



**Climate Change Education in Afar, Ethiopia – Practices, Barriers, Policy Awareness
and Perceived Community Support through Teachers’ Experiences**

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Abstract

Climate change education is crucial in preparing children to mitigate the daunting consequences of climate change that already affect them severely in countries such as Ethiopia. This study investigates climate change education in Afar, Ethiopia, exploring practices, barriers, policy awareness and perceived community support through teachers' experiences. Twelve primary and tertiary teachers from the Afar region participated in the research. This qualitative study used surveys and interviews. Results signal a need for developing locally relevant curricula, as well as community-driven programs to enhance climate change education in the region.

Educatie over klimaatverandering is van cruciaal belang om kinderen voor te bereiden op het verzachten van de angstaanjagende gevolgen van de klimaatverandering, die hen in landen als Ethiopië al ernstig treffen. Deze studie onderzoekt onderwijs over klimaatverandering in Afar, Ethiopië, waarbij praktijken, barrières, beleidsbewustzijn en waargenomen steun van de gemeenschap worden onderzocht via de ervaringen van leraren. Twaalf leraren uit het basis- en tertiair onderwijs uit de Afar-regio namen deel aan het onderzoek. Bij dit kwalitatieve onderzoek is gebruik gemaakt van enquêtes en interviews. De resultaten wijzen erop dat er behoefte is aan het ontwikkelen van een lokaal relevant curriculum, evenals aan gemeenschapsgestuurde programma's om het onderwijs over klimaatverandering in de regio te verbeteren.

Climate Change Education in Afar, Ethiopia – Practices, Barriers, Policy Awareness and Perceived Community Support through Teachers’ Experiences

Effects of climate change threaten children worldwide in multiple ways; directly through events, such as heat stress or increased disease exposure and indirectly through economic loss, displacement, forced migration, or violence and conflict (Helldén et al. 2021; Palinkas & Wong, 2020). This global crisis is a severely challenging barrier to the reduction of poverty and existing inequalities (Apollo & Forh Mbah, 2021). With the adoption of the Convention on the Rights of the Child in 1989, nations around the world agreed that children have the right to a clean environment, including clean air to breathe, water to drink, and food to eat, as well as the right to accessible education (OHCHR, 1989). The effects of climate change disrupt access to these fundamental needs (UNICEF, 2021).

The Children’s Climate Risk Index (CCRI) was introduced by UNICEF as a scale that provides a comprehensive overview of children’s exposure and vulnerability to climate change (UNICEF, 2021). The trend is clear; countries with the lowest emission levels are the ones facing the most severe effects of the climate crisis (UNICEF, 2021). Ethiopia’s children are within the top 10 most affected worldwide (UNICEF, 2021). A comprehensive review by Simane and colleagues (2016) reveals the reality of these effects; they report an increase in mortality and morbidity due to floods and heat waves, vector-borne diseases, water-borne diseases, meningitis, and air pollution-related respiratory diseases, as well as the degradation of sensitive systems, such as health and agriculture. Furthermore, climate change impacts access to education in Ethiopia in multiple ways; infrastructure damage, reduced enrolment numbers and academic outcomes, and reduced equity for marginalized groups are all direct effects of local climate emergencies (Tombe, 2016).

Governments around the World are attempting to tackle climate change by activating behavior change in their countries’ populations through policies. In 2011, the Government of

the Federal Democratic Republic of Ethiopia launched the multisectoral Climate Resilient Green Economy (CRGE) initiative, aiming to protect the country from the adverse effects of climate change, building a green economy, and switching to a more sustainable development model. Involved in this initiative is the National Climate Change Education Strategy 2017-2030, serving as a comprehensive framework promoting climate change education. As part of this strategy, in 2015 Ethiopia joined the UN Climate Change Learning Partnership (UN CC: Learn). UN CC: Learn is a global program that supports countries in reflecting on their education and training needs for a broader transition towards low-carbon, and green, equitable growth. The focus of this program in Ethiopia is to support the formal education system, at primary, secondary and tertiary levels.

Non-governmental organizations (NGOs) also participate in attempting to tackle climate change. With offices in the Netherlands and four African countries, including Ethiopia, Edukans is an NGO that delivers programs in the field of education. Edukans recently launched a school greening project involving three pilot schools in the Afar region of Ethiopia. At these primary schools, associates of Edukans built functional gardens to provide a better learning environment for the school's students and employees. The gardens provide shade and can be utilized for growing fruits and vegetables for the community (Edukans, 2021). Edukans partners with the local teacher training center, Asayita Teacher College, to train aspiring teachers on the tertiary level. Following the government's advice and Edukans' example, employees at this center built a garden for the facility, too.

Climate change education (CCE) is the introduction of content about climate change sciences, causes, consequences, and solutions, through creative thinking, problem-solving, and skill development in educational settings (Tombe, 2016). CCE requires participatory, experimental, and open-ended teaching and learning methodologies (Tombe, 2016). Thus, CCE embodies more than gathering climate information; it encompasses tools that enhance

skills, attitudes, and values (Ardoin et al., 2020). CCE can act as a bridge between science and practice (Ardoin et al., 2020). Students are seen as a relevant group for climate change communication due to their developing worldviews (Leve et al., 2023).

