# EXPLORING ENVIRONMENTAL WORLDVIEWS AND CLIMATE EMOTIONS:

## The Impact of Climate Education on High School Students in Haarlem

Maartje Tolen (1015956)
Supervisors: Dr. Ir. J.M. van Paassen
Dr. J. Verboom-Vasiljev
Knowledge, Technology, and Innovation Wageningen University
March 2025

# Content

# Abstract

Climate change is an increasingly pressing issue, yet there is a limited understanding of how climate education influences students' environmental worldviews and climate emotions. This study explores the impact of climate education on 14 to 16 year old VWO high school students in Haarlem, focusing on how their environmental worldviews and climate emotions interact with those presented in the climate education they receive in their geography curriculum. Using a mixed-methods approach, the research incorporates textbook analysis, teacher and student interviews, and questionnaires to examine the interaction between climate education and the worldviews and climate emotions of high school students in Haarlem. The findings indicate that textbooks often present climate change through a pluralistic lens and based on values and beliefs from a post-modern worldview. The geography teachers share this post-modern worldview and aim to educate their students about the impact they can have as individuals on climate change. Additionally, the teachers actively include technological innovations to provide a source of hope amongst their students, encouraging positive climate emotions. The students predominantly identify with the post-modern worldview, acknowledging the interconnectedness of humans and nature. The climate emotions that the high school students experience are predominantly negative. This research shows the similarities that can be found between the worldviews represented in the climate education that the students receive at school and those of the students themselves. However, this research also shows that high schools are not the main source of climate education for high school students in Haarlem, but social and news media. Additionally, this research shows that many high school students have limited clarity about the climate emotions they experience. The climate emotions that the students are experiencing are predominantly negative. This research indicates that the climate education of the students interacts with the worry that students experience, showing a decrease in the number of students that are worried about climate change. Therefore, this research provides an understanding for teachers of how climate education impacts their students and it provides a basis for future research to build upon for understanding and improving the impact of climate education.

# 1 Introduction

Climate change is a widely discussed topic as the impact is becoming more prevalent and the current climate policies are not enough to reach the goal of the Paris Agreement (Angarita et al., 2023). Which aims to limit the global temperature increase to preferably 1.5 degrees Celsius and well below 2 °C (United Nations, 2015). Climate change has already resulted in the displacement of 20.3 million people, a number that has increased significantly since 2014 (Environmental Migration, 2024), showing how pressing this issue of climate change is. Above all, climate change has been an uncertain phenomenon (Mehta and Srivastava, 2020), making it hard to predict what the future holds. This puts pressure on our youth as they are now exposed to additional life questions. It is no longer only the question of 'What will I be when I grow up?' but of 'How will the world be when I'm an adult?'. There are even instances where young adults are unsure if they want to have children due to the burden of climate change (Marczak et al., 2023; Szalma & Szczuka, 2024). All this is just one example of how climate change affects the younger generations.

There is a substantial difference in how the different generations view climate change (Farber, 2020). Even though there are instances where older generation females can be seen as climate conscious (Chazan & Baldwin, 2020), overall, the middle-aged to older generations are more likely to deny or downplay the effect of climate change than the youth (Farber, 2020; Skeirytė et al., 2022). This difference between the generations is becoming more visible due to the protests that are initiated and the behavioural actions that are taken by the youth to reduce climate change and its effects. This action is one of the ways in which the youth deals with the impact that climate change has on their lives (Farber, 2020). However, the impact that the knowledge of climate change has on the youth is not always visible through the actions they take, some teens experience such intense emotions regarding climate change that it paralyses them (Kleres & Wettergren, 2017).

For the past 20 years, there has been an interest in climate emotions, the emotions people are experiencing that are related to the climate or climate change (Pihkala, 2022). The research about climate emotions has been approached from multiple angles, such as how climate emotions can lead to pro-environmental behaviour (Ramkissoon & Smith, 2014; Reyes et al., 2021) and how climate change impacts psychological health (Ojala et al., 2021). Climate change is known to create both positive and negative emotions such as hope, stress, anger and even anxiety (Kleres & Wettergren, 2017; Ojala et al., 2021). The negative emotions affect a large number of young people: 84% of youth is worried about climate change and 75% is frightened about the future (Hickman et al., 2021). The extent to which youth experiences negative emotions regarding climate change emphasises the importance of investigating how these emotions affect the lives of youth.

