A STUDENT-CENTRED CLIMATE EDUCATION PROGRAM FOR HIGH SCHOOL GIRLS

Case Study Final Report

Iran

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MECCE Project Funded Case Study

A Student-Centred Climate Education Program for High School Girls[1]

EXECUTIVE SUMMARY

The *Action to Combat Climate Change from High School* (ACCCH) program is a groundbreaking climate education initiative for girls in grades 10 and 11. The program is Iran's first comprehensive, project-based, student-centred climate change education initiative for high school students.

ACCCH uses problem-based, project-based, and inquiry-based learning to engage students in meaningful climate action. The central goal of the program is to help students gain sustainability competencies and empower them to take meaningful climate action. The program enhance students' understanding of climate change while developing their critical thinking, problem-solving skills, leadership, and teamwork skills. The ultimate objective of the ACCCH program is to create climate ambassadors who not only gain knowledge but also adopt climate-friendly behaviours and actions in their schools, families, and communities.

Integrated into the high school curriculum, the program blends classroom instruction, field trips, and hands-on activities. Students actively participate in designing and implementing climate-related projects. For example, the program incorporates art and nature-based approaches, encouraging students to express environmental concerns through theatre and mural painting. Field trips to nature reserves help students witness the effects of climate change firsthand. The students also tackle local and global environmental challenges through advocacy campaigns and creative performances.

This case study used a participatory action research approach to investigate how the ACCCH program facilitates student transformations in regards to climate learning and behaviour. Over a nine-month period, researchers observed a remarkable transformation in students. Initially, many students felt indifferent and confused by the program's unconventional structure. However, over time, they became proactive leaders, initiating projects and influencing their peers, families, and communities.

Through this research, a new educational framework called the "Pedagogy of Change" was developed by the research team. This framework outlines the strategies that enabled transformations from disengaged students to climate ambassadors. Ultimately, the case study highlights that by integrating student-led learning through art, journalling, and real-world projects, climate change education thrive within a traditional exam-oriented school. This case study also demonstrates that with the right instructional methodologies and community engagement, climate education can be impactful even in settings where it is not a national priority. Organizations working on climate action and education policy can use the ACCCH and this case study as an example to advocate for similar programs in other regions.

[1] The views in the report are not necessarily endorsed by the MECCE Project, which funded the research.

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CCE PROGRAM OVERVIEW

The *Action to Combat Climate Change from High School* (ACCCH) Program was established in Farzanegan Andieshe in Karaj, Iran in 2018. The program is an outcome of an international "Train the Trainer" program offered by the Institute of Health and Environment at the University at Albany. In its first year, the program engaged students to undertake multiple projects through its project-based approach. However, the COVID-19 pandemic disrupted in-person learning, forcing the program to shift to an online format. Further disruptions occurred in 2022 during the nationwide *Women*, *Life*, *Freedom* movement,[2] which affected schools across Iran. The program resumed in 2023.

The central goal of the program is to help participants gain sustainability competencies and empower them to take meaningful climate action. Focused on girls in grades 10 and 11, enhances students' understanding of climate change while developing their critical thinking, problem-solving skills, leadership, and teamwork skills.

Integrated into the high school curriculum, the program promotes environmental stewardship, bridges knowledge with action, encourages creativity and innovation, strengthens personal growth and resilience, provides meaningful nature-based learning experiences, and empowers students to become climate ambassadors in their communities. The ACCCH program integrates problem-based, project-based, and experiential learning with progressive student-centred teaching methods. The program uses dialogues, discussions, and brainstorming sessions (using the 5E teaching model[3]) as well as innovative art and nature-based learning approaches. The program's pedagogy is premised on a participatory approach, engaging students in the co-creation and co-development of the program. While the general framework of the program is predefined, it allows flexibility, as project ideas are entirely developed by the students. Depending on the direction students take, the details of the program's focus and outcomes evolve accordingly.

The ACCCH program runs for seven months, with weekly 45-minute sessions. Overall, the ACCCH program consists of two major parts, climate change content and projects developed by students. The first three months of the program are focused on the science of climate change, as well as mitigation and adaptation strategies. During this time, the students participate in field trips to places like *Khansar*, *Khojir* and *Shirgah* Nature Reserve, to begin sensitizing them to environmental issues through connections to place (nature-based learning) and engaging in hands-on activities such as environmental clean-ups, learning about solar stoves, and conducting nature photography. During the rest of the program, students engage in different projects of their choice. The program seeks to foster student leadership in climate advocacy, equipping them with the knowledge and tools to create meaningful impacts within their communities.