While all and every action matters in fighting this global crisis, literature suggests that bottom-up efforts by local and Indigenous communities are generally more effective than those controlled by external organizations (Dawson et al., 2021). A meta-analysis by Dawson and colleagues (2021) identified actions that empower local communities embedded in wider policy as the pathway to long-term effective climate action. A general lack of public understanding of climate change issues has been identified as one of the causes of a lack of climate change response in Ethiopia (Tombe, 2016). Based on the latest statistics, around one-third (37.9%) of Ethiopia's population is between 4 and 18 years old, thus school-aged for primary and secondary education (Ministry of Environment, Forests and Climate Change & Ministry of Education, 2017). The government expects that targeting this population directly will lead to behavior change (Ministry of Environment, Forests and Climate Change & Ministry of Education, 2017).

Although CCE is increasingly present in policy, practice tends to fall behind. Scientific literature identifies multiple barriers teachers face when introducing CCE in their classrooms, the most common being a lack of adequate training, lack of resources, lack of content knowledge, and feeling unprepared (Foss et al., 2019; Hayward, 2020; Leve et al., 2023; Parry & Metzger, 2023). However, the literature identifying these barriers originates from the Global North. The Global North refers to countries concentrated in the northern hemisphere, characterized by generally high-income levels, widespread technological and physical infrastructure, and macroeconomic and political stability, while the Global South refers to countries located mostly in the southern hemisphere, characterized by generally low-income levels and facing structural problems (Kowalski, 2021).

Despite being more affected by climate change, the Global South remains underrepresented in academic research (Collyer, 2016). This pattern calls for more research to be carried out with hard-to-reach populations from the Global South, such as teachers from Afar, Ethiopia. Another barrier could be eco-anxiety; a form of distress and anxiety about the future evoked by awareness about climate change (Coffey et al., 2021). Indigenous people, children and youth, and those connected to the natural world with strong ties to the land tend to be the most affected by this phenomenon (Coffey et al., 2021; Léger-Goodes et al., 2022).

Teachers play a significant role in evoking behavior change in children. According to social learning theory (Bandura, 1977), individuals learn through observation and modelling others' behavior. Teachers' behavior, attitudes and actions can influence the behaviors and attitudes of pupils. Two years after launching UN CC: Learn, reports found the integration of CCE in the educational system to be low (Ministry of Environment, Forests and Climate Change & Ministry of Education, 2017). Limited engagement of schools, lack of strategic guidance, lack of skilled human resources, and deficiency in institutional capacity were identified as causes of low integration. Existing subjects lack practical teaching methods, while extracurricular activities are weak, and awareness about the role of CCE within the educational sector is low (Ministry of Environment, Forests and Climate Change & Ministry of Education, 2017).

The current study investigates CCE education in the Afar region of Ethiopia. Afar's population consists of mainly pastoralist communities, whose livelihoods are threatened by climate-induced stressors such as drought, rising temperatures and irregular rainfall, leading to the loss of livestock (Mekuyie et al., 2018). Literature suggests that among strengthening other social services, the improvement of education significantly enhances the resilience of pastoralist communities in the area in the face of climate change (Mekuyie et al., 2018). This

study focuses on gaining insights into CCE in the area through teachers' experiences and aims to contribute to the strengthening of educational programs targeting Afar.

Theoretical framework: Theory of Planned Behavior

Understanding teachers' behavior is crucial in the implementation of Ethiopia's CCE strategy. Ajzen's theory of planned behavior (1991) includes three conceptually independent components: attitudes, subjective norms, and perceived behavioral control. These components determine intention and influence the execution of behaviors.

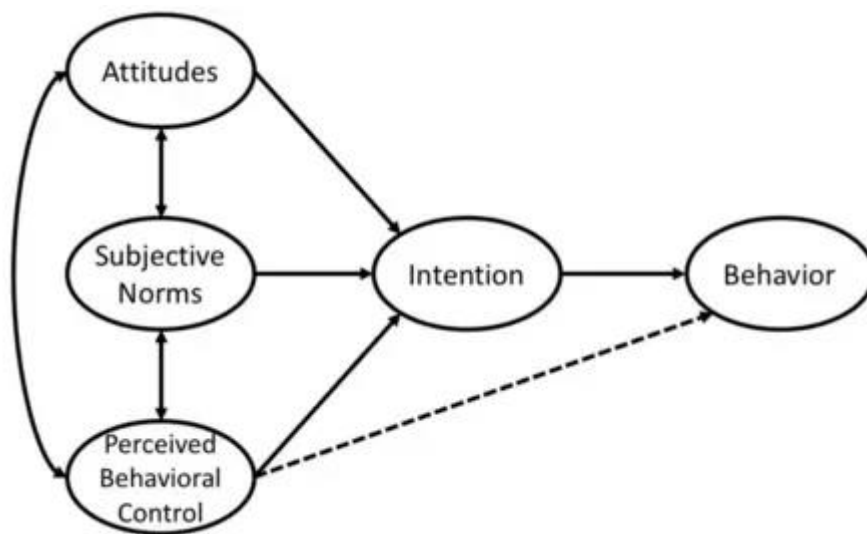


Figure 1. – Model with components of Ajzen's theory of planned behavior (1991).

