



## **Promoting Teacher Education for Climate Change Education through Collaboration between Asian Centres of Excellence for Education for Sustainable Development (ATECCE)**

### **Project Interim Report**

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Promoting Teacher Education for Climate Change Education through Collaboration between Asian Centres of Excellence for Education for Sustainable Development (ATECCE) – Project Interim Report  
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### 3. Promoting Literacy, Awareness and Willingness to Act on Climate Change

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#### ABSTRACT

School plays a central role in educating people about the danger of climate change to our life. Educating the younger generation can be a key for a more sustainable community involvement in the future. Promoting students' literacy and awareness of climate change are certainly the bases for building their willingness to act on controlling climate change. Students' literacy, awareness and willingness to act are certainly influenced by the quality of teaching and learning delivered by the teachers. Therefore, teachers' competencies and teaching strategy are two areas that need to be improved. This project focuses on the two areas, namely promoting teachers' competencies and exploring suitable teaching strategies. Since climate change is usually integrated into science lessons and no teacher is deliberately prepared to teach it, this project starts by constructing a standard of science teacher competencies to teach ESD. The standard is very important as a reference for both pre-service and in-service teacher training. For the second area, this project explores a variety of teaching strategies that may be effective in promoting students' literacy, awareness and willingness to act on climate change. Due to the pandemic, the teaching strategies were largely digital and computer-based, such as computer modeling, virtual learning and future workshops. It seems that such strategies can promote students' literacy but they fail to raise students' awareness. Experiential learning by observing changes of coast line and observing changes of the local climate were also explored but they do not give significant contribution to students' awareness and willingness to act. The project will continue to work on developing effective teaching strategies, especially towards teaching strategies that require students to have direct experience and involvement in efforts to combat climate change.

**Keywords:** climate change literacy, climate change awareness, teaching strategies, teacher competencies, willingness to act

#### 3.1 INTRODUCTION

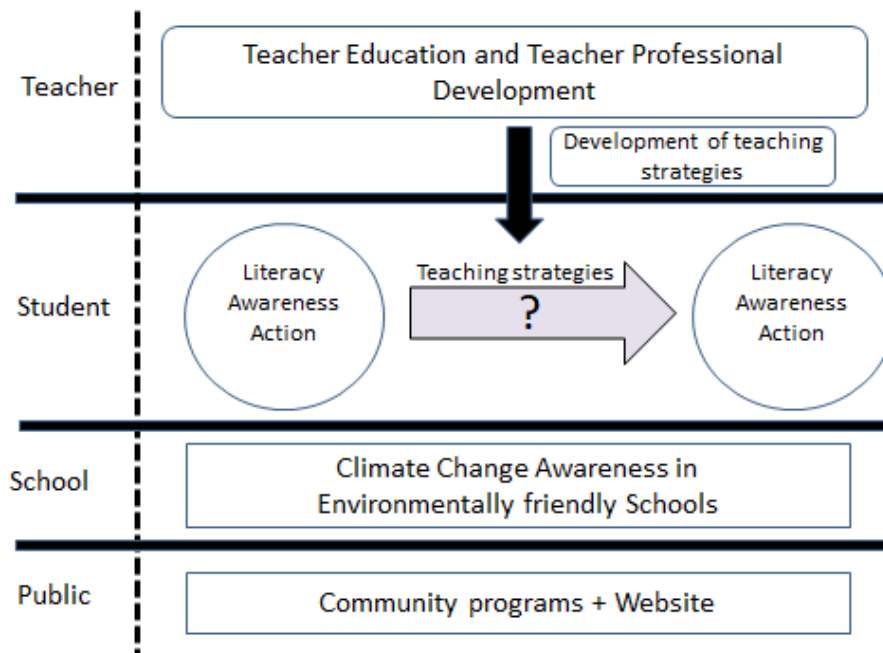
Climate change has been a concern of countries around the globe. There are plenty of evidence that the climate of our planet has changed, e.g. changes of the global temperature, the decline of mountain glaciers and the reduction of polar ice (Thompson & Kuo, 2012) and that such a change affects our life. As an archipelagic and agricultural country, the effect of