Education is meant to prepare our children for their future. This is, for example, done by educating them about biology, mathematics, history, and geography. However, we can ask ourselves if we are doing a good job when three-fourths of our youth is scared about the future. We educate them about what is going on in the world, but at what cost? It has been shown that climate education can lead to negative emotions in the students, making them feel overwhelmed and disempowered (Jones & Davison, 2020; Jones & Whitehouse, 2021; Marczak et al., 2023). On the other hand, there have also been instances where climate education has led to students feeling empowered and engaged about the climate (Oberman, 2023; Schneider et al., 2021). The difference in the impact of climate education seems to be found in the

underlying worldviews in education (Oberman, 2023). One of the ways to make climate education effective is by basing it on fundamental environmental worldviews (Ramkissoon & Smith, 2014). Environmental worldviews are the morals, values, and beliefs on which an individual bases their reality, decision-making, and behaviour about the environment (Hedlund-de Witt, 2013; Hochachka, 2024). Ramkissoon & Smith (2014) have shown that worldviews are drivers of emotions and that climate education with a similar environmental worldview to its audience is more effective in transmitting its message and engaging its audience. Similarly, Brown (2005) and Stevenson et al. (2014) show that there is a higher acceptance of a message when the student and the climate education share the same worldview.

However, there is little knowledge available about worldviews in climate education. Therefore, this research aims to bridge this scientific knowledge gap by finding out which environmental worldviews are present in climate education at high schools in Haarlem. Another research gap appears when looking at the emotions people feel about the climate. Most of the research about the impact of climate emotions is done at primary schools, universities or with adults (Jones & Davison, 2020; Jones & Whitehouse, 2021), thereby neglecting the age group of high school students. This research thus combines climate emotions and the environmental worldviews of the students in climate education since they both influence how climate education is perceived.

## 1.1 Research objective

This research aims to investigate if the environmental worldview in current climate education resonates with the worldview of high school students, the climate emotions they experience, and the effect it has on them. Bridging the knowledge gap and gaining insight into the current climate education at high schools and how it resonates with and fosters climate emotions amongst students. Additionally, these insights can be used to understand the impact of climate education on high school students. This will provide information about the influence climate education might have on the climate emotions that the students experience and understand if climate education could be the source of the fear that 75% of students experience when thinking about climate change (Hickman et al.,2021). This will help future research to design a climate education program that fits the views and needs of its students to foster empowering and engaging emotions with regards to the climate. Thereby decreasing the number of students that experience fear or powerlessness with regards to climate change in the future and providing a space for high school students to learn about the climate and the emotions they experience with regards to the climate. Meaning that this research can be used to improve the quality of climate education.

Taken altogether, the objective of this research is to understand the environmental worldviews and climate emotions that Dutch VWO students (14-16 years) usually experience and what worldview and effect climate education programmes of geography have on their emotions.

# 2 Theoretical framework

This chapter will explain the two main theories from this research, environmental worldviews (chapter 2.1) and climate emotions (chapter 2.2). After these explanations, I will clarify their relevance and how these theories link together for my research questions (chapter 2.3).

## 2.1 Environmental worldviews

Environmental worldviews are the lens through which individuals build their beliefs and base their meaning-making. These worldviews impact how individuals enact, interpret, and co-create reality (Hedlund-de Witt, 2013; de Witt et al., 2016). Therefore, these worldviews are often grouped with value systems, morals and beliefs (Hochachka, 2024; Lynam, 2019), focussing on the inner world and how this impacts how individuals process information (de Witt et al., 2016). This research combines the integral worldview framework (IWF), see chapter 2.1.1, with developmental psychology, see Chapter 2.1.2, to create a framework that shows the nature perspectives within worldviews.

### 2.1.1 Integral Worldview Framework (IWF)

Hedlund-de Witt (2013) created the IWF to provide an interdisciplinary overview to operationalize the four major worldviews that are present in the West. These major worldviews are the traditional, modern, postmodern, and integrative worldview. IWF can be used to map worldviews based on five aspects: ontology, epistemology, axiology, anthropology, and social vision (Hedlund-de Witt, 2012; Hedlund-de Witt, 2013; de Witt et al., 2016), see appendix I for further explanation of the five aspects.