Attitudes

Attitudes refer to an individual's evaluation of a behavior, which can be favorable or unfavorable (Ajzen, 1991). Research has found that a positive attitude is related to stronger science-teaching intentions (Lin & John Williams, 2015). Positive attitudes can present themselves in the form of different beliefs; common drivers of teachers' motivation to teach about climate change are their interest in environmentalism, knowledge, expertise, and a sense of hope impacting the future through students (McNeal et al., 2017).

Subjective Norms

Subjective norms are an individual's sense of social pressure to perform or not to perform the behavior (Ajzen, 1991). Teachers are vulnerable to social pressure from governments, superiors, colleagues, parents, and other members of the community (Gleitze et al., 2022). Subjective norms can therefore be influential in carrying out CCE; positive subjective norms are associated with stronger science-teaching intentions (Lin & John Williams, 2015).

Perceived Behavioral Control

Perceived behavioral control refers to an individual's perception of the ease or difficulty of performing a behavior (Ajzen, 1991). Higher perceived behavior control is associated with stronger science-teaching intention (Lin & John Williams, 2015). This implies that the more difficult teachers perceive CCE to be, the less likely they are to carry out CCE.

The current study investigates teachers' CCE awareness and practices in Afar, Ethiopia. For teachers, attitudes towards CCE, norms influenced by parents, colleagues or the wider community, and perceived behavioral control of CCE are key factors in delivering CCE. To inquire about these components, this study asks:

1. What are teachers' attitudes towards climate change education in Afar, Ethiopia?
2. Do teachers in Afar practice climate change education and if yes, what methods do they use?
3. Are teachers in Afar aware of the Ethiopian government's climate change education policy?
4. What are the barriers teachers in Afar face when delivering climate change education? Do these barriers differ from those identified in the Global North?
5. What are teachers' perceptions of the local community's attitudes towards climate change education?

Findings from this study will inform about the state of CCE in Afar, including CCE delivery methods, policy awareness, common barriers and needs, and perceived community support, through the experiences of teachers. Additionally, findings serve as pointers in understanding why the implementation of Ethiopia's CCE strategy has been slow, as well as advise about the needs of educational professionals in the local context.

Method

Participants

Participants were recruited through Edukans' local office in Ethiopia through convenience sampling. Participants were selected in two groups: primary teachers and tertiary teachers. Primary teachers educate primary students in primary schools in the region, while tertiary teachers educate aspiring teacher students in the Asayita Teacher College. Nine primary teachers and three tertiary teachers participated in the study. Target schools were selected through Edukans. Primary teachers had to be at least 18 years of age and be employed at one of the three primary schools participating in Edukans' school greening program. Tertiary teachers were recruited from the Asayita Teacher College. Tertiary teachers had to be at least 18 years of age, have a good command of English and be employed as a tertiary teacher at the Asayita Teacher College. Each participant was compensated with 1.000 Ethiopian birr (=16 euros) for their efforts.

Instruments

Data from primary teachers was collected via a survey. The survey consisted of seven questions (see Appendix 1). The questions cover six topics: general demographics, school greening program, policy awareness, teaching about climate change, subjective norms (community perception), and perceived behavioral control. Questions 6 and 7 were formulated to measure theory of planned behavior components (Fishbein & Ajzen, 2010).

Data from tertiary teachers was collected via online interviews on Microsoft Teams. The interviews were semi-structured (see intended structure in Appendix 2). In the interviews six topics were discussed: policy awareness, teaching about climate change, climate education pedagogies, subjective norms (community perception), and needs. Questions 5 and

6 were formulated to measure theory of planned behavior components (Fishbein & Ajzen, 2010).

Procedure

Due to unstable connectivity and a general lack of infrastructure, surveys were printed and distributed locally by Edukans staff. As most teachers do not have a good command of English but speak one or two local languages, the questions were displayed in three languages: English, Amharic and Afaraf. Answers could be provided in either language and were translated by local staff. The surveys were anonymized upon receipt in the Netherlands. Upon receipt of the data, a mistake in the translation of the surveys was noted: the last intended question, inquiring about primary teachers' needs, was not included in the printed surveys.

For the semi-structured interviews, participants were hosted at the Asayita Teachers College. The interviews lasted a maximum of 45 minutes and were conducted in English. The interviews were opened with an explanation of the researcher's role, the goal, and the topics of the interview. Since participants might give socially desirable answers, they were informed of the anonymity of their answers and encouraged to share opinions freely. This increased the internal validity of the research (Boeije, 2010).

Data analysis

The current paper is a qualitative exploratory research study. Survey data and interview transcripts were analyzed using emergent coding. First, all data was anonymized to be processed according to the guidelines of Utrecht University's Personal Data Processing Policy (2016). Then interviews were transcribed, and surveys were typed up digitally. All data was analyzed using Nvivo (14) computer software.

