Breaking Ecological, Social, and Spiritual Barriers for a Sustainable Future: A New Approach to Sustainability Education with the CircularCityChallenge Method

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ABSTRACT

Climate change profoundly impacts societies worldwide, necessitating urgent action to create a more resilient and sustainable world (Allan et al., 2021). Consequently, there is a critical need for citizens who are educated in understanding climate change and sustainability policies and can effectively engage in policymaking. Therefore, teaching sustainability in schools is essential. However, the complexity of the subject and the lack of expert teachers pose significant challenges.

The CircularCityChallenge (CCC) teaching method addresses these challenges by overcoming primary divides—ecological, social, and spiritual—that hinder effective change towards a more sustainable and equitable future, emphasizing the need for a shift in awareness and collective leadership (Scharmer, 2016). This method empowers students to identify sustainability issues in their communities, analyze stakeholders' needs, and develop socially equitable and environmentally fair solutions.

We tested the CCC method in a one-day workshop in Trofaiach, Austria, with 28 students aged 14. Using Otto Scharmer's Theory of Divides, we analyzed learning outcomes and measured the method's effectiveness in overcoming ecological, social, and spiritual divides. The results indicate that the CCC method successfully enhances students' understanding of local sustainability issues and their ability to participate in policymaking and participative design processes.

This paper details the method's origin, methodological steps, and discusses its strengths and weaknesses based on the pilot workshop results. The study informs actions for holistic sustainability education and enhancing the quality of participative policymaking processes.

1) BACKGROUND

As members of society, individuals should be empowered to participate in socio-political processes, like participative design and policymaking. This requires a 'sustainability mindset' and sustainability literacy. This study sees education for sustainability as education that makes students knowledgeable about the environment and its interconnectedness to social and economic systems, while encouraging them to develop attitudes of concern and motivation, as well as practical, complex systems thinking and critical thinking skills to identify and understand sustainability problems. The study understands ESD as an inter-disciplinary issue that must be approached holistically. This requires learning to occur along three dimensions: cognitive - relating to knowledge, understanding and critical thinking; socio-emotional - relating to a sense of common humanity, values and responsibilities, empathy, solidarity and respect); and behavioural - relating to skills development (Mulvik et al. 2022).

Obstacles to implement effective sustainability education

Education for teenage students about sustainability and the circular economy is imperative for cultivating responsible citizens and fostering green competences. Integrating these topics into the curriculum equips students with the knowledge to comprehend the environmental, social, and economic impacts of their actions, thereby preparing them to make informed decisions in their personal and professional lives (Hays & Reinders, 2020). At the international level, the United Nations'

Sustainable Development Goals (SDGs), particularly Goal 4 (Quality Education) and Goal 12 (Responsible Consumption and Production), provide a framework for promoting sustainability education (UNESCO, 2017). The European Union's European Green Deal and Circular Economy Action Plan are pivotal policies that support sustainability education within the EU (Renfors, 2024).
Despite numerous initiatives, two significant impediments persist.
First, the context-dependent nature of sustainability and circularity solutions limits the effectiveness of general teaching approaches (Parry & Metzger, 2023). In EU, all Member States cover various transversal skills in their overall curricula, but these are not contextualised for ESD learning outcomes. ESD is a field in which interdisciplinary and interconnected understandings of the natural and human world are particularly important. Existing findings suggest that this may be due to a lack of clearly defined competences that describe how linkages between disciplines and fields can be approached in practice. Transversal skills such as the complex systems thinking defined in the context of ESD, when built upon a good foundation of knowledge of both science and civics/citizenship (the historical, geographical, economic and political context), can help to bring out this unique aspect of ESD and crystallise the interdependent nature of the natural and social world.
Second, school curricula and teachers are often overburdened with existing content, making it challenging to incorporate additional topics (UNESCO, 2021). Also, it has been established that limited teacher training on ESD is characterised by lack of EES professional trainers in the field and insufficient emphasis on sustainability during initial teacher training. As there is often no systematised training framework in place, becoming an expert on sustainable development in the education sector appears not to be considered by many as a viable career route. Without initially learning the appropriate skills and new teaching methods, many teachers tend to lack sufficient motivation to immerse themselves in ESD during continuous professional development.
Addressing these challenges requires tailored educational strategies and support for educators to ensure the successful integration of sustainability into the curriculum.

2) APPROACH

The CircularCityChallenge teaching method is a result of the CircularCityChallenge project, which was conducted from 2022 to 2024. The CircularCityChallenge is an educational project aimed at developing an innovative curriculum to teach young people about sustainability and circular economy practices. The project is part of the ERA-NET Urban Transformation capacities and is funded by the European Union’s H2020 research and innovation program https://circularcitychallenge.eu/.
Key aspects of the project include:
• Challenge-Based Learning: Students tackle real-world problems related to climate change and social inequalities, proposing sustainable solutions to their local governments.
• Stakeholder Engagement: The project involves collaboration with various stakeholders, including city decision-makers, industry, and government, to bridge the gap between young people's ideas and practical implementation
• Educational Impact: The CircularCityChallenge aims to transform sustainability education by promoting systems thinking and interdisciplinary learning.

