doi.org/10.1016/J.GLOENVCHA.2019.101947

Prestopnik, N. R., & Crowston, K. (2011). Gaming for (citizen) science: Exploring motivation and data quality in the context of crowdsourced science through the design and evaluation of a social-computational system. Proceedings - 7th IEEE International Conference on e-Science Workshops, EScienceW 2011, 28–33. https://doi.org/10.1109/ESCIENCEW.2011.14

Rizvi, S., Waite, J., & Sentance, S. (2023). Artificial Intelligence teaching and learning in K-12 from 2019 to 2022: A systematic literature review. *Computers and Education: Artificial Intelligence*, 4. https://doi.org/10.1016/j.caeai.2023.100145

Rospigliosi, P. 'asher'. (2023). Artificial intelligence in teaching and learning: What questions should we ask of ChatGPT? *Interactive Learning Environments*, 31(1). https://doi.org/10.1080/10494820.2023.2180191

Ruiz-Rojas, L. I., Acosta-Vargas, P., De-Moreta-Llovet, J., & Gonzalez-Rodriguez, M. (2023). Empowering Education with Generative Artificial Intelligence Tools: Approach with an Instructional Design Matrix. *Sustainability*, 15(15). https://doi.org/10.3390/su151511524

Sardi, L., Idri, A., & Fernández-Alemán, J. L. (2017). A systematic review of gamification in e-Health. *Journal of Biomedical Informatics*, 71, 31–48. https://doi.org/10.1016/J.JBI.2017.05.011

Schmidt-Hertha, B. (2014). Different concepts of generation and their impact on intergenerational learning. In Learning Across Generations in Europe: Contemporary Issues in Older Adult Education. https://doi.org/10.1007/978-94-6209-902-9_12

Schmidt-Hertha, B., Krašovec, S. J., & Formosa, M. (2014). Learning across generations in Europe: Contemporary issues in older adult education. In Learning Across Generations in Europe: Contemporary Issues in Older Adult Education. https://doi.org/10.1007/978-94-6209-902-9

Shove, E., & Walker, G. (2014). What Is Energy For? Social Practice and Energy Demand. *Theory, Culture & Society*, 31(5), 41–58. https://doi.org/10.1177/0263276414536746

Stephan, A. (2021). Intergenerational Learning in the Family as an Informal Learning Process: A Review of the Literature. *Journal of Intergenerational Relationships*, 19(4). https://doi.org/10.1080/15350770.2020.1817830

Stephens, C. G., Short, A., & Linnane, S. (2023). H2O Heroes: Adding value to an environmental education outreach programme through intergenerational learning. *Irish Educational Studies*, 42(2). https://doi.org/10.1080/03323315.2021.1932549

Sutherland, D. S., & Ham, S. H. (1992). Child-to-parent transfer of environmental ideology in costa rican families: An ethnographic case study. *Journal of Environmental Education*, 23(3). https://doi.org/10.1080/00958964.1992.9942797

Szulecki, K. (2018). Conceptualizing energy democracy. *Environmental Politics*, 27(1), 21-41. https://doi.org/10.1080/09644016.2017.1387294

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Thomas, M. (2009). *Think community: An exploration of the links between intergenerational practice and informal adult learning.* NIACE.

Tomasi, S. (2022). The (Non) impact of the Spanish "Tax on the Sun" on photovoltaics prosumers uptake. *Energy Policy*, 168. https://doi.org/10.1016/j.enpol.2022.113041

van der Zant, T., Kouw, M., & Schomaker, L. (2013). Generative artificial intelligence. In V. Müller (Ed.), Philosophy and Theory of Artificial Intelligence. (Vol. 5). Springer. https://doi.org/10.1007/978-3-642-31674-6_8

Vaughan, C., Gack, J., Solorazano, H., & Ray, R. (2003). The Effect of environmental education on schoolchildren, their parents, and community members: A study of intergenerational and intercommunity learning. *Journal of Environmental Education*, 34(3). https://doi.org/10.1080/00958960309603489

Veelen, B. van, & Horst, D. van der. (2018). What is energy democracy? Connecting social science energy research and political theory. *Energy Research & Social Science*, 46, 19–28. https://doi.org/10.1016/j.erss.2018.06.010

Wade, R. (2008). Service-learning. In L. Levstik & C. Tyson (Eds.), *Handbook of research in social studies education* (pp. 109–123). Routledge.

Wahlund, M., & Palm, J. (2022). The role of energy democracy and energy citizenship for participatory energy transitions: A comprehensive review. *Energy Research and Social Science*, 87. https://doi.org/10.1016/j.erss.2021.102482

Wake, S. J., & Birdsall, S. (2020). Lookout for learning: Exploring the links between drama and environmental education pedagogies. *Australian Journal of Environmental Education*, 36(3). https://doi.org/10.1017/aee.2020.22

Wang, J., Long, R., Chen, H., & Li, Q. (2022). How do parents and children promote each other? The impact of intergenerational learning on willingness to save energy. *Energy Research and Social Science*, 87. https://doi.org/10.1016/j.erss.2021.102465

Watts, J. (2017). Multi- or Intergenerational Learning? Exploring Some Meanings. *Journal of Intergenerational Relationships*, 15(1). https://doi.org/10.1080/15350770.2017.1260367

Williams, S., McEwen, L. J., & Quinn, N. (2017). As the climate changes: Intergenerational action-based learning in relation to flood education. *Journal of Environmental Education*, 48(3). https://doi.org/10.1080/00958964.2016.1256261

Wittmayer, J. M., Avelino, F., Pel, B., & Campos, I. (2021). Contributing to sustainable and just energy systems? The mainstreaming of renewable energy prosumerism within and across institutional logics. *Energy Policy*, 149. https://doi.org/10.1016/j.enpol.2020.112053

Wu, J. S., & Lee, J. J. (2015). Climate change games as tools for education and engagement. *Nature Climate Change* , 5(8), pp. 413–418. https://doi.org/10.1038/nclimate2566

Wünderlich, N. V., Gustafsson, A., Hamari, J., Parvinen, P., & Haff, A. (2020). The great game of business: Advancing knowledge on gamification in business contexts. *Journal of Business Research*, 106, 273–276. https://doi.org/10.1016/J.JBUSRES.2019.10.062

Yi, Y., & Gong, T. (2013). Customer value co-creation behavior: Scale development and validation. *Journal of Business research*, 66(9), 1279-1284.

Ypsilanti, A., Vivas, A. B., Räisänen, T., Viitala, M., Ijäs, T., & Ropes, D. (2014). Are serious video games something more than a game? A review on the effectiveness of serious games to facilitate intergenerational learning. *Education and Information Technologies*, 19(3). https://doi.org/10.1007/s10639-014-9325-9

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

9 Annexes

9.1 Annex 1: Teaching Unit. Creating Energy Communities

See the full document in the next page.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

CREATING ENERGY COMMUNITIES

TEACHING UNIT

Anaïs Varo (anais.varo@udg.edu)

Albert Sabater (albert.sabater@udg.edu)

Universitat de Girona

Contents

Cover image: Caramizaru, A. and Uihlein, A., Energy communities: an overview of energy and social innovation, EUR 30083 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-10713-2, doi:10.2760/180576, JRC119433.

Introduction

Context and justification

This educational proposal is part of the RESCHOOL project. It is an innovation project funded by the European Union to promote the creation, growth and management of Energy Communities. Energy communities are understood as collaborative projects for the joint production and consumption of renewable energy.

The educational activity proposal is designed for the third cycle of primary education or the first year of secondary school (i.e. for children between 10 and 12 years of age). The activities on energy communities are conceived from the perspective of the relevance of community projects to promote energy transition and sustainability.