The IWF provides an overview and organized scheme of how each worldview approaches the five aspects of worldviews, as portrayed in table 1. This overview that IWF creates is useful to gain a better understanding of what each worldview values and believes in. De Witt et al. (2016) have created a possibility to quantify the IWF theory by using statements and this provides a quantitative understanding of worldviews while this is mostly done in a qualitative way. Earlier research has shown that the IWF is useful for understanding the relationship between an individual's perception and their worldview (de Witt et al., 2016).

*Table 1: Overview of how each of the five aspects from the IWF portray the five major Western worldviews from (Hedlund-de Witt, 2013)*

| | Traditional worldview | Modern worldview | Postmodern worldview | Integrative worldview |
|---|---|---|---|---|
| Ontology | Religious/metaphysical monism. Reality as singular, transcendent.<br>Universe as purposively constructed whole. God-created universe *ex nihilo*.<br>Transcendent God/Creator is separate from profane world; dualism.<br>Nature as embodiment of meaningful, imposed order (e.g. God's creation). | Secular materialism. Reality as singular, immanent.<br>Mechanistic universe brought about by random selection.<br>Material reality devoid of meaning, intentionality, consciousness; dualism, disenchantment.<br>Nature as instrumental, devoid of intrinsic meaning and purpose. Resource for exploitation. | Post-materialism. Reality as pluralistic, perspectival, constructed.<br>Multiple cosmogonies/cosmogony as social construct<br>Reality as discontinuous and fragmented, meaning as social construct; anti-essentialism.<br>Nature as constructed through a plurality of cultural values, meanings, and interests. | Holism/integralism (unity in diversity). Reality as transcendent *and* immanent.<br>Universe as evolving, creative manifestation of Source/Spirit.<br>Outer and inner reality co-arising, interdependent; re-enchantment.<br>Nature as intrinsically valuable. Frequently seen as divine force that humanity is part and expression of. |
| Epistemology | Naïve realism; emphasis on concrete-literal interpretations of religious doctrine (literalism, dogmatism).<br>Religious/conventional authority (scripture, divine revelation, tradition).<br>Implicit methodology<br>Substantive rationality | (Post-)positivism; emphasis on reality as objectively knowable, (empiricism, reductionism, scientism).<br>Secular authority (science, the state).<br>Quantitative methods; methodological monism.<br>Procedural rationality | Social constructivism; emphasis on reality as constructed (pluralism, relativism).<br>Internalization of authority (e.g. moral, emotional, intuitive, artistic knowing)<br>Qualitative methods; methodological pluralism<br>Skeptical rationality? | Critical realism, pragmatism; emphasis on reality as approachable through integration of sources of knowledge<br>Triangulation of authority (scientific, spiritual/religious/philosophical, and subjective knowing)<br>Mixed methods; integrative pluralism<br>Synthetic rationality? |
| Axiology | Traditional values (e.g. security, tradition, conformity, obedience, humility)<br>Emphasis on community, family<br>Pre-conventional morality? | Rational-secular, materialist values (e.g. power, achievement, hedonism, stimulation)<br>Emphasis on independent individuality<br>Conventional morality? | Self-expression, post-materialist values (e.g. openness to change, self-direction)<br>Emphasis on unique individuality<br>Postconventional morality? | Self-expression/self-transcendence values (e.g. universalism, self-actualization)?<br>Emphasis on embedded, relational individuality<br>Universal morality? |
| Anthropology | Humanity in managerial stewardship role vis-à-vis nature<br>Prime purposes determined by larger order and social roles. Human being as sinful/fallen from grace. Dependent on religious/metaphysical authorities for salvation.<br>Ethnocentric identity? | Humanity in promethean control over nature<br>Prime purposes of a material, hedonistic nature. Human being as self-optimizing, independent being. *Homo economicus*.<br>Sociocentric identity? | Humanity in cautious relationship to nature<br>Prime purposes are found within, intrinsic. Human being as self-expressing, unique individual.<br>Worldcentric identity? | Humanity in unity and synergy with nature<br>Prime purposes found within, serving the larger whole ('service through self-actualization'). Human being as evolutionary co-creator, with a vast—though generally unrealized—potential.<br>Planetcentric identity? |
| Societal vision | Traditional societies, emphasis on (subsistence) farming.<br>Traditional and religious authorities and values as source of solutions to societal and environmental problems. | Industrial societies, emphasis on mechanized modes of production (e.g. industrial/conventional agriculture).<br>Technological optimism: science and technology as solutions to societal and environmental problems. | Post-industrial societies, emphasis on service economy and creative industries.<br>Scepticism of status quo, idealism: mobilization of the public through revealing injustices as prime solution to societal and environmental problems. | Increasing emphasis on services, creative industries, and social/sustainable entrepreneurship.<br>Integrative vision: emancipation of the public through consciousness growth and a synthesis of interests and perspectives as solutions to societal and environmental problems |