The CircularCityChallenge teaching method is a framework designed to overcome identified obstacles to effective ESD, with an overall aim to foster a level of knowledge of sustainability that equips students to be able to knowledgably participate in local policymaking processes and participative design processes. Aim wise, this method aims to overcome “three critical barriers to achieving a comprehensive understanding of sustainability”, as conceptualized by Otto Scharmer's Theory U (Scharmer, 2007). The first barrier is the Ecological Divide. This involves identifying and addressing the depletion and overuse of natural resources, which leads to environmental degradation and unsustainable practices (Elegbede et al., 2023). The second barrier is the Social Divide. This highlights

the growing disparity between rich and poor, resulting in social polarization, inequality, and exclusion from decision-making processes (Schmelkes, 2020). The third barrier is the Spiritual Divide. This points to a pervasive sense of disconnection and lack of purpose, often manifesting as a general sense of disillusionment (Yocum et al., 2020). By bridging these divides, the CCC method aims to equip students with the knowledge and skills necessary to identify the sustainability or/and circularity problem in their environment, understand in depth about various stakeholders and their stakes around the sustainability issue, and to become aware of the personal role and domain of influence on the matter.

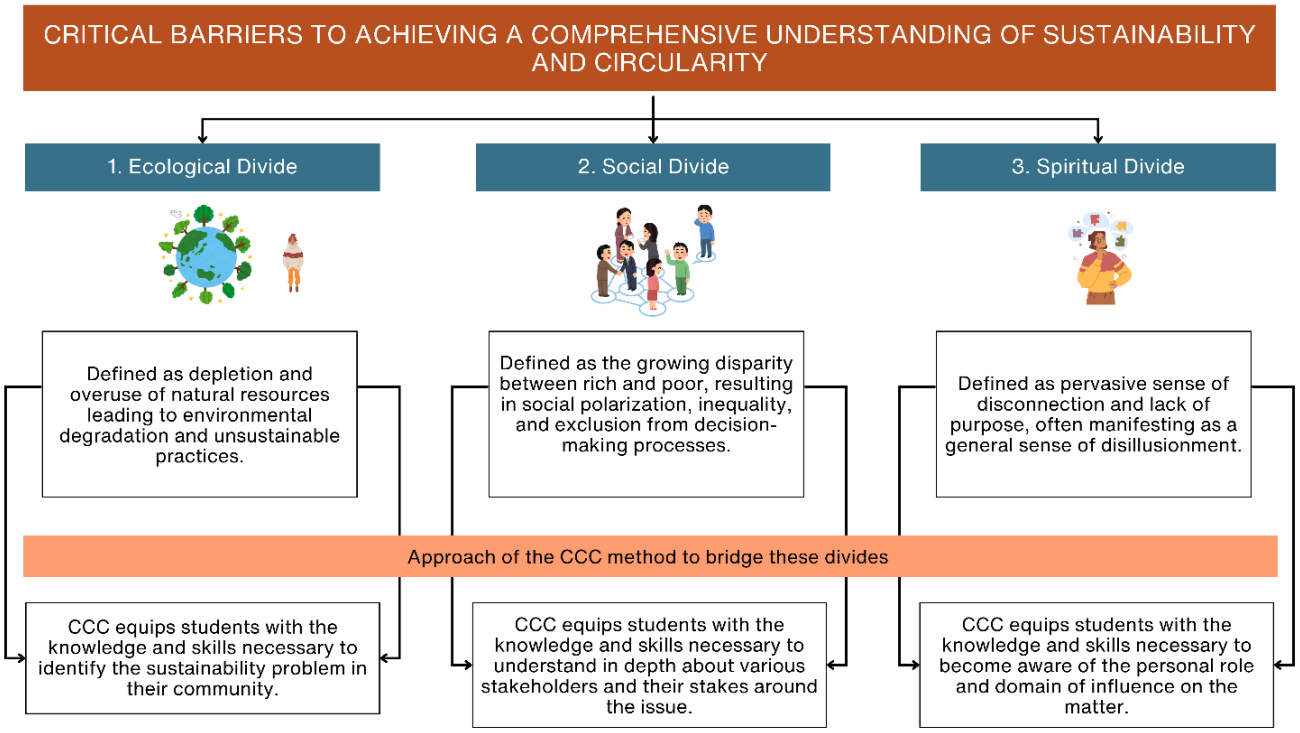


Figure 1. CircularCityChallenge approach to overcoming divides for a comprehensive understanding of sustainability