In parallel with the implementation of the pedagogical proposal, the University of Girona will coordinate the collection of data for the research through short online surveys related to the proposal of educational activities on energy communities. The analysis of these data will allow us to know to what extent the activities and interventions carried out in schools have an impact on the knowledge and practices of families.

Structure of the teaching unit

The proposal is structured in four interlinked teaching sessions, through which students will learn about what energy communities are, the actors involved and the role of the community, using experiential activities through process theatre.

Scientific Background and preliminary studies

In this section we present the ground and foundation from where we build our pedagogical intervention proposal in schools. As we have seen in the results section of the literature review on IGL, experiential activities are key for the success of intergenerational transfers from young to older generations.

Our proposal is based on experience-oriented approaches where pedagogical theatre strategies are used as a pedagogical tool. In particular, the proposal is constructed from a "process theatre" approach. Process theatre focuses on the process or activities involved in the development of the play and not so much on the final result. There are different ways of approaching theatre from a ‘process’ perspective; for instance, it is possible to provide a partially developed script for further development or simply provide some introductory information to stimulate the imagination of the participants (Curtis et al., 2013). A positive element for prioritising process theatre over other approaches is that it allows different learning styles to be combined, facilitating inclusive and meaningful learning processes (Curtis et al., 2013).In this context, we underline that in recent years, many experiences have been carried out incorporating theatre as a pedagogical tool in connection with environmental education (Wake & Birdsall, 2020; McNaughton, 2004, 2014), and it is from this methodological standpoint that we develop our proposal.

Theatre as an educational tool allows the incorporation of essential elements from the field of sustainable development into the learning process:

- The ability of students to move from particular aspects (the specific history) to a more general view linked to the real world and complex problems (McNaughton, 2014).
- The ability of students to empathise with different visions and situations in the real world through their own experience (McNaughton, 2014).
- The opportunity to explore and evaluate different ideas and perspectives (Caldwell, 2011; McNaughton, 2010).

Nevertheless, using theatre as a pedagogical strategy does not necessarily seek to provide answers or a direct result, but to facilitate and encourage engagement and involvement through the formulation - implicitly or explicitly - of appropriate questions and critical thinking (Eaves, 2014; Chamberlain et al., 2018).

In addition to the introduction of process theatre strategies to the pedagogical proposal, the activities of our learning unit also incorporate an element of "artificial intelligence literacy" (Ng et al., 2021). Generative artificial intelligence is defined as “the field of science which studies the (fully) automated construction of intelligence” (van der Zant, Kouw & Schomaker, 2013).

Although this is still a very new field of study, previous studies have already analysed the potential of incorporating artificial intelligence tools at the primary school level, highlighting the opportunities this offers at the pedagogical level (Rizvi et al., 2023). Some authors highlight how the introduction of generative artificial intelligence tools, such as the already well-known ChatGPT in its various versions, among others, will 'revolutionise' both the way we design and implement learning activities (Ruiz-Rojas et al., 2023).

In this logic, the proposal incorporates generative artificial intelligence in a dialogical way through activities that allow students to interact through questions with artificial intelligence tools to obtain results and analyse them critically (Rospigliosi, 2023).

Learning objectives

In the following lines we expose the learning objectives of the learning unit ‘Creating Energy Communities’:

- To know the basic structure and functioning of a local energy community.
- To identify and recognise the different actors involved in the creation, functioning and decision-making processes in local energy communities.
- To explain the individual and collective benefits of participating in an energy community.
- To know and critically use artificial generative intelligence tools with natural language to co-construct knowledge and learning.

Key competences and basic skills

In this section we focus on the key competences and basic skills that are expected to be integrated through the implementation of the unit in schools. To do this, and bearing in mind that this unit should be applicable to any European context, we have chosen to use a common framework as a reference.

In May 2018, the Council of the European Union established a comprehensive framework outlining key competencies necessary for lifelong learning in the rapidly evolving global

landscape. This framework, detailed in the Council of the European Union Recommendation on 'Key competences for lifelong learning' (European Commission & Directorate-General for Education, 2019), identifies eight areas of competence relevant for personal development, active citizenship, employability, and social inclusion. Among these, the framework emphasizes the importance of digital competence, citizenship competence, and a robust understanding of science, technology, and engineering. These competences collectively seek to build an environment where individuals are equipped to navigate digital landscapes, critically assess the impact of human activities on the environment, and engage with technological advancements ethically and sustainably.

According to the document on key competencies for lifelong learning, as a common document of reference for all countries in the European Union, this teaching unit is aligned with the following competences:

- **Digital Competence:** This involves the confident,critical, and creative use of Information Society Technologies (IST), as well as an understanding of the digital world, which is essential for describing and exchanging ideas on technological or digital problems. This also involves an understanding of the ethical principles and practices of the digital world, which is essential for using technology ethically and sustainably.
- **Citizenship Competence:** This involves an understanding of the concepts of democracy, justice, equality, citizenship, and civil rights. It includes critical thinking and integrated problem-solving skills, which could relate to understanding the consequences of human intervention in the environment.
- **Science, Technology, and Engineering Competence:** This involves an understanding and knowledge of the natural world, which is fundamental for interpreting changes in the environment.

Didactic sequence

Option A: Teaching unit of 4 sessions

Session / Activity	Duration	Description of the activity	Social organisation	Materials and resources

Teaching session 1	50'	• Activity 1 Preliminary ideas on energy communities
		• Introduction of key concepts:
		  ▪ Energy transition and renewable energy sources
		  ▪ Local energy communities
		  ▪ Examples of energy communities
		  ▪ Key actors in the creation of energy communities
		• Introduction to the educational theatre activity
			Classroom	• Presentation with the contents
				• Computer and projector

Teaching session 2	50'	• Introduction of the key characters and possible roles. • Activity 2 Initiation of the work on characters and potential dilemma situations.	Cooperative groups of 5-6 students	• Activity cards of the characters, positions and points of view of the agents involved, and scenes and dilemmas.
Activity at home	15'	• Activity 3: Activity at home.	Individual (with the support of families)	• Worksheet
Teaching session 3	50'	• Activity 4: Introduction of the activity to create a dialogue between the characters in a specific setting. Exploration of Examples. Creation of a brief script to respond to the dilemmas presented. • Activity 5: Guided activity to recreate an alternative script to the one proposed by the students with an AI. Small group exercise to compare the two scripts. The group must choose the script they think is more plausible or appropriate (self-created script, AI script or a hybrid proposal).	Cooperative groups of 5-6 students.	• Computers and internet connection. • Projector • Generative AI App: ChatGPT
Teaching session 4	50'	• Activity 6: Performance of the theatre scenes by the students. This performance will be combined with discussing the script with the rest of the class. ○ Debate activity:	Classroom	• Guide for the debate • Evaluation rubric

		■ The different groups have generated different scripts depending on the actors involved and their positions. ■ Human-created scripts .vs. AI-created scripts. ● Activity 7: Time for reflection: What have we learned?		

Option B: Teaching unit of 2 sessions

- *It should be noted that the two-session proposal is not designed to achieve all the learning objectives, only the first four.*

Session / Activity	Duration	Description of the activity	Social organisation	Materials and resources
Session 1	25'	Activity 1: Introduction to key concepts and key actors in Energy Communities	Classroom	Annex 1 and Annex 2
	25'	Activity 2: Actors involved in Energy Communities	Cooperative groups of 5-6 students.	Annex 3
	10'	Reflection and debate	Classroom	
Activity at home	15-20’	Activity 3: How do neighbours position themselves?	Individual (with the support of families)	Annex 4
Session 2	5'	Wrap-up of the results of the activity at home and discussion	Classroom	
	20'	Activity 4: Let's create a dialogue!	Cooperative groups of 5-6 students.	Annex 5
	35'	Activity 6: Let's do some theatre!	Classroom	
Activity at home	10'	Self-evaluation (adaptation of Activity 7)	Individual	Annex 6

Description of the activities

Activity 1: What do we know about energy communities?

