

CHAPTER I

PREFACE

1.1 Research & Technology Program Background

Climate change shows through environmental consequences such as global warming, habitat loss, and increased frequency of natural disasters. Indonesia, situated along the Pacific Ring of Fire, is highly vulnerable to various natural disasters (Kryspin-Watson et al., 2020, as cited in Hendrawan et al., 2025). The National Disaster Management Agency (BNPB) reported a 52% increase in natural disaster occurrences, rising from 3.544 in 2022 to 5.400 events in 2023 (PDSI Pusdatinkom BNPB, 2024). Other natural disasters including droughts, forest fires, landslides, and floodings; also have caused significant casualties in Indonesia. For instance in 2024, natural disasters in Jakarta submerged 2.729 houses and displaced 9.862 residents (BNPB, 2025). These impacts highlight the concerns of Indonesian youths, who are expected to endure more natural disasters than any previous generations (Vrije Universiteit Brussel, 2025), particularly due to the country's geographical diversity and recent developments which makes it prone to many hydrometeorological disasters (UNDRR, 2020).

Although their future is severely impacted, youths are emerging as leading agents of change for climate action. For instance, the Youth Actions for Climate Protection (Aksi Muda Jaga Iklim/AMJI) initiative in Tanjung Pasir Beach involved 100 participants to clean marine debris, planting mangrove seedlings, and sowing mangrove propagules (Alfiyah, 2023). Other actions for mitigating and adapting to climate change include supporting initiatives such as Climate Change Education (CCE), which aims to empower communities by expanding their knowledge, skills, values, and attitudes for informed decision-making towards climate change solutions (Tang, 2024). In Indonesia, one notable example of CCE initiatives is educational game (edugame), which is an educational tool using a Game-Based Learning (GBL) approach that enriches students' experience by

providing a dynamic environment to develop decision-making and problem solving skills (Cheung & Ng, 2021). This approach in education is capable of supporting personal growth and increases relevancy (Satyagraha et al., 2025).

Available climate change games in academic literature are found lacking in learning engagement, pedagogical effectiveness, while also being inaccessible for the public (Galeote & Hamari, 2021). A meta-analysis by Galeote et al. (2021) also reported recurring issues of game engagement issues and failures to increase self-efficacy. Furthermore, edugames evaluations rarely measure their engagement comprehensively, due to conceptual ambiguities for engagement and lack of consistent measurement tools (La Manna et al., 2024). In addition, a knowledge-action gap is also present in translating heightened awareness into behavioural changes through edugames (Satyagraha et al., 2025). To address these shortcomings, GENERAKSI was created. It's a project supported by Knowledge Partnership Platform Australia-Indonesia (KONEKSI) and led by PREDIKT to translate CCE concepts into an inclusive, engaging, and effective learning experience for students in Indonesia.

GENERAKSI's first output (GENERAKSI 1.0) is an educational board game called "GENERAKSI!", aimed to educate and empower youths about taking climate actions for a safer world. To broaden GENERAKSI's reach, an expansion (GENERAKSI 2.0) is underway to integrate the "GENERAKSI!" board game as the main medium for teaching into a CCE learning kit filled with activities and supporting worksheets. Its goal is to train teachers with a Training for Trainers (ToT) guide, that aims to foster their students' decision making and participation in climate actions. In this project, the writer's roles are as a graphic designer and research assistant, in active collaboration and supervision with PREDIKT to co-create a CCE learning kit titled "Generasi Beraksi!". To ensure its capability in enhancing student's learning engagement, the CCE learning kit will be assessed using the instrument called Universal Design Learning (UDL) framework.

1.2 Problem Formulation of Research & Technology Program

According to the research background, the problem formulations can be seen below.

1. Engagement from existing Climate Change Education (CCE) initiatives among high school level students remains limited.
2. There is insufficient evidence to prove the effectiveness of the CCE learning kit “Generasi Beraksi!” in increasing engagement for climate actions among secondary level teachers and students.

Based on the points above, this research seeks to answer the question of: how effective is the Climate Change Education (CCE) learning kit, “*Generasi Beraksi!*” in increasing the efficacy of engagement among high school level teachers and students to take climate actions?

1.3 Research & Technology Program Research Scope

According to the research background and problem formulation explained above, the scope of problem as defined by the writer is as follows.