Overcoming the Social Divide

Overcoming the Social Divide implies bridging the gaps between different social groups. This can partly be achieved by engaging all stakeholders in a policymaking process to understand their perspectives and collaboratively develop solutions. We structured our teaching method for overcoming Social Divide based on the rich heritage of Kurt Lewin's theories. He proposed "planned change through learning" as a key to resolving social conflict. That approach integrates field theory, group dynamics, action research, and his 3-Step model of change (Burnes, 2004). The first step, “Unfreezing”, involves exploring the need for change, diagnosing issues, planning a strategy, and building commitment. This phase requires skills in data collection, problem analysis, communication, and persuasion. Participants are encouraged to analyse the situation as a whole and consider group norms, roles, and interactions to create change (Schein, 1996). Next, the “Moving” step steers towards acceptable behaviours and processes through participatory and collaborative action research. This phase emphasizes understanding system dynamics by attempting to change them. Participants must implement change, collaborate, and reflect to gain new insights. Finally, the “Refreezing” step aims to sustain new behaviours and processes. Stakeholders discuss goals, gather information, and make decisions about new rules and policies (Gershwin, 1994). This phase requires skills in evaluating outcomes, reinforcing new behaviours, and integrating new norms into the culture.

Acknowledging Lewin’s planned approach to change, we use the stakeholders mapping and analysis technique to equip individuals with the necessary skills to navigate and influence their social environments effectively.

Stakeholder mapping and analysis techniques are increasingly utilized in sustainability education to enhance the learning experience and ensure that educational programs are relevant and impactful (Höffken and Lazendic-Galloway, 2024). These techniques involve identifying and understanding the relationships between various stakeholders, such as students, educators, industry partners, citizens, grassroots, government agencies, and non-governmental organizations (NGOs), who are directly affected by or can contribute to sustainability solutions.

One prominent application of stakeholder mapping in sustainability education is through challenge-based learning (CBL) approaches. For instance, a recent study highlighted the use of CBL in courses that address pressing sustainability challenges in fields such as health, urban living, agriculture, and waste management. These courses enabled students to collaborate with external stakeholders, fostering critical thinking, organizational skills, and teamwork capabilities. The collaboration with stakeholders was particularly valued for its relevance to students' learning and potential career progression, as it allowed them to take ownership of the challenges and engage in meaningful debates on responsible innovation and the Sustainable Development Goals (SDGs).

Additionally, stakeholder mapping is used to create inclusive educational environments that promote open dialogue and mutual learning. This approach helps integrate theoretical knowledge with real-life insights through experiential learning, thereby deepening students' understanding of sustainability challenges and solutions.

Overcoming the Ecological Divide

Overcoming the Ecological Divide involves shifting from actions being driven by self-interest, to an action by the well-being of the whole. By fostering a deeper connection with nature and understanding the impact of our actions, individuals and organizations can develop sustainable practices that respect and preserve natural resources. Because of the complexity of sustainability and circularity, there can’t be effective “universal” curricula for educating children on these topics. Instead, effective teaching methods are highly dependent on local contexts and specific circumstances. Therefore, our context-dependent approach recognizes the unique environmental, cultural, and socio-economic factors that influence sustainability practices in specific region. Therefore, it is more effective to tailor educational strategies to the local context, ensuring that the lessons are relevant and applicable to the students' immediate surroundings and experiences. circularity principles.

Overcoming the Spiritual Divide

Overcoming the Spiritual Divide implies reconnecting with one's deeper purpose and values. This inner transformation helps to align actions with a higher purpose, fostering a sense of meaning and fulfilment that counters feelings of disconnection and disillusion.

In 1970., Buber observed that relationships were often experienced as functional. Each person in a relationship treated the other as an object and thus presented a partial, guarded, and compartmentalised version of themselves (Buber 1970). In contrast, Buber argued that a relationship which focused on the reciprocity between two human beings, what he called the “I-Thou relationship”, was an engaged encounter in which both persons were fully attentive, empathetic, and present. The “I-Thou” relationship allowed each person in the relationship to view the other party as an end in himself or herself, which recognised and supported each person’s wholeness (Buber 1970).

Lisa Miller, along with Amy L. Chapman, Lauren Foley, and Jenifer Halliday, explored in a 2023. study "Relational Spirituality in K-12 Education: A Multi-Case Study” how relational spirituality impacts education by examining three schools where it is a central driver of the school's mission and purpose. The study by Miller et. al. form 2021 concludes that relational spirituality in schools has a profound impact on students' well-being and academic success: It enhances emotional well-being by nurturing meaningful relationships, giving students a sense of security and support, which is vital for their emotional health. When students feel valued and connected, they become more engaged and motivated, leading to improved academic outcomes. Additionally, relational spirituality helps create a supportive and inclusive school culture where everyone feels a sense of belonging. It also encourages

personal growth by allowing students to explore their own values and beliefs, contributing to their overall personal development.