Duration	15'
Specific objectives of the activity	• Identify students' prior knowledge and ideas about energy communities. • Introduction of the objectives and justification of the didactic unit.
Social organisation	Classroom
Materials and space	15 minutes Computer and projector
Development of the activity	Viewing of the video: *"What is an energy community?"* https://www.youtube.com/watch?v=33t1MRBKOLE Based on the video, a brainstorming session on energy communities will be proposed, considering the following questions: • What are the energy communities doing? • How is the energy produced in an energy community? • Who can be part of an energy community? • Can a school be part of an energy community? It can also be complemented with the information and audiovisual resources of the RESCHOOL project website: www.reschool-project.eu/energy-communities/

This activity will be followed by a conceptual introduction to energy communities with didactic material provided to teachers (to be provided).

Activity 2: Actors involved in energy communities

Duration	30'
Specific objectives of the activity	• To know the different actors that may be involved in the process of creating an energy community. • Identify the different interests and positions that the actors involved can take in the process of building an energy community. • Explore ways of resolving conflicts and creating consensus between different actors with opposing interests.
Social organisation	Work in cooperative groups of 4-5 students.
Materials and space	• Targets for actors (to be provided) • Targets of interests and positioning (to be provided).

Development of the activity	• Cards are handed out with the profile of the actors identified. The children have to distribute or organise the actors according to their sector (economic, social, public, etc.). Each group will receive between 2-3 actors, depending on the total number of students per group and the number of groups formed.
	• Cards will be distributed with the interests/impacts of each actor according to the position they could adopt in different situations and processes of creating energy communities.
	• Each proposed actor will be given two cards:
	  ○ Interests of the actor that benefit from creating an energy community.
	  ○ Interests of the actor are detrimental to creating an energy community.
	• The children, in small groups, have to relate their positive/negative interests to the actors they are working with.

Activity 3: How do the neighbours position themselves?

Duration	15 minutes
Specific objectives of the activity	• Identify the existing perceptions and the possible positive and negative interests of the citizen actor in creating energy communities. • Facilitate a space for the transfer of information to families and intergenerational work.
Social organisation	Individual work at home with families.
Materials and space	Worksheet (to be provided)
Development of the activity	Students will have to fill in a worksheet at home in which, based on a specific situation, they will have to decide the position (proactive or resistant) that the actor of citizenship adopts and which interests may be affected.

Activity 4: Let's create a script!

Duration	20 minutes
Specific objectives of the activity	• Cultivate brief dialogues with the aim of reflecting the perceptions and interests of the different actors, and how they can interact in governing energy communities. • Work in a cooperative group to create a short script that represents the interaction among different actors to achieve a specific objective. • Explore the tensions, conflicts and possibility of consensus between actors with opposing interests in a specific

	situation.
Social organisation	Work in cooperative groups of 4-5 students.
Materials and space	Worksheet (to be provided)
Development of the activity	The students will work in cooperative groups to create short scripts - designed for 5 minutes scenes - between characters that represent different options to address dilemmas that may arise in the process of creating energy communities. Students will be provided with a number of 'dilemma' situations to help them identify the different potential positions, the interests involved and the actors involved. The objective will be for each group to choose a course of action (one option) and think - through elaborating a brief script - how this action would take place in practice.

Activity 5: Can an AI create a script?

Duration	30 minutes
Specific objectives of the activity	• To explore and work, under adult supervision and guidance, with a generative artificial intelligence with natural language. • To explore different examples of scripts created by generative artificial intelligence and the limits in producing conversational scripts. • To critically compare the text proposals generated by the group of students and the IA proposal and identify the main differentiating elements.
Social organisation	Work in cooperative groups of 4-5 students.
Materials and space	• Computers (1 computer per cooperative group) with internet connection. • Computer with projector. • Create at least one ChatGPT user account (this can be done via Google) under the responsibility of the teacher in charge. The results of the instructions/prompts for creating possible scripts will be projected on the main screen of the class.
Development of the activity	First of all, we will make a brief introduction about what artificial intelligence is and Chat GPT as an example of a generative artificial intelligence application. The teacher and students will collectively apply some examples of prompts to see results and understand the app's dialogic functioning. Based on the dilemma scenarios developed in activity 4, the Chat GPT will be asked to generate a dialogue or script of a short scene

	corresponding to the selected dilemma. The students will then critically compare the two scripts, the one generated by themselves and the one generated by the AI. The following questions can be used as a guide or orientation for developing the discussion: 1. Can you identify two differences and two similarities between the two scripts? 2. Why do you think there are differences between the two scripts? 3. Which script seems more realistic and why? Finally, each cooperative group will choose one of the scripts - or they can mix the two scripts, creating a hybrid option - which they will perform in front of the rest of the group in the next session.

Activity 6: Let's perform!

Duration	35 minutes
Specific objectives of the activity	• To experientially share the work and debates carried out in the process of creating the scripts in small groups with the rest of the group. • To examine the different options, courses of action and dialogues generated from 'dilemma' situations. • To collectively analyse the interactions, tensions and conflicts between the actors involved in each scene.
Social organisation	Performances in small groups, and collective debate in the classroom.
Materials and space	Classroom space, with enough space for brief performances.
Development of the activity	In this first activity, the cooperative groups will perform the scripts. This activity aims to share, through an experiential activity, the different options and discussions in relation to the dilemmas presented. After each of the performances (max. 5 minutes per group), some questions will be posed for group reflection: • What is the dilemma/conflict that is raised in the specific scene? • What actors are involved and what interests are evident or highlighted in the scene? • Could this conflict have been resolved in a different way? How? • Do you think this guide was written by the students, by the AI, or is it a hybrid option?

Activity 7: Reflecting on what we have learnt

Duration	15 minutes
Specific objectives of the activity	This is a closing activity for the teaching unit. It involves an exercise of assessment and co-assessment of the learning results of the didactic unit.
Social organisation	Cooperative work and individual work
Materials and space	Self-assessment form (to be provided)
Development of the activity	As a final activity, it is proposed to carry out a small individual and collective self-assessment exercise in which the students reflect consciously on the learning process and collective work throughout the different activities carried out.

Assessment: criteria and instruments

The proposal assessment criteria to evaluate the achievement of basic competencies and skills are as follows:

Digital Competence	1. *Information Management:* Evaluate and select appropriate information from diverse digital sources, ensuring the reliability of the content based on the source and author's credibility. 2. *Resource Use:* Employ digital devices and resources effectively for information analysis, organization, and communication. 3. Digital Communication: Utilise digital tools to articulate ideas, share learning outcomes, and engage in discussions, emphasizing clear and reasoned argumentation.
Citizenship Competence	1. *Eco-Social Analysis:* Critically assess human interventions, formulating well-reasoned opinions and actively participating in addressing and resolving eco-social challenges. 2. Adopt a *critical perspective* towards widespread societal attitudes, particularly in terms of equality and gender, analyzing diverse models and advocating for non-discriminatory practices.
Science, Technology, and Engineering Competence	1. Examine the *historical impact* of technological activities on society and the environment, evaluating both positive contributions and potential impacts in the context of sustainable development. 2. Engage with *emerging technologies in an ethical and responsible manner*, identifying their advantages and shortfalls in contributing to well-being, social equality, and environmental sustainability.

The assessment of the learning unit is structured around the assessment criteria defined above. In the following lines, we detail the evaluation tools to be implemented.

The evaluation instruments to be used are:

- Classroom monitoring and observation by the teacher or teaching team

- Follow-up of the interventions and activities carried out by each student and in small groups by the teacher or teaching team.
- Self-assessment and co-assessment of group work through a final activity.