Two-thirds of the program's duration is devoted to developing and implementing projects at various scales, including school-based initiatives, community-wide efforts, and even some attempted global initiatives, such as writing to the United Nations. These projects are the cornerstone of the program. During the program, students design and carry out a wide range of innovative projects and showcase a diverse range of action-oriented approaches to addressing climate-related environmental issues.

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[2] The Women, Life, Freedom movement was sparked by the death of 22-year-old Mahsa Amini in September 2022, following her detention by Iran's morality police for violating the country's dress code. Her death ignited widespread protests across Iran, led largely by women and supported by diverse groups, calling for gender equality, dignity, and personal freedoms.

[3] The 5E teaching model is a framework based on constructivist learning principles, emphasizing active learning and the role of students in constructing their own understanding of concepts. It is structured into five phases: Engage, Explore, Explain, Elaborate, and Evaluate. The teacher applies the 5E framework as a guiding process, facilitating student learning while allowing each class and year to have a unique experience.

Generally, student projects focused on the following thematic areas: **Education**, which focuses on raising awareness and building knowledge; **Stewardship**, emphasizing direct care and responsibility for the environment; **Advocacy**, aimed at influencing public perception and policy; **Behavioral Change**, encouraging shifts in individual and collective habits; and **Community Engagement**, fostering collaboration and shared action among various stakeholders.

The program's theory of change is based on the understanding that active and student-centred learning fosters deeper engagement, critical thinking, and long-term commitment to climate action. By integrating project-based learning, experiential education, and nature-based approaches, the program empowers high school girls to develop environmental awareness, leadership skills, and a sense of agency to address climate challenges. The initiative assumes that hands-on involvement, collaboration, and real-world application of knowledge will not only enhance students' understanding of climate issues but also inspire them to become climate ambassadors who influence their peers, families, and communities. Through this approach, the program seeks to bridge knowledge with action, ensuring that students move beyond theoretical learning to practical, solution-driven engagement with climate change.

METHODS

Research Questions

The main research questions guiding this case study are:

- How does the *Action to Combat Climate Change from High School* (ACCCH) program empower students to be climate change ambassadors and develop their sense of agency and action?
- How has the program helped students to develop new skills?
- What is the experience of students participating in the ACCCH?
    - How has the program influenced students' engagement with environmental issues and climate change mitigation actions?
    - Has the program changed the students' attitudes, behaviours and skills? How?
- What are the main outcomes of the ACCCH program? What action-oriented outcomes has the program produced?
- How is student-centred pedagogy implemented in a traditional and teacher-centred educational setting? What challenges and barriers does it face?

Research Design

The case study used a participatory action research (PAR) approach to develop research design, analyze students' experiences, and inform program development. The project was led by a team of 'co-researchers' to enable collaborative research design and collective transformation for participants and communities alike. In this case study, the co-researchers included the principal researcher, teacher and two research assistants. The co-researchers engaged in weekly meetings and facilitated a school site visit to implement feedback into the program and sustain an evolving and responsive program delivery. Below we describe these two activities in more detail:

Co-researcher Meetings: These virtual meetings served multiple purposes. In the early stages of the research, the team worked through initial resistance exhibited by students to the program. The meetings also facilitated brainstorming on data collection methods, refining project execution strategies, and documenting processes. For instance, team brainstorming led to the idea of collecting bullet journals from students to assess behaviour change. Additionally, meetings covered class

planning, scheduling, implementation and design of methods, along with discussions on program strengths and weaknesses, upcoming plans, and future directions. Later on in the case study, weekly meetings surfaced opportunities to discuss students' project implementation challenges as well as school decisions and teacher-administrator feedback following project implementation.

The meetings helped align ideas, assess barriers, and adapt research plans. The meetings also provided opportunities for dialogue between team members, addressing differences in expectations and communication styles. Initially held weekly for three months, the co-researcher meetings became less frequent as ongoing logistical and program coordination details were addressed.

Principal Researcher Field Visit: As part of the case study's participatory processes, the principal researcher visited the school for one day to consult with students. The principal researcher sought student feedback on the program to incorporate their ideas into the program and case study. This visit, along with insights from three months of weekly meetings, helped finalize the research questions and methodology.