These findings underscore the transformative potential of integrating relational spirituality into educational settings. When creating a CCC method, we used this study as direction and opportunity for the field of sustainability education. Integrating the cultivation and encouragement of the spiritual core has collective implications for the integrated formation of the child, moral and ethically driven learning, and the renewal of civil society.

3) OBJECTIVES AND AIM

The educational program for sustainability education 'CCC' was applied within the context of Trofaiach Mittelschule. The aim of this paper is to explain its methodological steps, and discuss its strengths and weaknesses, based on one day workshop conducted in Trofaiach, Austria. More specifically, this paper aims to examine whether such a program can raise upper-secondary students' awareness and understanding of sustainability issues and overcome “three divides” raised in this paper. The assessment is based on observational data collected during the workshop and analysis of workshop outcomes.

Objective 1: To determine if the education provided by 'CCC' affects overcoming ecological divide. We are investigating whether it increases students' awareness of the need to address the depletion and overuse of natural resources, which leads to environmental degradation and unsustainable practices in the Trofaiach region.

Objective 2: To evaluate if the education provided by 'CCC' Or affects perceived social divide. We are determining if CCC method enhances secondary school students' awareness of stakeholders in athe local sustainability issues, enable them to understand different perspectives and to collaboratively develop actions and solutions in the Trofaiach region.

Objective 3: To investigate what is the effect of 'CCC' on students' sense of purpose and belonging, i.e., did it affect their perceived personal divide.

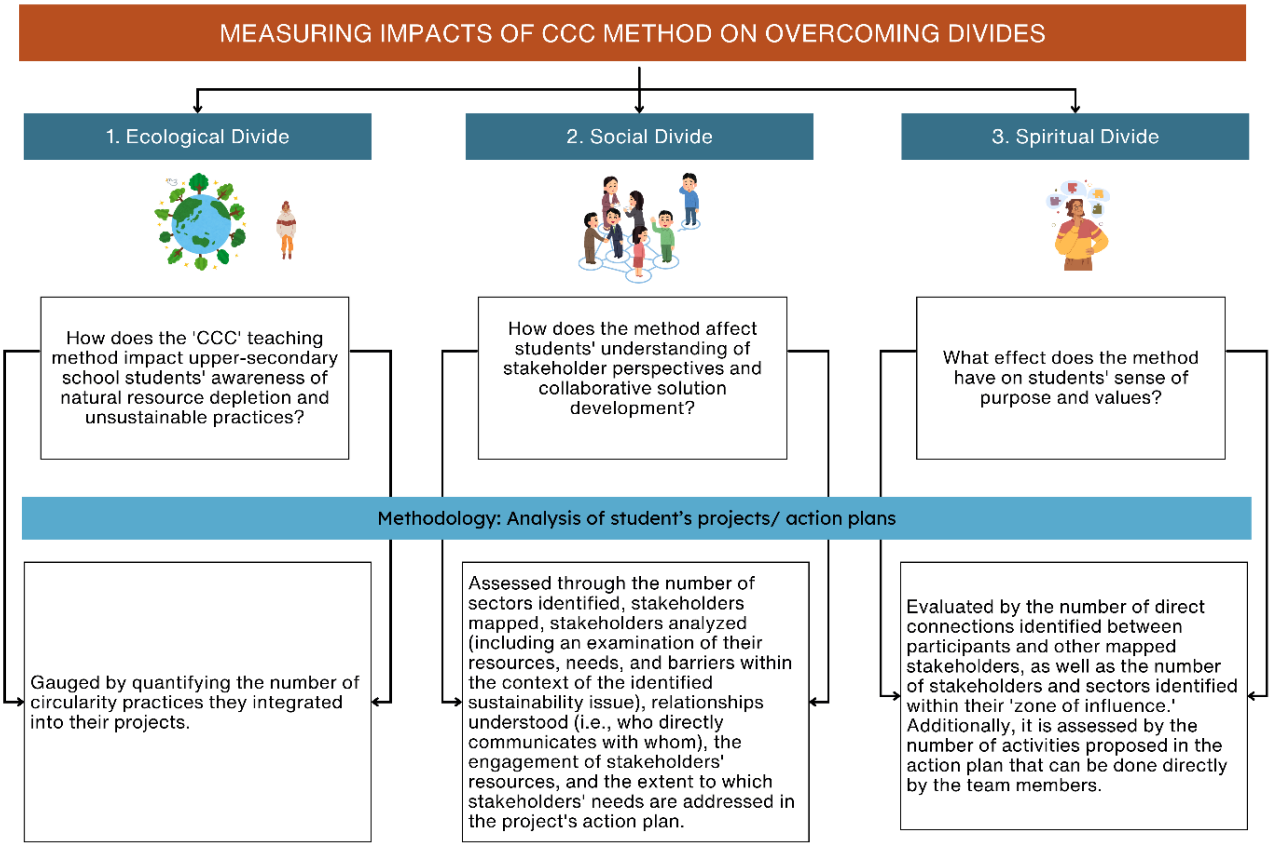


Figure 2. Measuring the impact of the CircularCityChallenge method on overcoming divides to achieve a comprehensive understanding of sustainability

4) DESCRIPTION OF THE CCC WORKSHOP

Part I. The initial step of the workshop involves engaging participants and connecting them to the topic through a warm-up activity. During this phase, it is crucial to publicly recognize the intelligence of the participants, set clear expectations, build trust in the process, and encourage participants to feel comfortable.