Results

Through interviews and surveys, twelve teachers provided insights about personal experiences and practices related to climate change education (CCE) in Afar, Ethiopia. This section presents the main results that emerged from their reports. Italicized parts represent labels developed during the qualitative analysis of the data. Participants are cited either as PT#, referring to survey data from primary teachers, or TT# referring to interview data from tertiary teachers. Firstly, teachers' beliefs and attitudes towards CCE are discussed, followed by the noted CCE pedagogies and climate action. This is followed by policy and curriculum awareness, as well as barriers and needs related to CCE. Finally, teachers' perceptions of community support are outlined.

Beliefs and attitudes

Responses suggested an overall positive attitude and willingness to take action regarding climate change mitigation efforts and education. Positive attitudes of teachers are reflected in statements like: “(...) *to make this project exemplary I will support it through direct participation.*” (PT3). Most teachers identified climate change as an urgent and *global issue*. These statements were usually connected to beliefs about *collective responsibility* by primary teachers, as seen in the following statement: “*Because the concept is a global issue, it's connected to all of nature, so every person should work together, we have to collaborate.*” (PT9). All primary teachers reported believing climate change awareness and mitigation to be a *collective responsibility*. What was meant under collective, however, varied between participants. Answers ranged from “*every teacher*” to “*every citizen*” to “*all living things*”. Collaboration is viewed as key in tackling climate change, as demonstrated by this response: “*I believe it should be the responsibility of all. We have to work as a community for the common goal to bring the desired change.*” (PT4).

Tertiary teachers believe that Afar is a “*developing region*” of Ethiopia. One participant stated that “*developing nations*” (like Ethiopia) gained an understanding of climate issues in the past 10-15 years, indicating that it is a relatively new topic for the public. The participant contrasted this with “*developed nations*” who have had this understanding for a longer time: “*But when it comes to our practical, uh, understanding of climate change it may not be before 10 years ago, 15 years ago, yes?*” (TT3). Lastly, tertiary teachers reported finding climate action meaningful, and achievable through the (future) work of aspiring teacher students and community involvement. Aspiring teacher students are seen as key to raising awareness within their own communities:

“Of course we try, but especially our students when they are going to, yeah, job life, they are then easily seen. They create, they try to create understandings, perceptions about the issue for the people and I think this method is a better one, I think.” (TT3)

Findings suggest that both primary and tertiary teachers of Afar have positive attitudes towards CCE and understand its importance. While primary teachers view collective action as key to climate change mitigation, tertiary teachers place responsibility on their aspiring teacher students.

Pedagogy

Primary teachers named *discussions* and *individual assignments* as climate change *teaching methods*. Primary school students are taught about the *concept of climate change*, its *effects*, and potential *mitigation* actions, such as *reducing debris* and *planting trees*. While these general methods were mentioned, no other pedagogies, such as activating pedagogies were noted.

Tertiary teachers listed multiple methods through which they educate aspiring teacher students on climate change. In due *courses*, *workshops*, *projects* and *programs*, students are given *assignments*, engage in *discussions*, participate in *practical exercises*, such as

gardening, and attend *excursions* to local sites, where climate events are evident. *Involving external experts* to give guest lectures was noted by one participant. Tertiary teachers mentioned using *active teaching methods*, *asking questions*, assessing knowledge levels, *reflection*, and validating the beliefs of aspiring teacher students. When confronting opposing cultural beliefs, teachers use scientific explanations, as reflected in this statement: “*We also tell them, of course, according to your understanding, according to your perception, it may be correct or it may be right. But scientifically, you know, scientifically, this is not true.*” (TT3). Internet searches and the use of *videos* were found effective by tertiary teachers. One teacher noted that this is due to their popularity among aspiring teacher students and colleagues alike: “*(...)because in our teachers, as students, like teaching by videos or films.*” (TT3). Through these methods, climate change-related phenomena are discussed, including local agricultural practices, local natural processes, such as *volcanic activity*, and globally general *causes of climate change*. Tertiary teachers believe the training delivered by the teacher training center can be directly used (“*casted*”) for primary level too.

When inquiring about the *pedagogical theory taught to aspiring teacher students*, tertiary teachers mentioned a main pedagogical message; aspiring teacher students are seen as responsible for educating the wider community about the importance of climate change:

“*OK, when they are going to the community, they can easily teach the issue of climate change for most of the people, because first they come out of the communities, the society, when they are coming to us. After graduation, when they're going to the community, what I have thought about climate change, easily addressed to the community.*” (TT3)

These results suggest that while educators in Afar are enthusiastic about CCE and experiment with different methods when delivering CCE, they lack in-depth knowledge of CCE pedagogies and delivery methods. Additionally, while primary teachers believe CCE is

a collective responsibility, tertiary teachers place this responsibility on their aspiring teacher students, thus indirectly on the primary and secondary teachers of Afar.