### 2.1.2 Developmental psychology

Developmental psychology shows how different developmental stages approach sustainability in a unique manner (Lynam, 2019). People have values and motivations which can change over time and this change can be explained with developmental psychology and as personal development (Pender, 2023). Additionally, this personal development is part of growing up and can be used to explain that worldviews are still forming during the teenage years (Stevenson et al., 2014). This shows that worldviews are not static and that an individual can have multiple worldviews during their lifetime (de Witt et al., 2024; Lynam, 2019; Hochachka, 2019; Pender, 2023). Developmental psychology has been used in educational science and de Witt et al. (2024) have shown that combining this with worldviews provides a better understanding of how students understand what is educated. Since this research is focused on teenagers instead of university students, there is more chance that their worldviews are still developing, and developmental psychology can help understand the shifts in worldviews that the high school students might show.

Hochachka (2019) explains that development psychology focuses on three aspects: the object of awareness, the complexity of thought, and the scope of time of individuals. The object of awareness can be explained as an individual viewing climate change only from a personal

standpoint and how it personally affects them or from the perspective of all living things and earthly systems (Hochachka, 2019). The second aspect of the complexity of thought within the stages refers to the links an individual can make between a term such as climate change and how it does not only encompass the weather but also biodiversity (Hochachka, 2019). Lastly, the scope of time refers to the timeframe in which an individual views a problem. This can be in the long term or the short term, but also in thinking of the past, present and future (Pender, 2023; Hockachka, 2019). This shows an additional aspect that can be used when looking at the worldviews of teenage students.

The knowledge of developmental psychology can help educators understand how to best communicate sustainably and on which values they should base their education (de Witt et al., 2024; Lynam, 2019) since the development of an individual affects how they perceive for example climate change and when a message resonates with them (Wolf & Moser, 2011).

### 2.1.3 Combining the IWF and developmental psychology

Recent research has shown that combining developmental psychology with the four major worldviews provides a better understanding of the learning progress of students (de Witt et al., 2024). The background of both IWF and developmental psychology can be found in the work of Cook-Greuter and Kegan (Lynam, 2019; Hochachka, 2019; Hedlund-de Witt, 2012; Hedlund-de Witt, 2013; de Witt et al., 2016; Pender, 2023). This is visible when you put both theories next to each other. These two theories can be combined through the aspects on which they base their theories. When we look at the five aspects of worldviews (ontology, epistemology, axiology, anthropology, and social vision) and the three aspects of development (the object of awareness, complexity of thought, and the scope of time), there is a similar curve visible. The ontological, epistemological, and anthropological aspects of the worldviews shift to different forms of awareness about the objects of a problem. Some worldviews are more capable of looking at the complexity of a problem and seeing/ acknowledging its different sides. Developmental psychology shows the same difference in development as in the worldviews, however, the focus of each theory is different. In order to maintain a full picture, this research combines both theories and therefore acknowledges all seven aspects. In this chapter, I will explain in more detail how these theories can be combined.

The traditional worldview values the belief that there is only one truth, which is usually based on religion. People with this worldview see themselves as dependent on authority, for example, a religious leader, and they value obedience. This worldview values a clear perspective on what is wrong and what's right, traditions and puts human life above and as separate form nature (Hedlund-de Witt, 2013). Similar developmental psychology describes that people with this worldview focus on moral obligations and put their trust in the ruling systems, making them driven by regulations (Lynam, 2019; Pender, 2023). Additionally, people with the traditional worldview see humans as separate from and even above nature. People who share this belief system put humans in a leadership role over nature, also known as a stewardship role (Lynam, 2019; Hedlund-de Witt, 2013; Pender, 2023). This shows how nature and the environment are valued as less than humans in the traditional worldview. To summarise, in this research, the traditional worldview is represented by the belief that humans are separate from nature, that there is a wrong or right, and that it is our moral obligation to take care of nature, climate (change), and the planet.