1.1. Ice-breaker: Describe your city in one word (15 minutes)

The facilitator asks the participants to think of their cities and write one word for each of the following questions on a post-it note: "What is the colour of your city? What is the smell of your city? What is the sound of your city?" The participants stick their post-its to the corresponding category (colour, smell, or sound) on the wall. The facilitator reads some of them aloud.

1.2. Reflection: Award a medal to your city (5 minutes)

The facilitator asks the participants to write an award for their cities, something that they like or appreciate about their environment. The participants write their awards on yellow circular papers that look like medals and stick them to the wall.

Part II. This section focuses on identifying and understanding both individual and collective perspectives concerning the sustainability issue at hand, at emotional and empirical levels. It begins with exploring and sharing observations from our habitual state of mind, then shifts to new or less familiar perspectives. This phase involves suspending old judgments, breaking habitual patterns, and

being open to and empathizing with multiple perspectives. The quality of the results depends on the facilitator's quality of listening (both to oneself and others) and the ability to suspend fear, judgment, and cynicism.

2.1. Problem-finding phase: Write a complaint to your city (25 minutes)
The facilitator asks the participants to think about what is not working in their city and what needs attention and improvement. The facilitator prompts them to recall their daily life in their households, neighbourhoods, and cities: "How do you leave your house and go to school or work? What do you experience or encounter? What frustrates you? What do you complain about?" The facilitator gives some examples of their own complaints, focusing on household, neighbourhood, and city-level issues, such as food and waste management, traffic, etc. The participants write complaints per post-it note and stick them to the wall. After everyone has finished, the facilitator asks the participants to gather in front of the wall and read some of the complaints aloud. The facilitator then asks the participants to group the complaints into similar categories. After the complaints are grouped, the facilitator asks the participants to put a round sticker (up to three stickers) on the problems that they think are the most urgent or important to solve. The participants put their stickers on the problems that they prioritize.

2.2. Fantasy phase: Turn the problem around
The facilitator selects some (or all) of the priority problems and moves them to a new section on the wall. The facilitator rewrites the priority problems as their opposites. For example, if a problem is "I produce too much waste in my household", the opposite would be "I produce no waste in my household", or if a problem is "my way to work is full of dangerous traffic situations", the opposite would be "I never encounter dangerous traffic situations on my way to work". The facilitator leads a quick "Belief relief" exercise (Sweeney and Meadows, 2010), guiding the participants to let go of their beliefs about problem-solving constraints. The facilitator then asks the participants "How can this opposite (turnaround) be true?" The facilitator gives them time to think about the possible ways that the turnaround can be a reality. The facilitator encourages the participants to open their minds to ideas and reminds them that there are no wrong answers in this exercise. The participants write their ideas on post-its and stick them to the wall. The facilitator asks the participants to identify the feasible ideas by applying a distinguishable sticker to the post is where they are written.

Part III. The third part consists of several sub-phases: crystallization, structured brainstorming, and deciding on practical plans for implementing sustainability ideas into transformative actions. Before delving into details and logistics, it is crucial to solidify the insights gained from deep observation and reflection. This begins by crystallizing broad intentions and principles. Next, it is essential to iterate continuously—experimenting, adapting, and responding to new information and ideas as they emerge. During this iterative process, it is important to establish a structure that balances individual and collective creativity, ensuring all voices are heard. Finally, insights, ideas, and prototypes are refined and connected with plans for concrete next steps and ongoing future actions.

3.1. Project plan phase
The facilitator shows that most of the identified problems can be categorized into four topics: "mobility", "built environment", "waste", and "food". The facilitator informs the participants about the facts and problems related to these categories. The participants discuss what solutions to these problems are already taking place. The facilitator encourages the participants to use these cases as inspiration for their own projects within their local communities. For inspiration, facilitator presents the list of circularity principles on the poster: using public and private spaces to enhance urban health and well-being, adapt existing infrastructure to minimize resource waste during infrastructural changes, support local businesses, repairing, re-using, renewable energy, and sharing of resources.