Data Collection and Analysis

The research team engaged in analysis of six main datasets: focus groups, storytelling assignments, observation reports, teacher reports, students' projects and bullet journals.

- Focus Groups**:** Five focus groups were conducted, each with the participation of students from different classes. Two groups had four participants each, while three groups had five participants each, bringing the total number of participants to 23 (See Appendix A).
- Storytelling Assignments: At the end of the year, the teacher asked students to provide a short story about their experience with the class using a format of their choice. The students created 15 stories in groups: 8 stories were audio files and 7 were movie clips. These files were analyzed to find themes in common across the assignments (See Appendix A).
- Observation Reports: This consisted of four reports developed by a research assistant about student-organized events and one report developed by the principal researcher during the field visit.
- Teacher Reports: Meeting notes and the teacher reports to the research team were used in our analysis.
- Student Projects: Fifteen projects were studied and analyzed, focusing on the type of action taken and the skills required for their development.
- Bullet journals: Students were asked to provide weekly journals. We reviewed 15 bullet journals to understand the students use of art and journalling as tools for behaviour change.

Data analysis followed a structured process: codes were extracted from the data, concepts emerged from the codes, and categories were identified from the concepts. Audio recordings were transcribed into text, then analyzed line by line and paragraph by paragraph to generate open codes. The data were broken into segments, with similarities and differences carefully examined. Next, related codes were grouped into concepts, and interconnected concepts were categorized into broader themes. For analysis, Maxqda 2020 software was used.

FINDINGS

Most Important and Interesting Findings

Transformation through project-based education

The most significant and interesting finding of this case study was the transformation of students' attitudes and engagement towards the program. At the beginning of the academic year, most of the students were disengaged in classes and inattentive to the teachers' explanations. This class was not taken seriously compared to other classes. During the focus groups and field observations, many students expressed that they began the course feeling confused and unconvinced of its necessity. Some common questions and comments were as follows:

> *"What can we do? "How can we have any impact?" "Why is this important?"(teacher reports)*
>
> *"We did not care in the beginning."*
>
> *"The class was boring in the beginning."*
>
> *"It was hard in the beginning!"*
>
> *– Focus group participants*

These confusions and lack of motivation could have created a situation where failure seemed likely. High schools in Iran primarily focus on preparing students for the highly competitive university entrance exam, leaving little space for alternative teaching methods. The final two years of high school are especially intense, with a heavy emphasis on science, math, and social sciences. The ACCCH program, however, is not a typical high school program; it adopts a project-based, student-centred approach, allowing students to engage in the full cycle of a project—from ideation and team formation to conflict resolution, decision-making, and adapting plans along the way. For students already overwhelmed by a rigorous math and science curriculum, participating in the ACCCH program was challenging.

First, the students believed the course was unimportant and unnecessary, particularly when they had many other important, stressful and high-pressure courses. Second, at the beginning students found the unfamiliar student-centered pedagogical approach unnecessary. The students reported uncertainty about their tasks and expressed a need for additional guidance. Third, the students believed that small climate actions had little impact and did not understand the significance of climate action in the larger societal context. Some students even initially resisted the activities, finding them "insignificant" or "too small-scale to have a broader impact," as noted during observations and mentioned in the teacher's report.

However, over time, the students evolved from indifferent and non-cooperative, to proactive and engaged. The change in students' engagement and attitudes was gradual, unfolding over several months. This was a recurring theme in the focus group and storytelling.

> *"At first, we weren't very engaged and didn't collaborate much, but over time, we gradually became more interested." - Focus group participant*
>
> *"During the first sessions, we didn't really care about the topic. The research we did was just to complete our assignments." – Focus group participant*

"At first, we only made small changes, but over time, it became more serious. Eventually, we put much more effort into it, and it turned into a valuable experience." – Storytelling video

Based on the teacher's reports and observation reports, the following strategies played a key role in fostering students' growth and engagement:

- Hands-on Experience: Learning by doing was a critical element. The process of conducting their projects, overcoming challenges, and achieving success helped students gain confidence and develop problem-solving and communication skills, including the ability to work collaboratively and reach consensus.