These assessment instruments are supported by two didactic support materials. On the one hand, there is a proposal for an evaluation rubric for teachers as support material for the activities of classroom monitoring and observation. In addition, a self-assessment and co-assessment guide (Activity 7) is provided for students through a specific activity which is accompanied by supporting didactic material to guide the individual and group reflection processes on their own learning.

Evaluation rubric for teachers

Criteria	Description	1	2	3	4	5
Knowledge of the structure and functioning of a local energy community	The student demonstrates basic knowledge about the structure and functioning of a local energy community.	Does not understand the structure and functioning of a local energy community.	Has limited knowledge of the structure and functioning of a local energy community.	Partially understands the structure and functioning of a local energy community.	Has a good knowledge of the structure and functioning of a local energy community.	Demonstrates a solid and complete knowledge of the structure and functioning of a local energy community.
Identifying and recognising the actors involved	The student is able to identify and recognise the different actors involved in the creation, functioning and decision-making of a local energy community.	Fails to identify and recognise the actors involved.	Has difficulty in identifying and recognising the actors involved.	Identifies and recognises some of the actors involved, but with certain difficulties.	Identifies and recognises the majority of actors involved in a local energy community.	Demonstrates an excellent ability to identify and recognise all the actors involved in a local energy community.
Explanation of the individual and collective benefits of participating in an energy community	The student can explain the individual and collective benefits of participating in an energy community.	Fails to explain the individual and collective benefits of participating in an energy community.	Has difficulties explaining the individual and collective benefits of participating in an energy community.	Partially explains the individual and collective benefits of participating in an energy community.	Clearly explains the individual and collective benefits of participating in an energy community.	Offers a detailed and convincing explanation of the individual and collective benefits of participating in an energy community.

Criteria	Description	1	2	3	4	5
Using generative artificial intelligence tools with natural language	The student understands and critically uses artificial generative intelligence tools with natural language to co-construct knowledge and learning.	Neither understands nor uses artificial generative intelligence tools with natural language.	Has difficulty in understanding and using artificial generative intelligence tools with natural language.	Partially understands and uses artificial generative intelligence tools with natural language in a limited way.	Understands and appropriately uses artificial generative intelligence tools with natural language.	Fully understands and uses artificial generative intelligence tools with natural language to co-construct knowledge and learning.

Annexes and teaching materials

Annex 1: Worksheet of previous knowledge (activity 1)

What do we know about energy communities?

Answer the following questions with words or drawings.

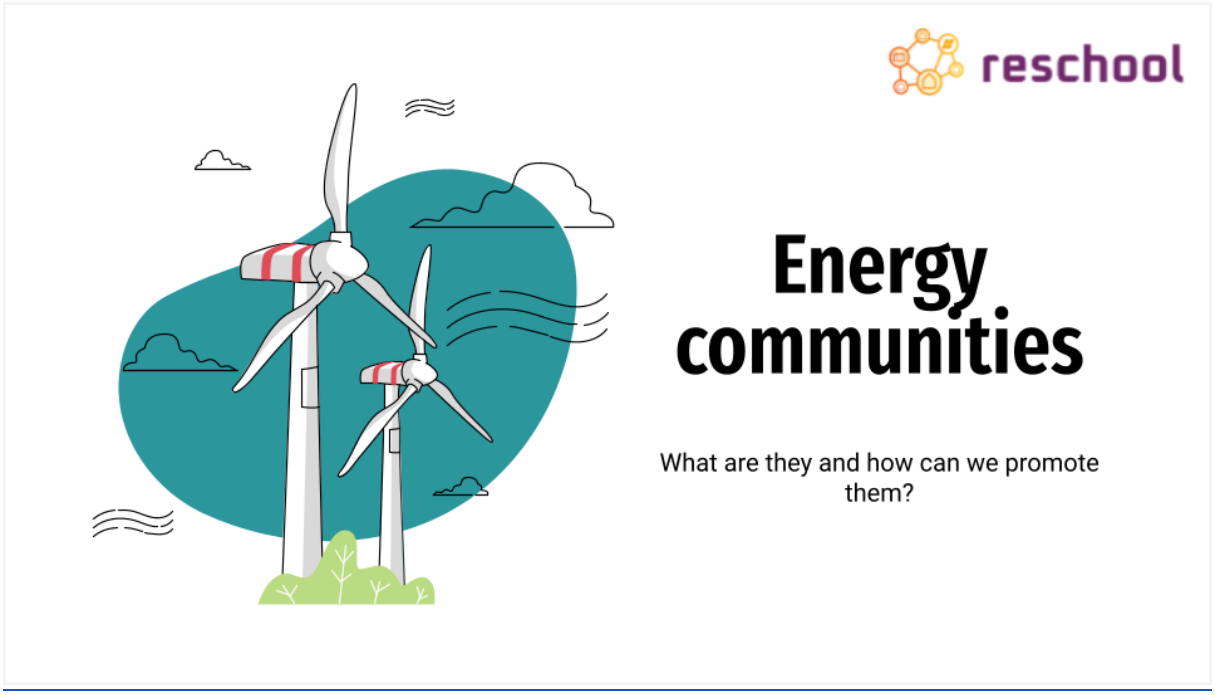
What are the energy communities doing?

How is the energy produced in an energy community?

Who can be part of an energy community?

Can a school be part of an energy community?

Annex 2: Didactic material on energy communities (activity 1)



What are the characteristics of energy communities?

01 En col-lectiu
The participation and decision can be made by the citizens, businesses, companies and town councils.

02 Sustainable
Generate energy from renewable sources to reduce climate impact.

03 Energy balance
Improving efficiency to save energy in our daily lives.

04 Local
Generate energy in the local environment, avoiding the need to transport it from far away.

Example of an energy community

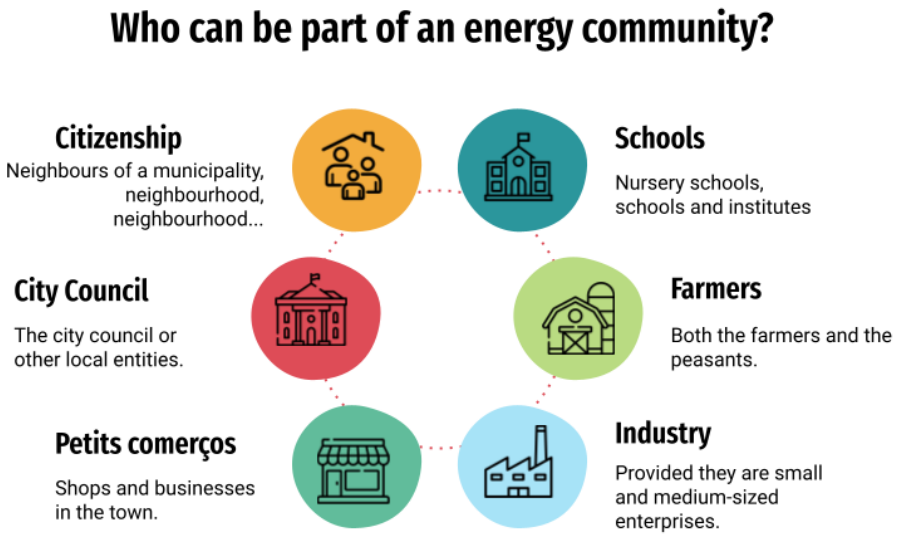
01 A group of neighbours, the town council and the school of a village agree to create an energy community.

02 The energy community acquires and installs some system to produce renewable energy, for example solar panels.

The solar panels can be installed on the roofs of houses, public buildings, factories, etc.

03 The renewable energy generated by the plates is consumed by the members of the energy community.

04 Normally, the energy that is not consumed by the members themselves (surplus) can be incorporated into the electricity grid.