3.2 Identifying and understanding the perspective of all involved stakeholders in their city.

The facilitator divides the participants into smaller teams and guides them to draw a map of stakeholders and their connections (who communicates to whom?) around the issue that they want to make more sustainable, e.g., teachers, parents, peers, principal, mayor, town governmental offices, social media influencers, local and national media, industry, mobility stakeholders, local businesses, etc.The facilitator announces a role-playing game and asks the participants to choose a role of a stakeholder. Some of them are going to be parents, some the mayors, some the teachers, some the business owners, etc. The facilitator then makes an introduction: "Take a minute, get into that role, and tell us about yourself. What is important for you? What is your work about? What are your needs (related to the identified issue)? Do you have trouble with meeting these needs? Do you have trouble with the other stakeholders? Etc." If the real stakeholders (city representatives, principal, teachers, officers, etc.) are present in the workshop, the participants will have the conversations with them. The facilitator asks each participant to describe their "experience" in about three minutes and asks additional questions when needed. All participants are interviewing that stakeholder.

3.3. Students understanding their role and power in shaping their city's future.

Participants identify their personal zones of influence on the stakeholder map. The facilitator guides the discussion on recognizing their power to shape their communities and how they can directly contribute to the solutions identified in step 2.2. Students then create action plans on posters, detailing how they will engage stakeholders and redesign processes. At the conclusion, participants produce posters that articulate the identified local sustainability issue, the stakeholder network with their needs and barriers, the students' domains of influence, and an action plan outlining who should do what and in what order (Figure 3). The gallery of the projects is also available at project's web site https://circularcitychallenge.eu/circularity-heroes/.

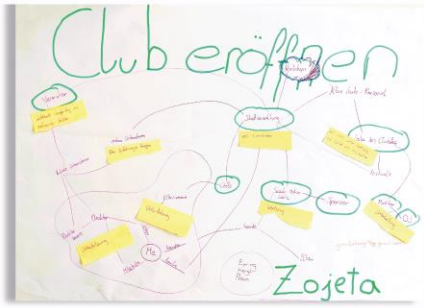
Trofaiach Tunes: Uniting Beats, Hearts, and Community

Hergl Jennifer
Eyring Zoe
Prein Tanja

The Nightlife Conundrum

Trofaiach's students are confronting a nightlife drought. The town's lack of suitable spots for clubbing leaves young people with few options for evening entertainment. Traveling to clubs in nearby cities is hardly ideal, posing both convenience and safety issues. Nightclubs, after all, are more than just party venues—they're social hubs where young people can mingle and broaden their horizons. The students' solution? To breathe new life into an unused building by transforming it into Music Club.

Stakeholder Ensemble



The initiative has identified a network of stakeholders, beginning with the students' inner circle—friends, family, and educators—who serve as the nexus to wider community involvement. This includes:

- The Parents Association and employers, who can advocate for the project and co-create the program.
- Local businesses and school principals, who can offer support and resources.
- The Association of School Principals, extending the project's reach into the educational sphere.
- These connections lead to pivotal contributors:
- The building's owner, who will negotiate the lease.
- Local authorities, tasked with granting approvals and allocating funds.
- The club manager, responsible for staffing, booking artists, and overall management

Influence and Outreach

The team takes cultural, social and economic dimensions into account and focuses on intergenerational cooperation. In doing so, it uses its influence through:

- Promoting the club on social media by sparking conversations about desired events and music genres.
- Securing sponsorship and investment to demonstrate the club's potential as a sustainable business. At the same time, public funding is also leveraged, enabling different revenue models that allow prioritizing community values over profits.
- Incorporating festivals and workshops into the club's offering to cater for a wide range of interests.

By studying successful models of similar ventures in other cities the students aim to emulate what works and avoid pitfalls to ensure that the Music Club strikes the right chord with young people in Trofaiach.

CircularCityChallenge

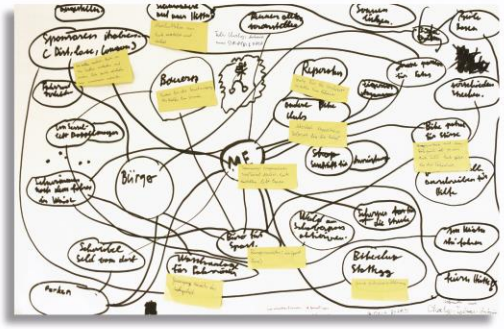
Green Wheels Initiative: Trofaiach's Teen Terrain

Scheiber Simon
Wohlmuther Florian
Hosner Tobias

The Vision and Strategy

Trofaiach's beautiful landscape is cherished by its young residents, yet there's a collective yearning among the youth for more structured recreational and sports activities. The students have pinpointed underutilized green spaces that could be transformed to benefit a diverse array of stakeholders and elevate their quality of life. Their proposal includes the creation of a downhill biking trail complete with a lift and parking facilities on a nearby hill. This initiative would also encompass a series of related events and amenities, such as bicycle festivals featuring local bands, family-friendly gatherings, and sandwich bars.