- Teacher's Facilitation: The teacher played a crucial role in guiding students through moments of confusion and uncertainty, helping them navigate challenges and achieve meaningful outcomes. At times, she went beyond traditional teaching responsibilities, leveraging every available resource to support students—whether through collaboration with external organizations or by providing consistent encouragement. However, she also recognized that if she could not provide students with the necessary resources and opportunities—such as permissions required for their projects—they might struggle to develop perseverance and a sense of agency. Her goal was to instill the belief that they could overcome obstacles and take the initiative to make things happen on their own.

- Field Trips and Connection to Place and the Environment: The field trips and opportunities for nature-based learning provided a transformative experience for many students. These activities helped them build a deeper connection with the environment, making their learning more personal, place-based and relevant.

- Connecting with Art: Watching an emotionally impactful movie and reflecting on the future of their children, wondering what would remain for them, helped them connect with the class. The students' concern for the future and the realization that they could actively shape it became a key motivation throughout the program.

- Seeing Change: Students felt inspired when they recognized that their actions mattered and that even small changes could have a significant impact on a larger scale. Their motivation was further reinforced by reading biographies of successful environmental leaders, engaging in discussions, and gaining new knowledge and awareness.

Empowerment through collective impact

As the students changed their behaviour, they reached out to friends, family, and the public to share and encourage behaviour change. Students utilized various methods during their public awareness projects, including creating videos, conducting interviews, engaging in conversations, educating elementary school children, and spreading information on social media.

During focus group discussions, the students emphasized the importance of leading by example**.** They emphasized that every individual can play a crucial role in driving social change, and that small actions can lead to significant societal transformations. They believed that change spreads like a ripple effect, inspiring others to take climate action as well.

"We talked to people about global warming, as well as issues like water scarcity, excessive electricity consumption, and species extinction."

"We must start with ourselves so that others see and follow our example. We shouldn't think that it's not our responsibility."

> *"I went to my language class, where there were about 20 students, and shared information with them. From there, it gradually spread—students told their families, and with every social media post, awareness expanded. It all starts with one person and keeps growing."*
>
> *"We successfully created models and conducted research that had a direct impact on people. The effect was very positive—everyone understood what global warming is. Some people didn't even know about it before, why it mattered, or how to prevent it, and we were able to share this knowledge with them."*
>
> *– Focus group participants*

The case study also higlights the importance of having a shared sense of responsibility to motivate collaboration and collective effort. The students indicate their belief that commitment and responsibility extend beyond personal actions to educating and promoting environmental awareness, ultimately leading to broader societal change.

> *"After conducting our research, we felt it was our responsibility as students to take action. We decided to study the issue from our perspective and help others understand the dangerous consequences of global warming for our planet." – Storytelling video*
>
> *"The fact that we all had one shared goal—protecting nature and the environment—was exciting and meaningful for all of us. It made us more aware and responsible." – Storytelling video*
>
> *"In any case, if we want to prevent something bad from happening, we can't just say, 'It's someone else's responsibility.' We have to start with ourselves." – Focus group participant*

<u>Intergenerational relationships</u>

The students communicated that one of the biggest challenges was communicating with older generations, which initially felt difficult. However, students eventually found ways to simplify their message to better engage their peers and broader audiences.

> *"It was difficult to communicate with people older than us. The generation gap made it hard to explain concepts like global warming, especially to older individuals who had never thought about it before." – Focus group participant*
>
> *"Since we were young, when we tried to talk about climate change with parents, relatives, and family friends, they didn't take us seriously and often dismissed our concerns." – Focus group participant*

Some students also shared they were motivated by concern for future generations, which some connected to their care for the environment.

> *"We must be mindful of future generations. If things continue at this rate, it won't just affect them—it will impact us too. That's something we realized we needed to take seriously." – Focus group participant*

Psychosocial Aspects

The case study highlights a variety of valuable psychosocial skills that students gained as a result of the ACCCH. These included expressing ideas, critical thinking, project execution, leadership, teamwork, problem-solving, task delegation, respecting diverse opinions, effective communication, consultation, and collaboration.

> *"One of the most important things we learned was how to work as a team, how to divide tasks, solve problems, and cooperate effectively." – Storytelling video*

> *"We improved our ability to think more critically, express our ideas, and turn them into tangible projects or models." – Focus group participant*

Beyond gaining knowledge, the students reported that, as they became more conscious of climate change and environmental, their sensitivity to their surroundings shifted.