climate change on Indonesia is very obvious such as extreme drought, rob flood and changing of the coastal line. Reports on the effect of climate change also show that climate change affects crop production (Gonzalez, 2015) that farmers need to be prepared for the changing situation (Gnanasubramaniam & Hemachandra, 2020). Although no data is available about Indonesian beliefs about climate change, it seems that people tend to believe that the disasters are caused by nature instead of due to human actions (Arbuckle et al., 2015). People's lack of understanding could be the root of their limited awareness and participation in programmes to reduce the effect of climate change (Halady & Rao, 2010; Vainio & Paloniemi, 2011). Therefore it is necessary to raise people understanding and belief about climate change in order to promote their willingness to act (Vukelić et al., 2022).

As acknowledged by UNESCO (2012), education plays very important roles in promoting people's understanding, awareness and willingness to act on climate change. Education is not limited to formal education in all its forms (curricular and extracurricular) but also informal education. A review on government policy (Læssøe & Mochizuki, 2015) shows that climate education still needs improvement. Since teachers are the key in climate change education, preparing teachers' competencies should be a central concern both in pre-service and in-service teacher education programmes. As reported (Tibola da Rocha et al., 2020), teachers have difficulties in understanding and implementing climate change education in the class. This programme aims to promote people's literacy, awareness and willingness to act on climate change. Unlike the existing programmes on climate change education, this programme attempts to be more comprehensive by addressing both formal and informal education. The formal education covers teacher education and the implementation of climate change teaching at schools while the informal education covers community awareness programmes. This programme also develops a framework of teacher competencies and an instrument to assess the competencies.

### **3.2 METHODOLOGY**

As mentioned earlier, the programmes aim to promote understanding, awareness and willingness to act on climate change. Four different areas were covered, namely teachers, students, schools and communities (**Fig. 3.1**). Teachers are key people for the implementation of climate change education in schools. However, no teachers are actually prepared to teach climate change education. Since climate change is usually integrated into science lessons, this project attempts to construct a standard of science teacher competencies to teach Education for Sustainable Development (ESD). The standard is needed as a reference for both pre-service and in-service teacher training. For the second area, this project explores a variety of teaching strategies that may be effective in promoting students' literacy, awareness and willingness to act on climate change. For the third area, the programme tried to infuse climate change education in the existing environmentally friendly schools. The programme is still at the preparation stage. Finally for the fourth area, community awareness programmes were conducted and a website was constructed.



**Fig. 3.1** The outline of the programme

### 3.3 RESULTS AND DISCUSSION

#### 3.3.1 Developing a Framework of Science Teacher Competencies to Teach ESD

In the school curriculum climate change is one of the science topics. Therefore, climate change is taught by science teachers. Integrating climate change into science is at the one hand helping students to understand the phenomena but at the other hand it sacrifices the true nature of climate change education as action oriented education. Science teachers traditionally viewed climate change as a science phenomenon and the objective of the lesson is to promote students' understanding of the phenomenon. Since school science is traditionally content mastery-oriented a shift in teachers' teaching paradigm is needed. Science teachers should be able to teach climate change not only as a science content but also as awareness raising and action-oriented topics. Science teachers that are able to teach climate change need to have not only science teacher competencies but also ESD teachers competencies. A synthesis of standard for science teacher competencies (e.g., Morrell et al., 2020; Australian Institute for Teaching and School Leadership, 2011) and standard of ESD teachers (Okayama University ESD Promotion Centre, 2020) was done and a framework for science teachers competencies to teach ESD was formulated.

The final science teacher competencies standard to teach ESD consist of six standards, i.e. (1) The competencies to master ESD content and integrate ESD content into science concepts; (2) The competencies to implement inquiry lessons on ESD issues; (3) The competencies in professional practice especially in applying learning techniques for science that incorporate ESD; (4) The competencies in assessing students learning that are not only limited to understanding of the content; (5) The competencies in participating in professional development to become an agent of change in promoting ESD-based science learning; and

(6) The competencies in responding to social, economic and environmental changes to realize ESD learning in a community. The framework will be further validated and used as a reference for preparing science teachers to teach climate change. In addition, an instrument to assess teachers' performance on the framework was also developed and has been validated.