Developmental psychology explains that people with a modern worldview value independent, rational, scientific thinking, and expert opinions. Their focus is on market-led and technical

solutions (Lynam, 2019; Pender, 2023). To which the IWF adds the appreciation for technology that can be found in the modern worldview (Hedlund-de Witt, 2013). Developmental psychology shows that there is a shift happening within the modern worldview of how individuals value other disciplines and forms of knowledge. People in the modern worldview can still rely on experts as this is assumed to be better for the individual (Pender, 2023), but they acknowledge that there are different disciplines and, therefore, multiple ways of looking at something (Hochachka, 2019). This shows two different ways of approaching the modern worldview. Hedlund-de Witt (2013) showed that people with the modern worldview still separate humans from nature. However different form in the traditional worldview, people with the modern worldview see the innovative possibilities that humans can use to conserve nature. This is more clearly defined by Lynam (2019) and Pander (2023) who explain how these innovations are visualised. People with the modern worldview are stated to value nature based on the benefits is has for humans. When it comes to protecting nature, there are multiple ways to approach this within the modern worldview, namely by focusing on innovations and technologies or on efficiency and the market value (Pender, 2023). Therefore, people with a modern worldview value nature based on what it can provide humans, and they believe that with innovations and the market, humans can protect nature and the services it provides. To conclude, the modern worldview acknowledges that humans influence nature and believes that the market, technology, and innovation will be the answer to the climate crisis.

People with the third worldview, post-modernism, acknowledge the collective, the interconnectedness of humans and nature, the possibility of uncertainty due to complexity, and that there is not just one right way of looking at things. These people are prone to focus on the long-term and focus on inner and outer developmental work (Lynam, 2019; Pender 2023). Additionally, people with this worldview value multiple forms of knowledge, including the social and cultural, seeing the interconnectedness between humans and nature, and value the world as one integrated system (Hedlund-de Witt, 2013). However, there is also a possible distinction that can be made between post-modernism and late postmodernism, which explains that people with this worldview are not always able to acknowledge that not everyone views and values the world in the same way (Hedlund-de Witt, 2013; Lynam, 2019; Pender, 2023). This means that people with a post-modernist worldview develop into acknowledging that not everyone thinks the same way and that these differences are valuable (Pender, 2023). People with the postmodern worldview value nature as a whole and they are therefore more focused on the systems that can be found on earth and what is needed to protect the earth and nature as a whole (Lynam, 2019; Pender, 2023). To summarise, people with a post-modern worldview see that humans and nature are interconnected and that the climate, nature, and the planet can be protected with social knowledge and movements.

Lastly, the integral worldview focuses on holistic thinking, the belief that there can be multiple realities, and the larger whole meaning human-nature interactions and transformations (Hedlund-de Witt, 2013). Additionally, people with this worldview are aware of how meaning is constructed, the complexity of the world and its problems, and they have a kosmo-centric perspective on the environment (Lynam, 2019). A kosmo-centric view means looking at humans and natures as an integrated whole and including the universe and the divine in how meaning is given to the natural world (Lynam, 2019). This research refers to the integral worldview as valuing nature and humans based on a wholistic views and as interconnected with the universe. Additionally this worldview beliefs in the define where the world will keep on living with or without humans.

Integrating developmental psychology with the four major worldviews of Hedlund-de Witt (2013) shows the flexibility that can be found within a worldview. This is useful since teenagers are still forming their the worldviews (Stevenson et al., 2014) which could be explained by the perspective of developmental psychology on these four worldviews and how an individual can have multiple worldviews during their lifetime (de Witt et al., 2024; Lynam, 2019; Hochachka, 2019; Pender, 2023). This means that people can become more traditional or modern during their life. The IWF creates an overview on how to recognise and research worldviews, providing a better understanding of how the worldviews work and the developmental psychology provides an understanding of how education can impact worldviews (de Witt et al., 2024).