1. Research Object Scope

The object of this research is a Climate Change Education (CCE) learning kit from GENERAKSI 2.0 which includes activities revolving around the CCE concepts in Indonesia. It was created with the CCE framework elements in mind, consisting of conditions, causes, impacts, mitigation, and adaptation of climate change, which was established by the Agency for Standards, Curriculum, and Educational Assessment (BSKAP) in late 2024 (Indonesian Education Standard, Curriculum, and Assessment Agency [BSKAP], 2024). The learning kit also includes supporting worksheets designed to help teachers foster an inclusive, engaging, and effective learning experience for teachers and students.

2. Research Subjects

The subjects of this research are divided into primary and secondary subjects. As the object of this research is a CCE learning kit meant to be

implemented inside Indonesia's formal education curriculum, its targets consist of teachers and students. The primary subjects are the teachers, which are meant to empower the secondary subject, the students, through the CCE learning kit "Generaksi Beraksi!" filled with activities and worksheets including the "GENERAKSI!" gameboard as a main medium for teaching.

1. Primary Subject

- **Demographic**

- Age: 30-39 years old
- Education: S1 (Bachelor's Degree)
- Occupation: secondary level teachers
- Gender: male and female
- Economy Status: low-high

- **Geographic**

Provincial: Jakarta (Urban)

- **Psychographic**

- High school level teachers who are concerned about environmental changes in their area.
- High school level teachers that engage and acknowledge current world problems and challenges.
- High school level teachers who are searching for ways to incorporate climate change concepts or environmental concerns into formal education curriculums without extra weighing work.

2. Secondary Subject

- **Demographic**

- Age: 13-18 years old
- Education: SMP-SMA
- Occupation: secondary level students

- Gender: male and female
- Economy Status: low-high
- **Geographic**
Provincial: Jakarta (Urban)
- **Psychographic**
 - High school students who are not familiar with the concepts of climate change and how it can affect daily livelihoods.
 - High school students who are more engaged in playing with their peers and family instead of with themselves.
 - High school students that demonstrated a low level of interest towards didactic pedagogy teachings.

To fit the CCE implementation guidelines stages of student growth and development by BSKAP, the subjects described above are meant to target phase D, which encompasses junior high school students (Sekarwulan et al., 2024) which later on included teachers as well as they are the main facilitator for learning inside Indonesia's formal education sphere. Inside the guide, phase D is expected to be able to analyze complex cause-effects processes while also contributing to their local communities in climate change related topics. A meeting between GENERAKSI representatives from PREDIKT, Universitas Multimedia Nusantara (UMN), and other collaborators, along with educational authorities and high schools in Jakarta from 25 August 2025, resulted in feedback suggesting the implementation of the CCE learning kit could also be extended to senior high school level students; thus why both primary and secondary subjects are positioned in secondary level education consisting of junior and senior high school. Additionally, secondary level education equips Indonesian students with the 4Cs, consisting of critical thinking and problem solving, communication, collaboration, and creativity and innovation which is based on the

Permendikbudristek (Regulation of the Ministry of Education, Culture, Research, and Technology) Number 5 of 2022 (Daflizar & Alfian, 2023).

The subject's economic status is also based on the expected outreach of the CCE learning kit, which encompasses 5 provinces including Jakarta, DI Yogyakarta, North Sumatra, North Sulawesi, and East Nusa Tenggara; which includes schools of rural and urban areas. Both subjects are ultimately placed in Jakarta (urban) to ensure accessibility and consistency in data collection, where Climate Change Education (CCE) initiatives are actively implemented. The primary subject psychography are teachers that have interest in environmental topics, but are presented limited opportunities to integrate them in their daily lives without disrupting their schedules and routines. Meanwhile the secondary subject psychography are students who present fatigue to the already existing learning methods from their teachers and have low awareness of impacts from climate change surrounding their daily lives.

1.4 Research & Technology Program Research Objectives

The objective of this PRO-STEP (Professional Skill Enhancement Program) research is to assess the CCE learning kit from GENERAKSI 2.0 using the Universal Design Learning (UDL) framework, consisting of 3 core principles, engagement, representation, and action & expression. This assessment gravitates towards the CCE learning kit's efficacy in increasing engagement towards climate actions for secondary level teachers and students.