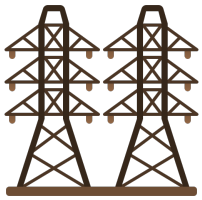
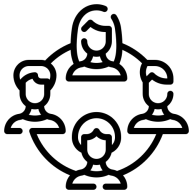
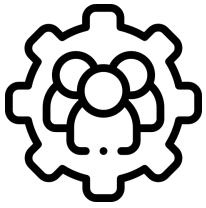

Who can be part of an energy community?
Citizenship
Neighbours of a municipality, neighbourhood, neighbourhood...
Schools
Nursery schools, schools and institutes
City Council
The city council or other local entities.
Farmers
Both the farmers and the peasants.
Petits comerços
Shops and businesses in the town.
Industry
Provided they are small and medium-sized enterprises.

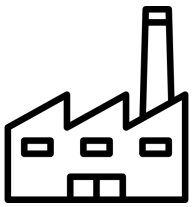
Annex 3: Cards of actors, interests and positions (activity 2)

Summary of the cards:

ACTORS	POSITIVE INTERESTS	NEGATIVE INTERESTS
Unorganised neighbours of the neighbourhood	Reducing energy waste.	Concern about the complexity of participating in an energy community and the lack of technical knowledge.
Mayor of the locality	Promote renewable energy projects to achieve a more sustainable city and generate local employment.	Pressure to guarantee popular support and avoid political criticism, as well as to secure funding.
Technical staff	Promote projects in the municipality that can improve the lives of citizens and reduce the energy consumption of vulnerable families.	Possible overload of work and lack of resources or funding.
Farmer	Explore new opportunities for profitability and diversification of their sources of income.	Incertesa sobre com pot afectar la seva activitat ramadera la creació d'instal-lacions energètiques.
Large national energy company	Expand its portfolio of projects and demonstrate commitment to sustainability to attract more clients.	Possible competition with local renewable energies and loss of market power.
Neighbours association	Achieve greater energy autonomy and reduce energy poverty in the neighbourhood.	Concern about the possible alterations to the landscape or negative visual effects of the new energy elements.
Regional cooperative of renewable energy	Promote and develop renewable energy production projects at the local level	Need to attract partners and ensure the economic viability of their projects.

Environmental social movement	Promote sustainable energy projects and raise awareness of the urgency of the energy transition.	Concern for the ecological integrity of the area where the energy installations are developed.
Local farmers	Explore new sources of income through the sale of renewable energy or participation in energy community projects.	Concern about the possible repercussions on the production or use of agricultural land.
Small Factory	Reduce energy costs and improve their business image through sustainability.	Initial investment and logistical concerns to integrate into an energy community.
School	implement a more sustainable educational model and involve students in the energy transition.	Lack of time and training (specific knowledge) for teachers.
Local shopkeeper	Benefit from more competitive energy prices and improve the image of the shop as an eco-sustainable establishment.	Uncertainty about the reliability of supply and concern about price fluctuations

Neighbours 	**Large national energy company** 
Mayor 	**Neighbours Association** 
Technical Staff / Public servants 	**Regional Renewable Energy Cooperative** 
Farmer (Dairy cows Farm) 	**Environmental Social Movement** 

Small Factory 	**Local Cereal Farmer** 
Local Shopkeeper 	**School** 

+	-
Promote renewable energy projects to achieve a more sustainable city and generate local employment.	Pressure to guarantee popular support and avoid political criticism, as well as to secure funding.
+	-
Promote projects in the municipality that can improve the lives of citizens and reduce the energy consumption of vulnerable families.	Possible overload of work and lack of resources or funding.
+	-
Explore new opportunities for profitability and diversification of their sources of income.	Uncertainty about how the creation of energy facilities may affect their livestock activity.
+	-
Expand its portfolio of projects and demonstrate commitment to sustainability to attract more clients.	Possible competition with local renewable energies and loss of market power.
+	-
Achieve greater energy autonomy and reduce energy poverty in the neighbourhood.	Concern about the possible alterations to the landscape or negative visual effects of the new energy elements.

+	-
Promote and develop renewable energy production projects at the local level	Need to attract partners and ensure the economic viability of their projects.
+	-
Promote sustainable energy projects and raise awareness of the urgency of the energy transition.	Concern for the ecological integrity of the area where the energy installations are to be developed.
+	-
Explore new sources of income through the sale of renewable energy or participation in energy community projects.	Concern about the possible repercussions on the production or use of agricultural land.
+	-
Reduce energy costs and improve their business image through sustainability.	Initial investment and logistical concerns to integrate into an energy community.
+	-
Implement a more sustainable educational model and involve students in the energy transition.	Lack of time and training (specific knowledge) for teachers.

+	-
Benefit from more competitive energy prices and improve the image of the shop as an eco-sustainable establishment.	Uncertainty about the reliability of supply and concern about price fluctuations

Annex 4: Questionnaire for identifying citizens' interests (activity 3)

What do citizens think about energy communities?

At home, with the help of some of the members of your family, answer these three questions about how citizens (families, neighbours) could position themselves regarding the creation of energy communities in your neighbourhood or town.

Do you know what energy communities are and what they are for?

.....

.....

.....

.....

Do you know any example of an energy community in Catalonia and do you know its name?

.....

.....

Put yourself in the shoes of a resident of a town or neighbourhood where an energy community is being created. Try to think about what arguments he/she might have to be in favour of (what would benefit him/her) or against (what would harm him/her) the creation of this energy community:

+	-
.....	.....
.....	.....
.....	.....
.....	.....
.....	.....

Annex 5: Examples of trigger dilemmas (activity 4)

Dilemma	Description	Options / Action course	Characters
Ownership of the energy community	In a rural community, there is the opportunity to create an energy community project through the installation of solar panels. However, two options arise in relation to the ownership or ownership of the solar panels.	Option 1: The project should be owned collectively by all members of the community, allowing everyone to have equal participation and decision-making power. Option 2: The project should be owned by a smaller group of people who have the necessary experience and resources to manage it effectively, with decisions taken in the best interests of the community as a whole.	Elisa: passionate about renewable energies and defends collective ownership. Joan: local businessman who has experience in managing similar projects and believes that managing the energy community with a large number of people will be a mess. Sara: a farmer who wants to make sure that the project benefits all members of the community and is concerned about possible inequalities in decision-making.

Financing the Energy Community	A local council is considering investing in a district-wide community energy initiative. However, there is a dilemma regarding funding options, raising challenges for the implementation of the project.	Option 1: the city council would have to allocate public funds to finance the energy community project, which would guarantee equal access for all residents, but could overspend the city's budget. Option 2: the city council would have to seek private investment from energy companies, which could provide the necessary capital more quickly, but could lead to higher energy costs for residents and a possible loss of control over the project.	Mayor Rodríguez - The mayor of the city, responsible for guaranteeing the successful execution of the project and weighing up the financial implications for the city. Olivia - A resident who supports public funding, believing that energy projects should be publicly owned and accessible to all. Isaac - A representative of an energy company interested in investing, highlighting the potential benefits of private investment in terms of efficiency and faster implementation.

Integration of the Energy Community	A very diverse neighbourhood in the city of Girona wants to establish an energy community, but there is a concern about the integration of different cultural and socio-economic groups in decision-making and the sharing of benefits.	Option 1: The energy community should have a representative committee that includes members from different cultural and socio-economic backgrounds, ensuring diverse perspectives and equitable distribution of benefits. This participation will not be related to the investment or financial contribution of the committee members. Option 2: the energy community should have an expert approach, with people with technical expertise and experience making decisions based on scientific evidence, aiming for maximum efficiency without prioritising specific cultural or socio-economic groups.	Maria: a community facilitator who advocates inclusive decision-making and ensures that the most vulnerable groups have a voice in the energy community. Ahmed - A technical expert who believes that decisions must be based on experience and efficiency, prioritising technical aspects. Sofia - A resident who wants to see the benefits shared equally among all residents, regardless of their background, and is concerned about possible conflicts that may arise if certain groups are prioritised.