### 2.1.4 Nature and worldviews

The IWF and developmental psychology focus on the broad definition and workings of worldviews. Since this research focuses on climate perspectives, there is a need to highlight the values and beliefs that the worldviews have about the climate. Buijs (2009) explains value systems focused on the natural world that are based on five nature images. These images are created by looking at certain values and beliefs that individuals have about nature and the climate. The values and beliefs that are used to create the nature images are about the nature definition, nature's fragility or resilience, the existence of balance in nature, how nature should be managed, and the goal of nature management (Buijs, 2009). Some of these values and beliefs are also represented in the combined worldviews from the IWF and developmental psychology.

The four worldviews show a divide in how individuals view the human-nature relationship. For example, people with the traditional worldview see humans and nature as separate and put humans above nature and in a stewardship role (de Witt et al., 2016; Pender, 2023). This can be compared with the distinction Buijs (2009) made in how individuals define nature as either separate from culture or as part of it. Additionally, Buijs (2009) shows that his nature images also have different views on how nature should be managed, for example intensively managed, which is similar to the stewardship role given to humans in the traditional worldview. Both examples are based on the traditional worldview, however, similar comparisons can be made for other worldviews, see table 2.

The nature images theory from Buijs (2009) does not completely overlap with the four worldviews. In table 2, the values and beliefs from the nature images theory are compared with the worldviews that are created when combining the IWF and developmental psychology. It is important to mention that not all the values and beliefs that are mentioned by Buijs (2009) are represented in the traditional, modern, post-modern and integral worldviews. Additionally, Buijs (2009) focuses on nature while this research puts its focus on the climate, which means that the explicit nature images from Buijs (2009) are not the same but closely linked. However, the theory from Buijs (2009) does show important aspects on which individuals base their view of the environment. Therefore, combining the nature images theory, IWF, and developmental psychology provides a clear overview of how each worldview values and sees the environment, both the climate and nature.

*Table 2: Overview of the representation of the values and beliefs found in the nature images theory from Buijs (2009) in the 4 major worldviews in the Western world (Hedlund-de Witt, 2013)*

| WORLDVIEWS | HUMAN NATURE DIVIDE | FRAGILE/ RESILIENT | BALANCE/ CHANGE | LEVEL OF NATURE MANAGEMENT | GOAL OF MANAGEMENT |
|---|---|---|---|---|---|
| **TRADITIONAL** | Humans and nature are separate from each other (Hedlund-de Witt, 2013; Lynam, 2019; Pender, 2023) | Nature is resilient; it is made to provide for humans (Lynam, 2019) | - | Active/ Hands on | Humans need to take care of the environment, nature, and the climate so that humans can keep using its ecosystem services (Hedlund-de Witt, 2013; Pender, 2023) |
| **MODERN** | Humans influence nature (Hedlund-de Witt, 2013; Lynam, 2019; Pender, 2023) | Nature is fragile; humans need to protect the environment (Pender, 2023) | - | Limited management | Humans need to protect the environment, nature, and the climate. They can do this with scientific knowledge and technological innovations (Hedlund-de Witt, 2013; Lynam, 2019; Pender, 2023) |
| **POST-MODERN** | Humans and nature influence each other (Hedlund-de Witt, 2013; Lynam, 2019; Pender, - 2023) | Nature is fragile; humans need to protect the environment (Pender, 2023) | - | Limited management | Humans need to protect the environment, nature, and the climate by working with different forms of knowledge and with social initiatives (Hedlund-de Witt, 2013; Pender) |
| **INTEGRAL** | Humans and nature influence each other (Hedlund-de Witt, 2013; Lynam, 2019) | Nature is resilient and will exist with or without humans (Lynam, 2019) | - | - | Humans and nature need to live together in harmony, which means that we need to work together with nature (Hedlund-de Witt, 2013; Lynam, 2019) |

## 2.2 Climate emotions

The concept of climate emotions is becoming more known; however, the range of climate emotions is still unclear (Pihkala, 2022). There is a distinction between emotions and affect. Emotions are conscious feelings that can be named and which have an object; affect is both unconscious bodily feelings and conscious experiences of feelings (Hamilton, 2020; Pihkala, 2022). This difference is, however, harder to distinguish when we are looking at climate emotions since anxiety is usually seen as an affect, while eco-anxiety does have an object, namely the environment or ecology making it an emotion (Hamilton, 2020). Therefore, climate emotions can be seen to capture both emotions and affects with a predefined object, namely the climate and climate change. This means that climate emotions can be defined as: (un)conscious feelings and bodily sensations with as object the climate or climate change.