In many cases, students communicated that these skillsets were tied to their engagement in climate action. For example, students' engagement with peers and the local community exhibited leadership skills including project management, task delegation within groups, and collaboration. Students strengthened their communication skills when sharing climate information with their families. The students also felt art and creativity were invaluable for effectively communicating their messages and raise awareness. They emphasized the importance of visual storytelling, one-on-one knowledge sharing, and engaging methods to attract and retain their audience's attention. They used art, colours, crafts, and models to make their educational efforts more compelling and relatable.

> *"We focused on making our materials engaging—using videos, interactive discussions, and creative elements—because people don't usually pay attention to dry facts and numbers. But when learning is combined with games, models, and crafts, especially for children, it becomes much more effective." – Focus group participant*

Action-Learning Aspects

Action learning in this program happens through student-led projects, where students actively engage in real-world environmental challenges, develop solutions, and implement their ideas. Some of the student-led projects illustrate this: the My Share of the Blue Sky event used creative performances like storytelling, stand-up comedy, rap, and art exhibitions to communicate climate issues in an engaging way. The Mother-Child Tree Planting Program fostered environmental stewardship by having students teach younger children about tree care and sustainability. Students also took part in stewardship actions, such as nature clean-ups and waste separation, and led advocacy efforts, meeting with officials and promoting sustainable practices like fabric bags.

The case study highlights how group activities and hands-on projects not only helped the students grasp key concepts, but also fostered real behavioural changes.

> *"Next year, it would be great to have even more hands-on activities, where students can directly experience and participate in solutions. Seeing things first hand has a stronger impact than just listening, especially for those who tend to ignore the issue." – Focus group participant*

> *"Midway through the year, our perspective started to change. The group work, creative projects, printed materials, and class presentations helped us engage others. Eventually, our classmates began to agree with us and wanted to contribute by reducing water waste, avoiding littering, and practicing waste separation." – Focus group participant*

As a unique form of action learning, the students noted the importance of bullet journalling helped them to systematically track their activities, set goals, and monitor their progress. According to their reflections, bullet journalling helped them correct unhealthy habits and establish new, positive routines.

"Creating a bullet journal helped make my habits more permanent and made me pay closer attention to small but important details we used to ignore. It also helped us correct bad habits." – Focus group participant

Climate Justice and Other Social Justice Issues

The teacher reports showed that climate justice has been introduced as a pivotal and thought-provoking topic within the program, sparking meaningful discussions among students. Framed around the concept of intergenerational responsibility, questions such as "What kind of Earth do you want to leave for your children and grandchildren?" prompted students to move beyond addressing immediate environmental challenges, encouraging them to reflect on the long-term implications of their actions for future generations. The program also focused on connecting climate justice to universal rights. For this, the teacher emphasized the parallels between the 'right to nature' and other fundamental rights, such as women's rights and human rights. This framing encouraged students to perceive climate justice not simply as an environmental issue but as an integral component of broader justice and equity. By introducing a rights-based perspective, the teacher guided students to explore the moral and ethical dimensions of environmental advocacy, fostering a deeper and more interconnected understanding of the subject.

The teacher highlighted in her reports a notable progression in the depth and complexity of student discussions over time. Initially, students engaged with climate justice on a surface level, focusing on immediate environmental concerns. As the program progressed, students increased their awareness which led them to create a formal message addressed to the United Nations, articulating their demands and perspectives on climate justice. Additionally, the students initiated a petition to gather signatures in support of their cause, showcasing their ability to mobilize others and amplify their collective voice. These actions reflect the students' progression from learning to individual action, to systemic advocacy, underscoring the program's success in empowering informed climate champions.

Cultural and Regional Contexts

Another important finding was the key role of the teacher in making things happen. As students developed their ideas and projects, the teacher often had to collaborate with organizations outside the school or coordinate with other schools for initiatives that students couldn't manage on their own. For example, she spent an entire month doing groundwork and securing permissions from security authorities—an effort made even more difficult in the aftermath of the *Women*, *Life*, *Freedom* movement. The lack of infrastructure to support informal, project-based learning further added to the challenges, requiring the teacher to step in to ensure the success of the program.