Engaging the Community



A broad spectrum of stakeholders has been identified, ranging from local cycling clubs and bike maintenance shops to the constructors of the lift and downhill track, as well as those responsible for additional infrastructure like restrooms, water, and power supply. Other key participants include sandwich bar proprietors, event planners, cyclists, residents, landowners, farmers, educational institutions seeking to offer extracurricular sports activities, and the municipal government.

Influencing Change

Adopting a business-oriented approach, the students have devised a plan of action that includes:

1. Securing sponsorships for the trail and generating public interest through local and social media channels.
2. Engaging with the municipality to present the backing of potential investors and the community, seeking project approval, and discussing possible co-funding and permit arrangements.
3. Uniting businesses that stand to benefit and contribute to the project, such as sandwich shop owners, local agriculturists, sports clubs, proprietors of nearby ski facilities, event coordinators, equipment rental services, and maintenance workshops.
4. Assembling service providers for essential infrastructure—sewage, electricity, water supply—alongside emergency medical services and construction firms.

CircularCityChallenge

Figure 3. Two examples of the students' projects.

Contextual Information of the CCC Workshop

The workshop was held on June 24, 2024, in Trofaiach, a mountain town in Upper Austria with a population of 16,000. The total duration of the workshop was four hours. It took place in the city's event hall and involved 24 middle school students aged 13 and 14, along with their three teachers and two facilitators trained in the CCC teaching method. The teachers acted as observers. Participants worked individually in Part 1 and formed teams in Parts 2 and 3. The workshop aimed to engage students in local sustainability and circularity topics, generate ideas for community improvement, connect students and their ideas with local decision makers, demonstrate the teaching method to teachers, and test the CCC method for impact analysis.

The workshop included 24 participants, aged 13 and 14, comprising 8 female and 16 male students. They attended a vocational middle school and were in their final year, planning to transition to various vocational high schools. They had not previously encountered courses on sustainability or circularity. The students came from different school departments and some were unfamiliar with each other, leading to initial hesitation in team activities. Facilitators moderated conversations to help establish connections.

Descriptive Observations

Initial distrust and scepticism were observed among both students and teachers. Engagement increased after introductions and an icebreaker session, as students realized no prior knowledge was required and their contributions were valued. Once students understood that all their answers were valid and listened to without judgment, their engagement and curiosity significantly increased. Facilitators played a crucial role in Parts 2 and 3, where team collaboration was required. Some groups were initially shy and needed facilitator intervention to start conversations. Teams with pre-existing relationships worked more cohesively. These differences diminished as the workshop progressed.

Participant Contributions

Students focused on mobility and leisure time issues in their projects. Of the eight projects developed, three proposed mobility enhancement between Trofaiach and nearby towns, four focused on urban renewal, and one dealt with local safety and security. Participants interpreted the term "waste" broadly, applying it to various local issues beyond the context of circularity. For example, they described specific local police actions as a "waste of police time" and job seekers not being able to find job as a "waste of human resources." They also referred to an underutilized mountain as a "waste of a good mountain."

Reflective Notes

Engagement and interest peaked during the stakeholder mapping activity, as students recognized their local knowledge and potential influence. This activity highlighted their connections to other stakeholders and their ability to effect change. Students discovered the extent of their local knowledge and how to use it effectively.

Rather than engaging with larger sustainability issues like climate change, students focused on immediate, familiar concerns. They effectively applied circularity principles to these topics, demonstrating an understanding of sustainability concepts in a local context.

A few weeks later, students presented their ideas at a public exhibition attended by the mayor, representatives from the local government's waste management department, peers, and teachers, all of whom showed interest in their ideas. Project partners, who are also sustainability experts, provided written feedback for each project. This feedback was based on the use of circularity principles, the number of stakeholders mapped and analyzed, and the students' understanding of their personal domain of influence on the topic.

5) Data Collection and Analysis

The workshops outputs are eight students' projects, that encapsulate identification of the local sustainability issue and possible solution, mapping and analysis of stakeholders involved, and action plan towards a circular solution. The projects were analysed to address the following research questions: (1) How does the 'CCC' teaching method impact upper-secondary school students' awareness of natural resource depletion and unsustainable practices? (2) How does the method enhance students' understanding of stakeholder perspectives and collaborative solution development? (3) What effect does the program have on students' sense of purpose and values?

Impact on awareness of natural resource depletion and unsustainable practices

The impact on students' awareness of natural resource depletion and unsustainable practices is gauged by quantifying the number of circularity practices they integrated into their projects. As demonstrated in Table 1, the students comprehensively applied all designated circularity practices within their project work.

Table 1. Circularity practices applied in the students' projects.