Climate Action

Reports indicated that teachers themselves are initiating and participating in mitigation efforts. Community members and students were cited as active participants too. Climate actions included *planting trees* and *growing vegetables and fruits* in the school compound's garden. Climate action is reportedly seen as an essential tool to manage the effects of climate change, as suggested by this statement: *"It is important because if we treat our environment properly, the climate change does not affect our future life"* (PT7). PT9 attributed the community's attitude to a sense of belonging created by environmental action within the community. Although reports of the conceptual importance and ongoing practice of planting trees are numerous throughout the data, one tertiary teacher hinted that Afar's Geographical characteristics pose a difficulty for tree planting as a form of mitigation: *"Yeah, it is well known that we plant trees. Where a place even nowhere, no trees, even one is there. There is not easy. Also, one tree of course, so we plant trees."* (TT3).

Responses suggest that teachers in Afar are completing climate actions advised by the government, and moderately utilize them as an active teaching method to deliver CCE. However, no further actions are mentioned besides tree planting.

Policy

When asked about policy, all teachers agreed to be familiar with the governmental policy on climate change education. Multiple teachers referred to a *greening program*, but many used different names such as *green legacy* or *green revolution*. A government program was not named concretely. According to participants' understanding, the focus of this government program is to plant trees. Other actions were not mentioned. Additionally, the policy is perceived to be a *"common agenda for everybody"*. Concerning the educational

aspects of policy, educators stated that it is *aimed at students to be able to take mitigation action, integrated into different subjects, incorporated in the teaching and learning process, and aims to provide knowledge about climate change*. Tertiary teachers deemed the public's understanding of government policy and the importance of climate generally sufficient. One participant mentioned the government using non-written forms of mass media to reach illiterate audiences.

These findings indicate that teachers in Afar are aware of the government's call to plant trees, however, no other actionable points were mentioned, suggesting low strategic guidance for furthering CCE.

Curriculum

Teachers reported climate change topics mentioned "*in different courses*" but did not elaborate or name concrete courses. On the primary level, the *Biology textbook* was mentioned, alongside the extracurricular *Environmental Science Club*. Primary teachers reported teaching the *concept of climate change in different subjects*. However, none of these topics were explained or elaborated on.

On the tertiary level, the *Natural Science Diploma* involves modules on climate change. Reportedly, the *integration of climate topics into the syllabus* is ongoing, however, it was not disclosed whether this is an action that the government is currently carrying out, or whether this is the responsibility of educators. During the interviews, tertiary teachers noted and discussed multiple *local climate issues* in depth. These phenomena are compiled in Appendix 3 to further inform the development of locally relevant training and curriculum.

Overall, the curriculum provided for teachers both on the primary and tertiary levels presents insufficient. One of the tertiary teachers listed curriculum when asked about needs, however, they did not elaborate on whether they meant improving the quality of the current

curriculum. This indicates that the CCE curriculum might be fully lacking or reaches teachers insufficiently.

Barriers to CCE

Primary teachers did not mention any barriers to CCE in their reports. This might be due to the fact that they were not explicitly asked about their needs regarding CCE.

Implicitly, tertiary teachers mentioned three barriers to their efforts to educate aspiring teacher students about climate change. These barriers are (1) students' *difficulty in grasping complex concepts*, (2) *confusion and conflicting personal beliefs* when it comes to the human causes of climate change, and (3) a general *lack of understanding*.

It was implied that students hold conflicting beliefs about their direct environment and human activity causing climate change. Students reportedly believe that the main cause of global warming is "*fossil fuels used by factories and industries in more developed countries*". Aspiring teacher students view a lack of industrial activity in Afar as a signal that the region is lagging infrastructurally. In their reasoning Afar is "*not developed*" therefore it "*is not the cause of climate change*". This reportedly causes *worry* in tertiary teachers, as reflected in this statement: "*Sometimes we are worried about how can we transfer.*" (TT3).

These reports suggest that for teachers on the tertiary level, who train the future generation of teachers in Afar, the aspiring teacher students' beliefs and lacking knowledge are posing barriers. There are obstacles in transferring knowledge due to students' personal beliefs and lack of comprehension skills. While tertiary teachers try to bridge these gaps, these obstacles in transferring knowledge worry them.

Needs

When asked about their needs to continue or improve their climate change education practices, tertiary teachers named four main requirements: (1) the involvement of *external*

expertise, (2) collaboration with *other instructors*, (3) material and training *support* from external bodies (government and NGOs), and, as mentioned earlier, (4) *curriculum*.

While these concepts are mentioned explicitly, they are not elaborated on.

Community

Teachers report a sense of support from the wider community and colleagues regarding CCE and climate mitigation. As mentioned earlier, besides encouraging teachers, community members take part in mitigation actions, for example by *planting seedlings together with community members*.

Some teachers attribute the community's support to the scale of the issue at hand, evident from statements such as: "*Since climate change is a global issue, different people appreciate the concept of environmental greening.*" (PT5). One participant attributed the community's support to a sense of *worry for the future* within the community: "*They encourage me, they are worried for the future generations.*" (PT6). Others stated that support is self-evident; "*Since nobody can live without air, everybody needs to make its own contribution.*" (PT3).

These responses suggest that educators perceive their community to be supportive of CCE, indicating positive social norms surrounding this topic.