Geographies and Places

Developing and implementing a project-based, student-centred pedagogy in this unique context presents significant challenges. The traditional educational culture in Iran is heavily teacher-centred and instructional, making it difficult to introduce and sustain such an alternative approach. Additionally, the country is experiencing a severe economic and political crisis, where environmental issues are often deprioritized or entirely overlooked. Despite these obstacles, the successful implementation of this program demonstrates that even in such challenging conditions, student-centred, action-based learning can be effectively applied, fostering engagement and meaningful outcomes. To do this, teachers must be supported on the ground, as mentioned in the previous section. Supporting teachers may be key in mobilizing environmental learning even amidst political and economic uncertainty.

CASE STUDY IMPACTS

Influence of the Case Study on Conceptualizations of Quality CCE

The participatory nature of the case study contributed to the ACCCCH program's evolution by providing valuable insights through focus groups and observations. Conducting focus groups allowed the teacher to deeply understand students' perspectives, including what they enjoyed and what worked well. This feedback informed the teacher's planning for offering the program the next year. For example, she plans to introduce more engaging and practical activities earlier in the program, rather than starting with content-heavy sessions.

Another notable contribution was the use of creative and art-based approaches, particularly bullet journalling, which emerged during brainstorming sessions. This creative strategy proved to be a promising tool for engaging students, though further research is needed to evaluate its full impact.

Nature-based learning also emerged as a key development during the process of designing the case study itself. Field trips and outdoor activities support connections with the natural environment, which enhances students' engagement in learning about climate and sustainability. It became clear that spending time in nature helps students connect more personally to environmental issues, making the learning experience more meaningful and relevant.

The key learnings from the case study were ultimately used to develop a climate change education framework called, "Pedagogy of Change/Empowerment Framework," which can be found in Figure 1 (below).

Implications and Impacts of the Case Study at Different Levels

At the local level, the program fosters environmental awareness and action among students, their families, and communities. By engaging in hands-on projects and advocacy efforts, students influence their peers and local stakeholders, promoting sustainable practices such as waste reduction and tree planting. Schools adopting similar student-centred approaches can create long-term change in educational culture.

At the regional level, the initiative serves as a model for climate education in schools, demonstrating how project-based and experiential learning can be effectively implemented despite structural and resource limitations.

At the national level, by demonstrating that climate education can thrive in an exam-oriented system, the ACCCH program challenges traditional instructional methods and highlights the value of student agency and experiential learning. Its success can influence educational policy discussions and encourage national education reforms that incorporate sustainability and project-based learning into mainstream curricula.

At the intergovernmental level, the case study offers a replicable model for integrating climate education in challenging socio-political and economic contexts. It provides valuable insights for global education and climate initiatives, demonstrating that with the right instructional methodologies and community engagement, climate education can be impactful even in settings where it is not a national priority. Organizations working on climate action and education policy can use the ACCCH and this case study as an example to advocate for similar programs in other regions.