Type of circularity practice	**Number of times applied in the projects / total pr.**
Looping: Embrace recycling, reusing, and repairing to diminish waste and preserve resources	7 / 8
Regeneration: Use and green public and private spaces like squares and parking to enhance urban health and well-being.	6 / 8
Adaptation: Use and adapt existing infrastructure to minimize resource waste during infrastructural changes.	6 / 8
Localization: Support local businesses to lower carbon emissions from long-distance transport.	4 / 8
Substitution: opt for eco-friendly alternatives, like repairing, re-using, or renewable energy, to lessen environmental impact.	7 / 8
Sharing: Promote sharing of resources to connect the community, decrease consumer waste and simplify living.	4 / 8

Impact on students' understanding of stakeholder perspectives and collaborative solution development

The impact on students' comprehension of stakeholder perspectives and the development of collaborative solutions is assessed through several metrics, analysed in students' projects (Table 2): the number of sectors identified, the number of stakeholders mapped, the number of stakeholders analysed (including an examination of their resources, needs, and barriers within the context of the identified sustainability issue), the number of relationships understood (i.e., who directly communicates with whom), the engagement of stakeholders' resources, and the extent to which stakeholders' needs are addressed in the project's action plan.

Table 2. Analysis of Stakeholder's maps in the students' projects.

	Sectors identified	**Stakeholders identified**	**Stakeholders analysed**	**Connections identified**	**Stakeholders' resources engaged**	**Stakeholders' needs met**
Team 1	2	6	4	6	4	6
Team 2	1	8	5	8	4	4
Team 3	4	9	5	11	6	8
Team 4	5	12	7	14	8	8

Team 5	3	9	5	6	6	6
Team 6	4	17	11	24	10	8
Team 7	4	11	7	20	8	4
Team 8	3	7	4	4	5	4

Impact on students' sense of purpose and values

The impact on students' sense of purpose and values is evaluated by the number of direct connections identified between team members and other mapped stakeholders, as well as the number of stakeholders and sectors identified within their 'zone of influence' (Table 3). Additionally, it is assessed by the number of activities proposed in the action plan that can be done directly by the team members.

Table 3. Analysis of the positioning of the participants in their stakeholders' maps and action plans.

	Direct links between team members and mapped stakeholders	**Number of stakeholders in Team's "Zone of influence"**	**Number of activities in action plan accomplishable by participants**
Team 1	2	3	4
Team 2	1	4	5
Team 3	4	4	5
Team 4	5	6	7
Team 5	3	8	5
Team 6	4	8	9
Team 7	4	5	7
Team 8	3	4	4

6) DISCUSSION

The results indicate that, through the workshop, participants gained a comprehensive understanding of how to recognize sustainability issues and identify relevant stakeholders. They developed an appreciation for the diverse perspectives and needs associated with the identified issues and learned that these needs can be addressed by engaging stakeholders' resources. The participants created action plans detailing the responsibilities necessary to redesign unsustainable issues in a circular manner. They also became aware of their own roles in these issues and realized their capacity to effect change. Notably, these outcomes were achieved by students who had no prior education in sustainability.

This assessment is a preliminary orientation. It would have been more effective to collect data through qualitative interviews and questionnaires, which was impossible due the limited time resources and the interest of the teachers and students. Despite those limitations, the workshop outputs provide valuable objective data on the overcoming the ecological, social and spiritual divides we aimed to measure:

- **Overcoming the ecological divide** through the awareness of natural resource depletion and unsustainable practices: The identified issues and stakeholder analyses demonstrate that students successfully recognized sustainability challenges in their local contexts. They specified how the environment and various social groups are affected, highlighting both losses and gains.
- **Overcoming the social divide** through students' understanding of stakeholder perspectives and collaborative solution development: Project analyses reveal that students developed solutions to sustainability problems by considering the needs of all identified stakeholders.
- **Overcoming the spiritual divide** through understanding students' sense of purpose and values: The "domain of influence maps" indicate that students grasped their role within a larger system, understanding their influence and significance beyond individual actions.

7) CONCLUSION

The CCC method offers significant potential for cross-subject learning in various formats. Its extended format allows students to engage with community members, adding substantial value to their educational experience. This method serves as an excellent introduction to detailed learning materials on specific sustainability topics and does not require additional teacher training to achieve good results.

The CCC method can be also suitable for workshops with citizens in participative processes. Participants quickly grasp the principles of stakeholder mapping and analysis. Facilitators, even without prior education in sustainability topics, were successfully trained to conduct workshops, demonstrating that this method requires no extra teacher training.

While the CCC method provides a meta-level understanding of problems, it does not teach existing effective sustainability practices. To address this, we have created a library of best-case examples that can be used as a teaching tool alongside the CCC method. This library is integrated into the CCC curriculum for students with a keen interest in circularity and sustainability. Additionally, the method effectively opens participants to a meta-perspective, highlighting the web of interdependencies and interrelations in sustainable development.

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