### **3.3.2 Promoting Students' Literacy, Awareness and Willingness to Act on Climate Change**

A variety of teaching strategies that could possibly improve students' literacy, awareness and willingness to act on climate change were explored. Due to the pandemic the teaching strategies were largely focused on digital and computer-based teaching, such as computer modeling, virtual learning and future workshops, but some experiential learning were also explored, such as observing changes and making documentary videos about the changes of coastal line. The results show that students' literacy, awareness and willingness to act on climate change are fairly low ( $x \leq 60$ ). It is also found that the teaching strategies were not so effective as at the end of the instruction there is no statistically significant difference. Modification and refinement are done to improve the teaching strategies especially for the implementation in post pandemic situations.

### **3.3.3 The Infusion of Climate Change Awareness in Environmentally Friendly School**

Some schools are declared as environmentally friendly schools by the government. The criteria for such status covers the school environment and the school programme. Hydroponic farming and passion fruit growing were introduced to a school. The two programmes were designed as city farming techniques suitable for people who live in big cities. It is expected that learning hydroponic farming could open up students' ideas to make use of limited space in their houses and therefore contribute to the reduction of greenhouse gasses. The passion fruit planting was introduced due to its pollination issue. Passion fruit needs the help of human beings for pollination due to the absence of the natural pollinators. It is an excellent case for the students to think of a solution to bring back the natural pollinators.

### **3.3.4 Promoting Climate Change Awareness to Public Community**

Two programmes were run to promote public awareness on climate change. The first programme is educating the community about the effect of climate change on our life. Energy consumption and energy saving strategies were introduced to raise people's awareness about energy consumption and climate change. The use of solar cells were introduced as an alternative energy source. A website was also developed to provide information about climate change to broader communities.

The fact that the level of students' literacy, awareness and willingness to act were fairly low suggests that a lot of effort is needed to work on. Since understanding of climate change is the base for awareness and willingness to act (Halady & Rao, 2010; Vainio & Paloniemi, 2011; Kim et al., 2012), understanding of climate change should be given sufficient attention. Although the teaching strategies were student-oriented, it seems that they failed to engage

students, as students' engagement is very important for the success of climate change education (Monroe et al., 2017). It seems teachers have difficulties to engage students in online class setting. Moreover, the absence of direct experience seemed also affect students' learning.

Analysis of the effectiveness of the programme indicates that promoting literacy, awareness and willingness to act require more than just teaching strategies that focus on climate change. It seems that even when using climate change oriented teaching strategies the teachers did not really change their old views of climate change as a science content. As a result they tended to focus on the scientific concepts of climate change instead of the impacts and the actions to reduce the impacts of climate change. This suggests that partial improvement of teachers' competencies is insufficient for teachers to implement climate change lessons. As another study suggested, teaching climate change is very challenging and demands teachers to master a variety of competencies (Favier et al., 2021). Our results also suggest that explaining the teaching strategies is insufficient. Teachers need to improve all six areas of competencies as identified in the framework prior to implementing the lessons.

### 3.4 NEXT STEPS

The upcoming programme will continue the current programme. In the first step, revision and refinement will be conducted. Implementing the framework of teachers' competencies, both in pre-service and in-service teacher education, will be given a priority. The detailed programme is as follows.

No	Activity	Time frame	Deliverable
1	Improving teachers' competencies		
	a. Training for in-service teachers	Jul – Dec 2022	Training materials
	b. Infusion of the framework into pre-service teacher education	Sep 2022 – Jun 2023	Book/learning materials for students
2	Exploring teaching strategies, especially for face to face situations	Jan – Jun 2023	Teaching models, methods, and media
3	Promoting public awareness on climate change		
	a. Improving website and social media	Sep 2022 – Jun 2023	Website and social media
	b. Promoting climate change to school students	Jan – Jun 2023	Promotion materials

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