Discussion

The current study investigated climate change education (CCE) in Afar, Ethiopia. Through the responses of primary and tertiary teachers, CCE practices, attitudes, policy and curriculum awareness, barriers, and perceived community support were mapped. Due to difficulties posed by a lack of infrastructure in the region and language barriers, the study design had to be modified; data from primary teachers was collected via printed surveys. Additionally, a question was omitted from the survey.

CCE attitudes and practice

To answer the study's first and second questions, teachers' CCE attitudes and practices were examined. According to the theory of planned behavior, attitudes are a key component leading to an intended behavior. Attitudes and values have also been identified as crucial in delivering CCE (Ardoin et al., 2020). Teachers throughout both the surveys and interviews displayed a positive attitude towards CCE. For example, tertiary teachers detailed efforts to raise understanding of the relevance of climate change in aspiring teacher students. Findings demonstrate that teachers have the necessary attitudes to deliver CCE.

While teachers' positive attitudes matter in their intention to deliver CCE, understanding the principles of CCE, such as its participatory, experimental, and open-ended nature, is crucial to the quality of education delivered. A general awareness of the importance of CCE was evident in the sample; nearly all teachers identified climate change as an urgent and global issue and all confirmed teaching about climate change. The findings indicate that teachers perceive their levels of awareness as sufficient, which conflicts with the Ministry of Education's findings marking the awareness about the role of CCE within the educational sector as low. Regarding concrete methods of CCE delivery, only one primary teacher noted using individual assignments and discussions. Tertiary teachers were more elaborative; they

listed assignments, discussions, practical exercises, excursions, and guest lectures as forms of CCE delivery in their classrooms.

Existing subjects lacking practical teaching methods was one of the reasons named by the Ministry of Education for the low integration of CCE in Ethiopia (Ministry of Environment, Forests and Climate Change & Ministry of Education, 2017). Teachers reported participating in climate action, such as planting trees and growing vegetables and fruits in the school compound's garden. While students are cited as participants, it is not clearly indicated whether all the students are involved and to what extent they have agency over club activities. Furthermore, it is unclear whether climate action is explicitly part of CCE or is a separate school activity.

These findings suggest that tertiary teachers use appropriate CCE delivery methods, while primary teachers scarcely do. This indicates that primary teachers are aware of the importance of CCE and have positive attitudes about it, however, they lack the necessary pedagogies and teaching methods to deliver high-quality CCE. Thus, practical exercises during the delivery of CCE in primary schools in Afar need to be strengthened. For this further teacher training regarding CCE must be delivered in the region.

CCE policy and curriculum awareness

The third question of this study asked whether teachers are familiar with the Ethiopian government's CCE policy. All teachers confirmed being familiar with governmental policy. However, while a "greening program" was referenced frequently, a policy was not named concretely, and no other actionable points besides tree planting were identified. These findings suggest a lack of clarity in the implementation of Ethiopia's CCE strategy in Afar beyond planting trees.

While teachers on both primary and tertiary levels report teaching about climate change in multiple courses, it seems that they are not provided with or are not reached by a

comprehensive curriculum for CCE. One teacher reported that the integration of climate topics into the syllabus is ongoing, but it is not clarified whether this is done by the government in the form of curriculum development, or whether teachers are expected to do this in their classrooms independently.

According to the Ministries of Environment, Forests and Climate Change and Education (2017), a reason for the low integration of CCE is weak extracurricular activities. The Environmental Sciences Club was mentioned in both the surveys and interviews, however, no elaboration was provided on the activities and size of this extracurricular club. It was mentioned that the club has a student leader who is actively involved in tree-planting activities. These findings indicate that both the curriculum and extracurricular activities need to be strengthened in Afar. To enhance participatory teaching methods, the curriculum must be sensitive to local the context, and extracurricular activities must be easily accessible for all interested students.

Barriers and needs identified by teachers

Teachers are direct role models to students (Bandura, 1977), therefore understanding their needs is a central factor in the successful improvement of CCE in Afar. Delivering CCE can have multiple barriers, such as lack of adequate training, lack of resources, lack of content knowledge, and feeling unprepared (Foss et al., 2019; Hayward, 2020; Leve et al., 2023; Parry & Metzger, 2023). Knowledge of these barriers originates from the Global North, however, this study was eager to reach the local population in Afar. This is due to the trend in scientific research, where, despite being most affected by climate change, the Global South remains overall underrepresented (Collyer, 2016). The study asked whether barriers identified in the Global South differ from those in the Global North.

This study found that tertiary teachers struggle with getting information across to aspiring teacher students due to four main barriers. Firstly, aspiring teacher students find

complex concepts difficult to grasp. This may be due to a lack of sophisticated evaluation skills (Lombardi, 2016). Literature suggests the promotion of evaluation skills and plausibility appraisal as potential solutions to address this phenomenon when delivering CCE (Lombardi, 2016).