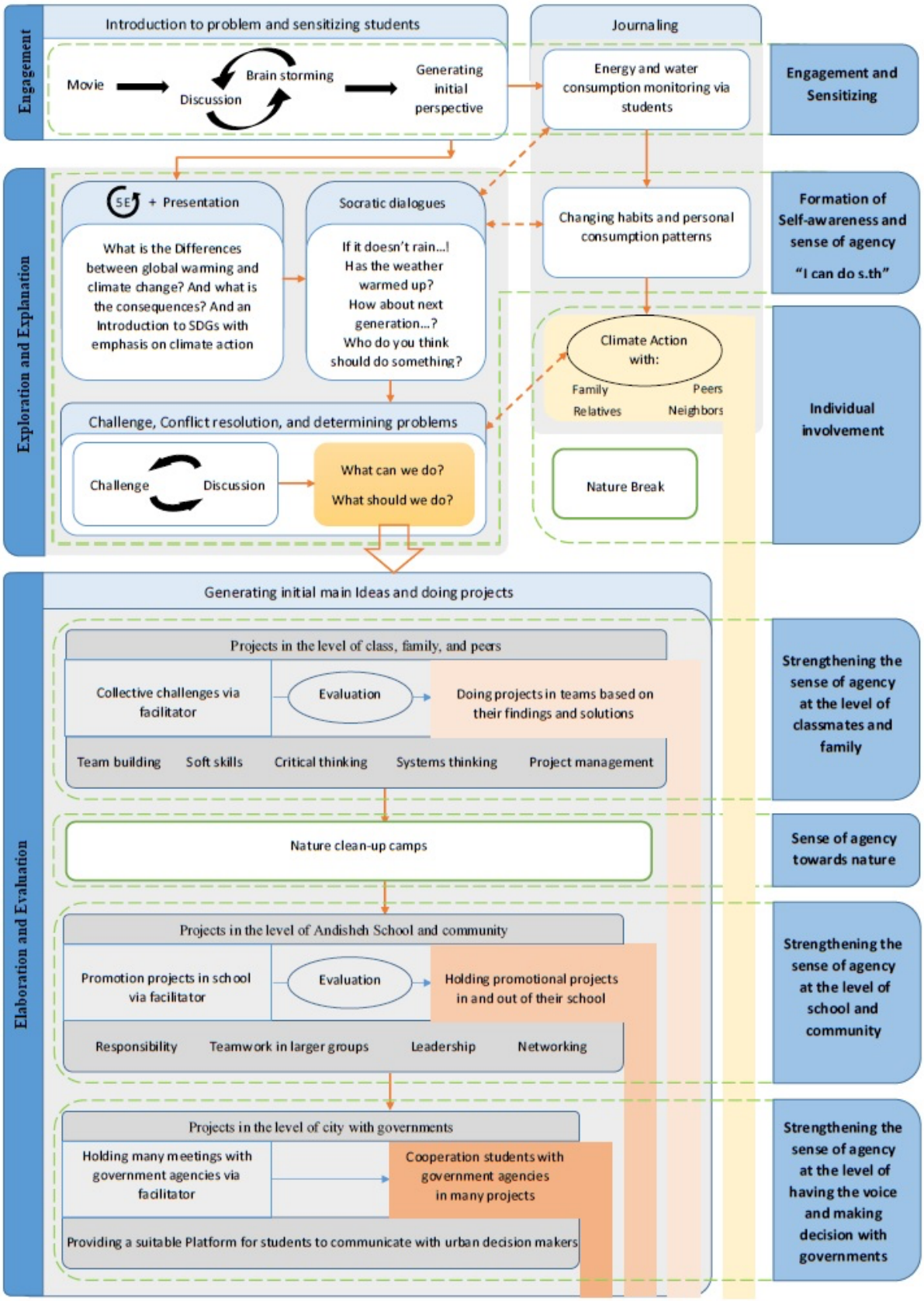

Figure 1. Pedagogy of change/empowerment framework

Scaling and Applicability of the CCE Initiative to Other Contexts

The new framework developed as a result of this case study (Figure 1) highlights the potential of student-centred pedagogies to drive significant change in traditional educational environments. The potential scalability of this climate education program within other educational institutions in Iran is promising due to its adaptable, student-centred approach that aligns with the country's educational and cultural context. While Iranian schools often follow a traditional, exam-focused curriculum, this program offers a complementary model that encourages experiential learning, creativity, and community engagement—elements that can enrich students' educational experiences across the country. The use of project-based learning, arts, and nature-based activities can be easily integrated into the school curriculum without requiring significant infrastructure changes.

The framework offers an opportunity to develop toolkits that can be presented to other high schools for implementation. The ACCCH program's flexibility means it can be adapted to different contexts and cultures, which is essential.

Future steps for continuing to develop the framework include: 1) creating comprehensive resources and toolkits to support the replication of the program in other schools. These toolkits will include practical strategies, step-by-step guidelines, and adaptable templates for schools to implement similar programs and 2) organizing professional development workshops for teachers focused on student-centred teaching methodologies. These workshops will be informed by the case study findings.

Challenges, Opportunities, and Learnings

The research team encountered many challenges during the development and delivery of this program. First, due to restrictions posed by the political situation in the country, the teacher encountered multiple bureaucratic hurdles in attempting to execute program activities. She required extensive permissions and approvals, even for basic activities such as field trips. The teacher often took on responsibilities beyond those typically expected in a non-traditional setting.

The teacher's role was critical to the success of the program, and this is something that may be hard to replicate. Developing strategies and systems to support teachers in similar roles is essential for the sustainability of such programs. One of the key findings of this study is that implementing a student-centred strategy works. While this approach has been used in other fields, such as English language education, we found no similar studies in the context of environmental education, particularly in climate change education.