Conflict over the use of the land	In a small village, there is a conflict between two groups over the use of a field annexed to the urban centre that has been used for agricultural purposes until now. One group wants to continue using it for agriculture, while another group sees an opportunity to install solar panels for an energy community project.	Option 1: The countryside must be preserved for agriculture, as it is essential for the subsistence of local farmers and the maintenance of the town's agricultural heritage. Option 2: the countryside should be used to install solar panels, provide renewable energy to the community and reduce carbon emissions, even if this means displacing some traditional agricultural activities.	Anna - A farmer who strongly believes in the preservation of traditional farming practices and fears the impact on the local agricultural economy if the field is converted into a solar panel installation. Marc - An environmentalist who stresses the importance of the transition to renewable energy sources and defends the solar panels project, highlighting the long-term benefits for the sustainability of the community. Mr. Pujol - A retired citizen who values the agricultural heritage of the town and is concerned about the possible loss of cultural identity if the countryside is no longer used for agriculture. 4. Sara - A young, environmentally conscious resident who supports the solar panels project, imagining it as an opportunity for the village to become a model of sustainable energy practices.

Conflict with the conventional energy company	An energy community project faces resistance and obstacles from a conventional energy company that is reluctant to facilitate the creation or sharing of resources. In particular, it does not provide all the bureaucracy and paperwork necessary to start up an energy community driven by a group of 10 residents of a block of flats in a city.	Option 1: the energy community should persist in negotiating with the conventional energy company, seeking collaboration and a mutually beneficial agreement to take advantage of existing infrastructure and resources. Option 2: the energy community should explore alternative solutions, such as seeking government support or partnering with other renewable energy companies to establish its project independently, reducing dependence on the conventional energy company.	Alex - The representative of the energy community, determined to establish the project and promote renewable energies, willing to negotiate with the conventional energy company. Mr. Rovira - The general director of the conventional energy company, who sees the energy community project as a competence and is reluctant to support it or collaborate with it. Olivia - A community activist who believes in the potential of the energy community project, promoting alternative solutions and exploring other avenues of support. Municipal technician of the municipality: a government official responsible for energy policies and sustainability, who can provide guidance, incentives or regulations to mediate the conflict and support the energy community project.

Annex 6: Individual and collective self-assessment sheet (activity 7)

This worksheet can be worked on in the classroom, during the first few minutes of the fourth session of the didactic unit, or at home.

Self-assessment

Name and surnames	
Members of the group	

Next, according to the assessment criteria in the following rubric, indicate how well you think you have achieved the objectives of the didactic unit individually:

	1 = Not achieved	2	3	4 = Well achieved
I have understood the structure of an energy community and its main characteristics.				
I can explain how an energy community works in the local context.				
I have identified the main components and processes involved in an energy community.				
I have contributed individually in the group work and I have done the individual tasks, especially the family work sheet.				

Now, looking at the group work process, answer how well you think you have achieved the objectives of the didactic unit at the group level:

	1 = Not achieved	2	3	4 = Well achieved
We have been able to relate the different elements and processes that form part of the energy community.				
We have debated and discussed the responsibilities and functions of the actors to better understand their role in the energy community.				
We have debated and argued the benefits that can be achieved through collaboration in the energy community.				
We have experimented with artificial generative intelligence tools to generate information and resources for our didactic unit.				

Finally, indicate what activity you liked the most and the least in the didactic unit:

What I've liked the most is…

.....

.....

.....

.....

.....

What I didn't like was…

.....

.....

.....

.....

.....

References

Caldwell, K., & Ed., M. (2011, July 26). Drama as a Teaching Tool. *Teaching through the Arts.* http://teachingthroughthearts.blogspot.com/2011/07/drama-as-teaching-tool.html

Chamberlain, K., McGuigan, K., Anstiss, D., & Marshall, K. (2018). A change of view: arts-based research and psychology. *Qualitative Research in Psychology*, *15*(2-3), 131-139. https://doi.org/10.1080/14780887.2018.1456590

Curtis, D. J., Howden, M., Curtis, F., McColm, I., Scrine, J., Blomfield, T., Reeve, I., & Ryan, T. (2013). Drama and environment: Joining forces to engage children and young people in environmental education. *Australian Journal of Environmental Education*, *29*(2), 182-201. https://doi.org/10.1017/aee.2014.5

Eaves, S. (2014). From art for arts sake to art as means of knowing: A rationale for advancing arts-based methods in research, practice and pedagogy. *Electronic Journal of Business Research Methods*, *12*(2), 147-160.

McNaughton, M. J. (2004). Educational drama in the teaching of education for sustainability. *Environmental Education Research*, *10*(2), 139-155. https://doi.org/10.1080/1350462042000198140

McNaughton, M. J. (2010). Educational drama in education for sustainable development: ecopedagogy in action. *Pedagogy Culture and Society*, *18*(3), 289-308. https://doi.org/10.1080/14681366.2010.505460

Ng, D. T. K., Leung, J. K. L., Chu, K. W. S., & Qiao, M. S. (2021). AI literacy: Definition, teaching, evaluation and ethical issues. *Proceedings of the Association for Information Science and Technology*, *58*(1), 504-509. https://doi.org/10.1002/pra2.487

Rizvi, S., Waite, J., & Sentance, S. (2023). Artificial Intelligence teaching and learning in K-12 from 2019 to 2022: A systematic literature review. *Computers and Education: Artificial Intelligence*, *4*(100145), 100145. https://doi.org/10.1016/j.caeai.2023.100145

Ruiz-Rojas, L. I., Acosta-Vargas, P., De-Moreta-Llovet, J., & Gonzalez-Rodriguez, M. (2023). Empowering Education with Generative Artificial Intelligence Tools: Approach with an Instructional Design Matrix. Sustainability, 15(15). https://doi.org/10.3390/su151511524

Rospigliosi, P. 'asher'. (2023). Artificial intelligence in teaching and learning: what questions should we ask of ChatGPT? *Interactive Learning Environments*, *31*(1), 1-3. https://doi.org/10.1080/10494820.2023.2180191

Wake, S. J., & Birdsall, S. (2020). Lookout for learning: Exploring the links between drama and environmental education pedagogies. *Australian Journal of Environmental Education*, *36*(3), 234-245. https://doi.org/10.1017/aee.2020.22

9.2 Annex 2: Letter of interest from Schools to participate in the project RESCHOOL

LETTER OF EXPRESSION OF INTEREST

Reschool Project

I, [name and surname], in capacity of [position in the school], confirm in behalf of the school [name of the school] located in [city or town]:

- The willingness of the school to participate in the research and innovation project on energy communities with the participation of schools (RESCHOOL);
- The willingness of the educational centre to participate in the preparatory meetings, as well as in the process of implementation and monitoring with resources from the project itself.

This letter does not imply a firm commitment to participate until after the first initial meeting in which all the details of participation will be explained and specified, including a presentation of the project and the specific timetable. After the first initial meeting in June 2023, the final group of schools participating in the RESCHOOL project will be formed.

The contact details of the person who will act as a link between the educational centre and the RESCHOOL project are specified below:

- School:
- Contact name:
- Correu electrònic:
- Telephone (if necessary):

You can find more information about the project at: https://www.reschool-project.eu/

9.3 Annex 3: RESCHOOL project information brochure for schools

RESCHOOL PROJECT

What does the project consist of?