Secondly, aspiring teacher students hold conflicting personal beliefs regarding the human causes of climate change, posing a barrier to CCE. Aspiring teacher students believe that due to the non-industrialized quality of Afar, the region cannot be the cause of global warming, since that is mainly evoked by factory activity. This results in aspiring teacher students doubting the role local activities play in climate change. While it is evident that countries with the lowest emission levels are the ones facing the most severe effects of the climate crisis (UNICEF, 2021), global warming is one of multiple aspects contributing to climate change. Understanding and translating the complexities of an event that affects the whole of our planet poses a great challenge in education and reportedly causes worry among teachers. The interviewed teachers address this challenge by using harmful local agricultural practices as negative examples. A reported example is harmful charcoal production in Afar. Although cultural and personal beliefs are not explicitly defined in the interviews, reportedly, a majority of Afar's population is religious (Rettberg, 2013). Climate change attitudes can be influenced by religious beliefs (Morrison et al., 2015). Religion at times offers alternative explanations for climate phenomena (Morrison et al., 2015), which potentially leads to conflicting concepts in aspiring teacher students.

Thirdly, a general lack of understanding regarding climate change processes was identified as a barrier to CCE on the tertiary level. This indicates that aspiring teacher students do not have basic climate knowledge from previous education. A possible way to address this gap is to deliver short science lessons as part of teacher training (Ratinen, Viiri & Lehesvuori, 2012).

Lastly, eco-anxiety, in the form of worrying, poses a barrier to CCE. Teachers mentioned feelings of worry related to climate change twice throughout the data; the community worries for future generations and tertiary teachers worry about conveying climate topics to aspiring teacher students. Eco-anxiety can lead to avoidance in teachers and community members alike (Maner & Schmidt, 2006), possibly manifesting in teachers avoiding CCE in class and community members opposing CCE.

While research conducted in the Global North names a lack of adequate training, lack of resources, lack of content knowledge, and feeling unprepared as the most common barriers in CCE, the findings of the current study indicate that students' lack of knowledge and comprehension skills are perceived as the greatest barrier by tertiary teachers in Afar. This difference points to a potential learning crisis in the area, which means that students enter into higher levels of education without sufficient learning. A global learning crisis was identified by scientists over the past years; while school enrollment rates are at a historical high, learning outcomes are low and have barely increased in the past decades (Angrist et al., 2022). Ethiopia is reportedly affected by this crisis too; primary school enrolments have more than doubled over the past decades, yet children are leaving school without basic literacy and numeracy skills (Iyer et al., 2020).

Perceived social norms about CCE

For teachers, subjective norms influenced by parents, colleagues and the wider community are key factors in delivering CCE. Literature suggests that a general lack of public understanding is one of the causes of a lack of climate change response in Ethiopia (Tombe, 2016). These two sources pointed to a possible lack of support for CCE in Afar. Without understanding the importance of CCE, the community surrounding teachers in Afar might have indifferent or negative views on CCE, creating subjective norms that oppose CCE. To investigate this possibility, the study asked about local teachers' perceptions of the

community's attitudes towards CCE. Despite expectations, teachers reported that they feel supported by the community, with one primary teacher even noting that the community is worried about future generations due to climate change, which demonstrates awareness about the importance of CCE. Furthermore, tertiary teachers described the level of awareness in the general public as sufficient. While these findings present positive social norms regarding CCE, eco-anxiety poses a threat to this positive state. If worry grows in the community, it could lead to avoidant behavior, and community members opposing CCE. A lack of community support creates negative social norms around CCE, which in turn can discourage teachers from CCE behaviors.

Perceived behavior control is one of three components determining the intention to carry out a behavior (Ajzen, 1991). Primary teachers were asked whether they feel that CCE is up to them. This question about perceived behavior control was misunderstood by participants, however, it did reveal a unanimous response; they all believe that CCE is a collective responsibility, and the burden of raising climate awareness should not solely lay on their shoulders. Primary and tertiary teachers' views were somewhat conflicting; while primary teachers believe in collective responsibility, tertiary teachers implied that primary teachers are the ones responsible for educating the wider community about climate change. This discrepancy must be considered when delivering CCE programs for the area; teachers must receive comprehensive guidelines pointing out their role in CCE and clarifying the responsibilities of all different actors involved.

Bandura's social learning theory (1977) implies that teachers' actions matter, as they are role models for students. As demonstrated throughout the data, teachers are active initiators and participants in local climate action. This is especially important since bottom-up efforts by local and Indigenous communities are generally more effective than those controlled by external organizations (Dawson et al., 2021). Teachers are eager to deliver

CCE, however, they lack a comprehensive action plan to take further action than planting trees. When designing CCE delivery programs for the Afar region, a bottom-up approach must be emphasized, and action points for teachers must be explicitly listed.