1.5 Research & Technology Program Urgency

The urgency of this research stems from the pressing need for an empirically tested and engaging Climate Change Education (CCE) initiative tool within Indonesia's formal education system. Few initiatives have been properly tested for their learning efficacy and engagement potential for long-term behavioural changes towards climate change. Therefore, this research aims to establish an evidence-based understanding of an inclusive, engaging, and effective learning experience for secondary level teachers and students through a CCE

learning kit to achieve higher engagement towards climate actions. To achieve it, the CCE learning kit from GENERAKSI 2.0 titled “*Generasi Beraksi!*” will be assessed through the Universal Design Learning (UDL) framework. Additionally, this research will incorporate data from the Training of Trainers (ToT) programs initiated by PREDIKT using the CCE learning kit to identify how secondary level teachers perceive and implement engaging and interactive approaches in CCE towards their students. These findings are expected to contribute to Indonesia's growing interest in climate actions, by strengthening Indonesia's education to accommodate climate change mitigation and adaptation efforts towards youths.

1.6 Research & Technology Program Output

Table 1.1 PRO-STEP Research & Technology Outputs

NO.	OUTPUT NAME	STATUS
1	Climate Change Education (CCE) Learning Kit “Generasi Beraksi!”	100%
2	PRO-STEP Research & Technology Program Report	100%

The output of this research includes a CCE learning kit titled “*Generasi Beraksi!*” from GENERAKSI 2.0 which includes a Training for Trainers (ToT) guide filled with activities and worksheets meant to support its implementations. Additionally, this research will also produce an analysis report titled “Analysis Of Climate Change Learning Kit ‘Generasi Beraksi!’ Effectiveness For High School Level” to measure its efficacy for raising engagement of secondary level teachers and students towards climate actions.

1.7 Research & Technology Program Research Benefits

With the creation of this PRO-STEP research paper, it hopes to be beneficial for the following parties with its intended impact.

1. For The Writer.

Through the results of this PRO-STEP research, the writer was provided with the opportunity to increase their understanding and awareness about the current state of CCE initiatives implemented in Indonesia. The continuation of this research aspires to provide the writer

with new insights about climate change as a phenomenon that affects the global population through various channels. This research also has enlightened the writer about how any initiatives towards climate actions can increase the probability to improve the current environmental situation towards a better future for the next younger generations.

2. For The Public.

Through the results of this PRO-STEP research, the writer hopes that it can offer a different perspective for the public about the importance of educational initiatives concerning global phenomenon or challenges. Additionally, it hopes to serve as a facilitator for major considerations towards experimental approaches with educational alternatives in CCE.

3. For Future Researchers.

This analysis report hopes to become a reference for future studies concerning educational initiatives for global challenges that concern daily livelihoods. Not only that, it also hopes to empower future potential researchers to create credible climate change related studies that are needed to strongly push the urgent need of an evaluated climate change initiative for the planet's decaying conditions.

4. For The Writer's University.

This research's output aims to further strengthen the collaborative efforts between KONEKSI, PREDIKT, UMN, and other organizations inside the GENERAKSI project with pushing for inspired implementation of CCE throughout multiple levels of education.

1.8 Research & Technology Program Time and Procedure

Table 1.1 PRO-STEP Research & Technology Outputs

NO.	DATE	ACTIVITY
1	8 August 2025	PRO-STEP Research and Technology Program briefing (online)
2	11 August – 12 August 2025	Course Selection Sheet session

3	18 August – 22 August 2025	PRO-STEP Registration Period
4	25 August – 3 October 2025	PRO-STEP Stage 1 Guidance Period
5	6 October – 17 October 2025	PRO-STEP First Evaluation
6	13 October – 17 October 2025	Midterms Examinations
7	13 October – 28 November 2025	PRO-STEP Stage 2 Guidance Period
8	1 December – 5 December 2025	PRO-STEP Second Evaluation
9	5 December – 11 December 2025	PRO-STEP Document Readiness Check for Evaluation Session of the Second Evaluation
10	5 December 2025	PRO-STEP Evaluation Session Registration Deadline
11	12 December 2025	PRO-STEP Evaluation Session for The Second Evaluation
12	15 December – 3 January 2026	Final Terms Examination
13	19 December 2025	Revision and Approval of the Final PRO-STEP Report

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