RESCHOOL is a European-funded innovation project that aims to encourage the creation, growth and governance of energy communities set up as collaborative projects for the shared production and consumption of renewable energy. The project aims to increase the knowledge and involvement of citizens in local energy communities and therefore seeks to make schools a driving force for raising awareness and encouraging participation. Schools can play a key role in promoting the involvement of families in these communities, as children can act as transmitters of information and, at the same time, stimulate the action and participation of adults.

How can you participate in educational centres?

Schools can participate in the project by becoming one of the leading schools where an educational activity proposal will be implemented to work on energy communities. The proposal will be designed for the last years of primary education and/or the first year of secondary education (10-13 years old). The activities will seek to work on energy communities from the perspective of the relevance of community projects to advance in the energy transition and sustainability.

In parallel to the implementation of the pedagogical proposal, the University of Girona will coordinate the data collection for the research. The analysis of this data will allow us to know to what extent the activities and interventions implemented in the schools impact the knowledge and practices of the household members.

How will it work?

How do we collect data for research?

Throughout the intervention, we will ask for your help in sending three surveys to the families of the participating children at three different times:

- An initial survey before the activity is developed in the classroom;
- A first follow-up survey in the week after the intervention;
- A second follow-up survey three months after the intervention.

Additionally, the research team might contact families who want to (and indicate so in the surveys) to conduct a more in-depth interview.

9.4 Annex 4: RESCHOOL project information brochure for families

RESCHOOL PROJECT

What is the RESCHOOL project?

RESCHOOL is a European-funded innovation project that aims to encourage the creation, growth and governance of energy communities, set up as collaborative projects for the shared production and consumption of renewable energy. An important part of this project is to increase the knowledge and involvement of citizens in local energy communities and, for this reason, it seeks to make schools a driving force for raising awareness and encouraging participation. The main reason is that schools can play a key role in encouraging the involvement of families in these communities, as children can act as transmitters of information and, at the same time, stimulate the action and participation of adults.

How do schools participate?

The educational centres participate in the project by sponsoring one of the motor schools in which an educational proposal will be implemented, in the form of a didactic unit, to work on energy communities. The didactic unit is designed for the first cycle of primary education and/or the first year of ESO. The activities of the didactic unit seek to work on energy communities from the perspective of the relevance of community projects to advance in the energy transition and sustainability and include various experiential activities, through educational theatre, to work on these contingents.

How do families participate?

In parallel to the implementation of the pedagogical proposal in the classroom, the University of Girona will coordinate the collection of some basic data from the family units in relation to their socio-demographic characteristics as well as their foreseen knowledge and practices in relation to aspects such as climate change, energy transition or energy communities. The analysis of these data will allow us to know to what extent the activities and interventions implemented in the classroom have an impact on the knowledge and practices of families.

How does data collection work?

The families receive two surveys, a preliminary survey before carrying out any activity in the children's classroom, and a subsequent survey when all the activities have been completed. This is a survey that can be completed in approximately 15-20 minutes and includes questions related to the characteristics of the family unit, the home, the expected knowledge about energy communities and climate change, as well as related practices and behaviours.

Access to the first survey [url]

In addition, families who wish to be contacted by the research team for a more in-depth interview with one of the researchers (and who indicate this in the questionnaires) can be contacted by the research team.

Additional information

Families can request additional information, or raise questions and comments, directly to the research team. The contact details of the researchers responsible for the project are: Anaïs Varo (anais.varo@udg.edu) and Albert Sabater (albert.sabater@udg.edu).

9.5 Annex 5: Presentation to be used for the first informative meeting with schools

reschool

Intergenerational learning for the promotion of energy communities

[date]
First meeting with educational centres

Universitat de Girona

[LOGO PILOT]

Intergenerational learning for the promotion of energy communities

1. Presentation of the RESCHOOL project
2. Pedagogical proposal
3. Cycle of research and school participation
4. Roles and responsibilities of the actors involved
5. Open session for questions

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

2

What is the Reschool project?

Reschool is a European-funded innovation project that aims to promote the **creation**, **growth** and **governance** of energy communities, set up as collaborative projects for the shared production and consumption of renewable energy.

- Relevance of schools as places of socialisation and community learning
- The role of learning processes and intergenerational impact: how to go beyond children.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

What is intergenerational learning?

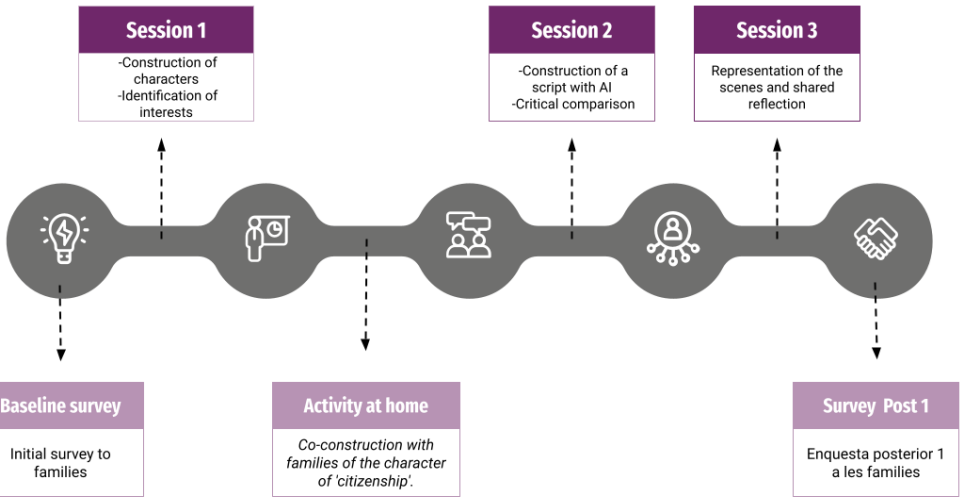
- **Lifelong** learning
- Children can be **active agents of change** and intergenerational learning.
- **Schools** are privileged spaces for working with students on concepts, practices and reflections that are passed on to families through formal and informal channels.
- Importance of finding communitarian mechanisms and from an integral perspective to **promote the energy transition.**

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Pedagogical proposal

- Proposal based on **pedagogical theatre**:
  - Experiential and experiential learning
  - Ability to understand different perspectives and visions of a given situation
  - The opportunity to explore and evaluate different ideas and perspectives.
- **Process theatre** as a tool for highlighting the process of construction, discussion, representation and collective reflection as a pedagogical tool.
- Critical literacy in artificial intelligence tools, for the creation of scenes through a dialogic method.
- Development of **specific competences.**

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Key elements of the proposal

Incorporation IA

Incorporation of AI through natural language in a critical way.

Work inside and outside the classroom

School-family connection through joint work

Power relations

The dramatisation of conflict situations allows the identification of profiles and roles.

Critical analysis

Process theatre provides the space for critical collective analysis.

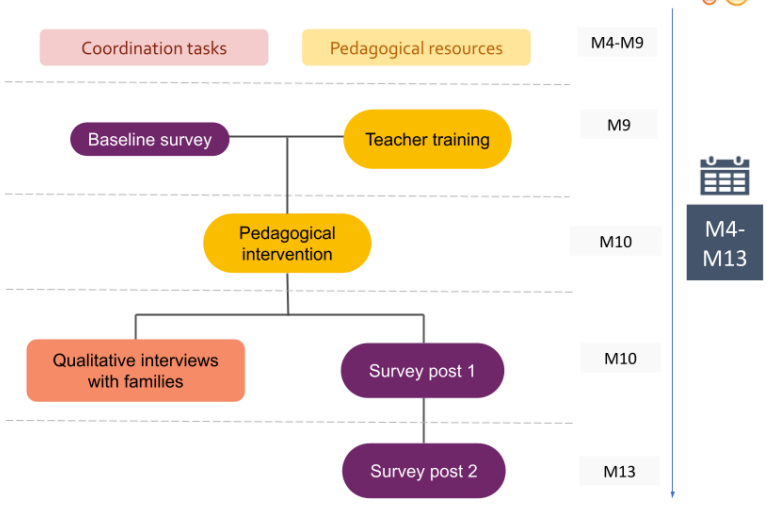
Theatre and emotions

The corporeality of theatre allows critical and empathetic reflection.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

How is research integrated in this proposal?