Limitations

Due to the research being conducted on a hard-to-reach population, the study has a number of limitations. Firstly, a lack of infrastructure disrupted data collection methods, compromising the study. Due to a lack of available computers and internet access, surveys were handed out and collected in person by a third party, compromising the anonymity of the study. Secondly, during the creation of the paper-based surveys by local Edukans staff, the last question was left out. This is rather unfortunate, and as it was only communicated towards the researcher after data collection, the study missed explicitly asking primary teachers about their needs to continue or improve delivering CCE. Thirdly, due to language barriers between participants and the researcher, data from primary teachers had to be collected via written surveys instead of previously planned interviews, further compromising the anonymity of the study. Interviews conducted with tertiary teachers were held in English, however, there were parts where the language use of participants was hard to understand for the researcher, or participants misunderstood the researcher. This is deduced from the answers being ambiguous at times, even after the repetition of some questions in a modified way. Lastly, it is important to note that the researcher is associated with, by conducting research at, an organization (Edukans) that provides resources to the participants. This indicates that responses might be overly positive due to desirability bias. To address these limitations, this study calls for further research to be conducted with the involvement of researchers speaking one of the local languages. Additionally, in-person oversight is advised, as it will help future researchers in ensuring the privacy of participants.

Conclusion

The findings of the current study make it evident that while there is a generally positive attitude towards CCE among teachers in Afar, both the curriculum teachers receive and extracurricular activities at schools need to be strengthened. Tertiary teachers named three barriers to CCE education; the complexity of concepts poses a difficulty for students, conflicting beliefs confuse students, and there is a general lack of understanding about climate change. These barriers reveal a need for a context-sensitive curriculum to help students grasp concepts. Open-ended teaching methods, such as discussions, should continue to be used in tertiary education. To enhance participatory teaching methods, exercises need to be relatable for students. Appendix 3 is a list of locally relevant climate topics gathered from the data, serving as a suggestion for topics to include when developing context-sensitive materials. Furthermore, it is evident that aspiring teacher students do not have basic climate knowledge from previous education. A possible way to address this gap is to deliver short science lessons as they enter training (Ratinen, Viiri & Lehesvuori, 2012).

It is unclear from primary teachers' reports whether climate action, such as planting trees, is explicitly part of CCE or a separate school activity. Reflecting on the barriers identified by the ministries of Environment, Forests and Climate Change and Education, practical CCE teaching methods should be increased both in number and in levels of student participation, throughout primary schools in Afar. Practical climate action should be explicitly connected to theoretical learning by teachers.

Furthermore, CCE is seen as a collective responsibility by primary teachers in Afar. Governmental policy communications should include additional action points for teachers, students, and community members, besides tree planting. Tertiary teachers call for more materials and external support. Through further research and collaboration with teachers in the area, local NGOs, such as Edukans, should design and implement bottom-up-driven programs to increase the delivery of CCE education. Teacher training centers and NGOs

should collaborate in developing and delivering teacher training programs, to guide teachers in enhancing CCE through practical teaching and learning methods. Extracurricular clubs can also be targeted through such programs, banking on the interest and drive of students who choose to participate in extracurricular programs.

Finally, while research conducted in the Global North names a lack of adequate training, lack of resources, lack of content knowledge, and feeling unprepared as the most common barriers in CCE, the findings of the current study indicate that students' lack of knowledge and comprehension skills are perceived as the greatest barrier by tertiary teachers. These findings imply a discrepancy between Global North and Global South, regarding the challenges teachers face in delivering CCE. Although studying hard-to-reach populations poses limitations, further research must be carried out in the Global South. When looking for answers to questions in education, teachers have the most hands-on knowledge, and their voices are essential for ever-improving this vast field.

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Appendices

Appendix 1 - Survey questions for teachers

Definition of the behavior “teaching about climate change”: *Teaching about climate change means any lessons or exercises given to students in your class that explains what climate change is, and/or the consequences of human behavior on the planet, and/or possible solutions.*

Table*Survey*

#	Survey questions
	Question
1	Which school do you teach at?
2	What age are the students that you teach?
3	How is the school greening project doing at your school? What do you think about the project? (3-5 sentences)
4	Are you familiar with the Climate Change Education Strategy of Ethiopia? If yes, please describe in a 3-5 sentences what you know about it.
5	Do you teach about climate change? If yes, how so? If not, why not? (3-5 sentences)
6	What do you think your supervisors, colleagues, parents of the children, and the children themselves (would) think about you teaching about climate change?
7	Do you think that teaching about climate change is completely up to you?

Note. English version of survey questions for primary teachers

Appendix 2 - Open-ended interview questions for tertiary teachers

Definition of the behavior “teaching about climate change”: *Any lessons or exercises given to teachers in your class that explains how to teach about what climate change is, and/or the consequences of human behavior on the planet, and/or possible solutions.*

List of questions:

Are you familiar with the Climate Change Education Strategy of Ethiopia?

Do you teach about climate change?

Do you train teachers to teach about climate change?

Do you feel confident teaching about climate change?

What do you think your community (supervisors, colleagues, teachers) think about you training teachers to teach about climate change?

Is there something you would need to improve or continue training teachers about climate change education?

Appendix 3 - List of locally relevant climate issues for context-sensitive curriculum and content development

1. Volcanic activity in Afar, and its contribution to temperature rise
2. Solar radiation
3. Rising temperatures and global warming
4. Harmful local agricultural practices:
 - i. Deforestation
 - ii. Overgrazing
 - iii. Improper land plotting
 - iv. Excessive use of fertilizers
5. Heat rushes
6. Greenhouse gasses and CO₂
7. Floods
8. Drought
9. Charcoal production