Another critical lesson from this case study was to understand how to bridge communication gaps between researchers and practitioners. The research team learned how to simplify academic concepts, and how to manage misunderstandings and miscommunication within the team. Manage and address the challenges of working long distance and in two very different cultural contexts. For the majority of the case study, the principal researcher engaged with the rest of the research team at a distance. Slow internet speeds, the teacher's limited access to a VPN, and the use of video conferencing tools which were not user-friendly further complicated research processes and communications.

Appendix A. Data Collection Tools

Focus Groups

Introduction: Exploring Student Perspectives on Climate Change Education

This study provides a platform for 10th-grade students to voice their thoughts, reflections, and opinions on their journey through the climate change education course. By engaging in open discussions and collaborative dialogue, we aim to uncover a deeper understanding of how students perceive, engage and experience course content, activities, and overall learning environment related to climate change.

For Students:

Welcome to the focus group study aimed at gaining valuable insights into the learning experiences of 10th-grade students in a climate change education course.

Your perspectives will not only inform the ongoing development of the course but also contribute to broader discussions on effective strategies for teaching and learning about climate change.

Your participation in this study is completely voluntary and your response will not have any impact on your grade. There are not any right or wrong answers, we are just learning and exploring your ideas and opinions together.

Thank you for participating in this focus group study, and we look forward to hearing your valuable insights and experiences regarding climate change education.

We will explore four categories of questions/discussions

First: Significant Moments

If you were to make a film from these 6 months in your class what scenes would you want to be definitely included in this film

Second: Changes of Belief/Attitude /Actions

What changes have you experienced in your life in terms of:

Your beliefs and attitudes

Your actions

Third: Agency and their Role as a Youth and Change Maker

As a youth, how can you make a difference?

What impacts/roles do you think you would have in contributing to climate change mitigation?

Fourth: Feedback About the Course

How is this course different from your other courses

What suggestions do you have to improve it

Storytelling

At the end of the year, students were asked to share their experiences with the class by recording a short voice or video clip in a format of their choice. As a result, we obtained **eight voice recordings and seven video clips**, created by various student groups. The open format allowed flexibility in group size—some classes produced a single recording collectively, while others worked in smaller groups ranging from **three to ten students** per clip.

Student Projects

1. Interviewing people about global warming and creating a video clip
2. Drafting statements and announcements for teachers and students
3. Creating content for presentation in an extracurricular language class by group members.
4. Nature clean-up, video creation, and organizing conferences on environmental stewardship.
5. Tree planting and waste separation, focusing on recycling paper and plastic bottles.
6. Raising awareness among elementary school children through theatre, games, and competition
7. Promoting the use of fabric bags with the goal of expanding adoption in stores.
8. Pomegranate festival
9. My Share of the Blue Sky
10. Sustainable Fashion Conference
11. The Mother-Child Tree Planting
12. Meeting with officials to propose a mural

<u>Examples of Student Projects</u>

- “My Share of the Blue Sky” Event: one of the key action projects was the "My Share of the Blue Sky" event, organized entirely by 10th-grade students. This daylong festival combined educational presentations on carbon footprints with creative performances, including short story reading, stand-up comedy, and a rap performance. The students also engaged their peers through interactive quizzes on environmental best practices and showcased an art exhibition featuring photos related to climate action and recycling initiatives. Around 90 students from grades 7 and 8, representing other schools, were invited to attend the event.

- The Mother-Child Tree Planting Program: Held on March 19, 2024, in Mallard Square, the Mother-Child Tree Planting Program involved around 35 elementary school children and their mothers, as well as high school students who designed and implemented the event. Representatives from the Natural Resources Organization and Mallard Urban Planning also participated. The event aimed to raise environmental awareness through activities like tree planting, where children were taught about tree care, reducing plastic waste, and maintaining a clean environment. High school students led environmental education sessions, emphasizing the benefits of trees and ways to reduce air pollution. Although students were initially unsure and nervous about where to start, they quickly adapted after a brief discussion. Background music accompanied the activity, and one student gave simple instructions to the children about planting and environmental care, particularly regarding plastic waste reduction. Although interactions among participants were limited, names were exchanged through the labelling of trees, which added a meaningful touch to the event. The program concluded with a quiz for children and the distribution of eco-friendly gifts. The overall event was well received and successfully fostered environmental stewardship among the children and their mothers.