In addition to the innovation proposal, the RESCHOOL project incorporates research objectives to evaluate the impact of intergenerational learning on families.



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

9.6 Annex 6: Presentation to be used for the training session with schools and teaching staff

reschool

Intergenerational learning for the promotion of energy communities

[date]
Training session with educational personnel

Universitat de Girona

[LOGO PILOT]

Intergenerational learning for the promotion of energy communities

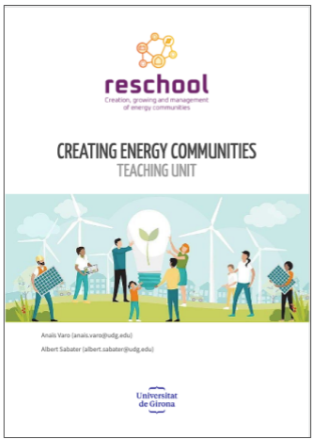
1. Presentation of the teaching unit "Creating Energy Communities".
2. Adaptability of the teaching unit
3. Implementation schedule and key dates
4. Pre- and post-surveys for families
5. Open session for questions

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

2

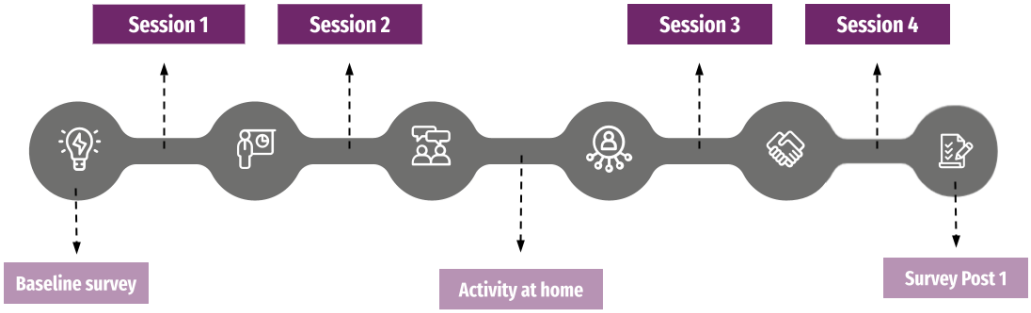
Teaching unit "Creting energy communities".

Contents



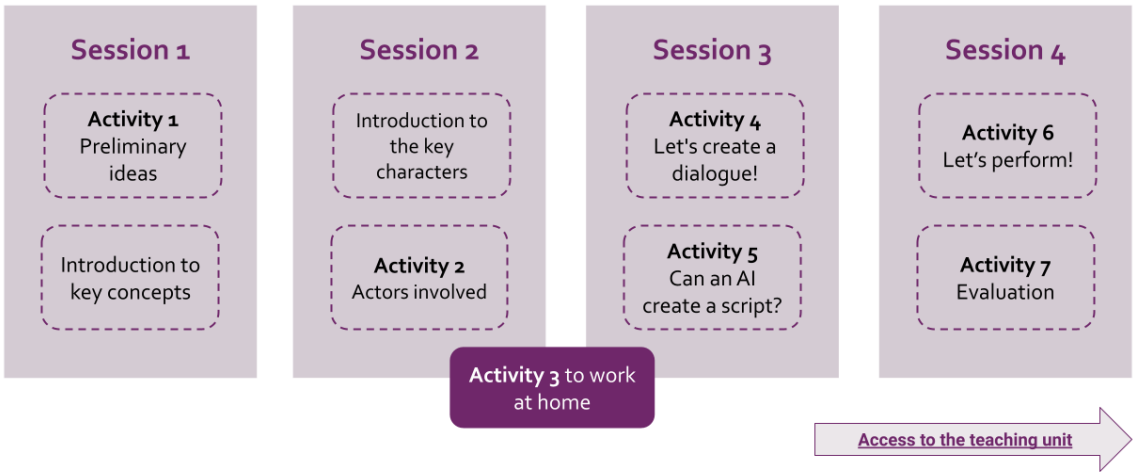
This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Seqüència de sessions



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Activity sequence



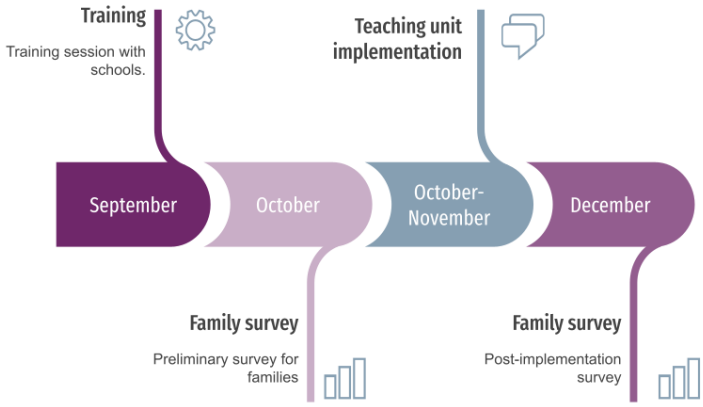
This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Adaptability of the didactic unit

- The contents and activities can be adapted to different contexts, including elements related to the local context and reality of each school and educational centre.
- The didactic unit is modular, so it is not necessary to carry out 4 sessions: two sessions can be carried out, a little longer, condensing the activities and processes.
- At the end of the implementation process, we will ask you to inform us, by means of a short form or e-mail, if you have made any adaptations to the proposal or if you have experienced any incidents, as this will have to be taken into account in the research.

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Implementation schedule



This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Pre- and post-intervention survey

- **Online survey** for families
- Brief survey, which can be completed in approximately 15-20 minutes.
- It is very important that it reaches families and that they complete it in order to be able to collect data.
- Through the survey, we will also select **volunteer families** to carry out interviews.

Access to the survey: [pending]

This project has received funding from the European Union's Horizon Europe research and innovation programme under grant agreement No 101096490

Thank you!

[Contact details]

Universitat de Girona

[LOGO PILOT]

9.7 Annex 7: Template email body text for the families

Welcome families,

Next year our school will be participating in the RESCHOOL innovation and research project. The aim of RESCHOOL is to develop tools to improve and facilitate the collective participation of citizens in the energy system through Energy Communities. The University of Girona and [pilot partner], among others, are partners in this project.

Among the more specific objectives, this project aims to analyse how the development of a pedagogical proposal in the classroom with children on energy communities and sustainability can have a subsequent impact on families. In other words, how working with school-age children can have an intergenerational impact and learning, with positive effects on families in terms of energy consumption, energy efficiency and sustainability in general.

If you would like more information about the project, you can consult the information sheet attached to this e-mail address.

But beyond this information, how can you help us on a practical level? Within the framework of this project, we propose that the families of the school fill in two surveys that form part of the pedagogical proposal in the classroom. In this sense, there is a first survey in which we collect some basic data about the family units in terms of their socio-demographic characteristics, as well as their foreseen knowledge and practices in relation to aspects such as climate change, energy transition or energy communities. After the educational activities have been carried out in the classroom, a second survey will be sent to you, which will allow you to obtain data and information to analyse some of the transfer impacts of the activities carried out in the classroom. Therefore, to start with, we provide you with the link to the first survey.

Access to the first survey: [XXX]

We would be very grateful if you could complete this first survey of the project before [date].

Thank you again for your cooperation. We hope you will enjoy taking part in this innovative project.

Kind regards,