Climate emotions can be both positive and negative. Pihkala (2022) has created a taxonomy of all the current knowledge of climate emotions. This research shows that there is a predominant focus on negative climate emotions and that theories about climate emotions are scarce. I will therefore focus on the basic emotions as a theoretical background since these lay at the basis of the emotions mentioned by Pihkala (2022) but also include positive emotions. There are many different perspectives on which emotions can be seen as the basic emotions (Tracy & Randles, 2011). However, there is a consensus that these basic emotions have direct power over behaviour and motivation (Tracy & Randles, 2011).

Hiser & Lynch (2021) has defined five basic emotions when it comes to the climate, namely hope, fear, sadness, shame, and anger. These five basic emotions are based on theories about general basic emotions and applied on emotions that are experienced with regards to the climate. The origin of this theory can be found in the wheel of emotions from Plutchik (2001). Tracy & Randles (2011) distinguish five prominent emotions from the wheel of emotions that are widely represented in research, namely happiness (joy), fear, sadness, disgust, and anger. The five basic emotions from Tracy & Randles (2011) are closely related to the five basic climate emotions from Hiser & Lynch (2021).

The difference between the five emotions used by Hiser & Lynch (2021) and Tracy & Randels (2011) can be found in the happiness which is changed to hope and the disgust that is changed to shame. By changing the basic emotions disgust to change, the personal dimension of climate change is highlighted in combination with the pressure that is put on change (Marczak et al., 2023). This means that it highlights the impact that climate emotions have on individuals, on their moods and wellbeing, but also on the actions that they are willing to take. These theories from Hiser & Lynch (2021) and Pihkala (2022) provide an overview of the main emotions that can be expected when talking about climate emotions.

This research will mostly focus on the five basic climate emotions from Hiser & Lynch (2021), see table 3, and support these basic emotions with the deeper understanding of all climate emotions shown by Pihkala (2022). Most of the taxonomy groups that are mentioned in Pihkala (2022) are also covered by the five basic climate emotions from Hiser & Lynch (2021). There is, however, a difference in how micro emotions are grouped. For example, the surprise related emotions from Pihkala (2022) consist of micro emotions that have been grouped under the basic emotions of fear and sadness, namely the micro emotions shocked (fear) and disappointment (sadness). Additionally, the taxonomy from Pihkala (2022) separated (micro)emotions that Hiser & Lynch (2021) kept together. This can be seen by the emotion of a) fear, which is represented in surprise, threat, and anxiety related emotions and b) sadness, which is represented in surprise,

sadness, and depression related emotions (Hiser & Lynch, 2021; Pihkala, 2022). The other climate emotions are separated in a similar fashion. This research will focus on Hiser & Lynch (2021) climate emotions since this categorisation and these emotions have been derived from college students, making it more likely that these emotions will be shared with high school students than research with a focus on adults.

*Table 3: Spectra of microclimate emotions sorted under basic climate emotions (Hiser & Lynch, 2021)*

| Fear | Anger | Sadness | Shame | Hope |
|---|---|---|---|---|
| In denial | It sucks | Heavy | Ashamed | Humble |
| **Powerless** | Irritated | **Disappointed** | Embarrassed | Grateful |
| Speechless | Cheated | Pessimistic | Guilty | Empathic |
| Helpless | Distrustful | **Sad** | Cringing | Interested |
| Detached | **Frustrated** | **Terrible** | Gross | Opinionated |
| Dumb | **Angry** | Depressed | Visceral reaction | Knowledgeable |
| **Worried** | | Resigned | | Enlightened |
| Unsure | | Discouraged | | Concerned |
| Mystified | | Dampened | | Motivated |
| Sceptical | | Heartbroken | | **Inspired** |
| Nervous | | Devastated | | Reassured |
| Stressed | | **Hopeless** | | Responsible |
| Concerned | | | | Determined |
| Alarmed | | | | **Hopeful** |
| Pressured | | | | |
| Shocked | | | | |
| **Overwhelmed** | | | | |
| Scared | | | | |

## 2.3 Conceptual framework

The above mentioned theoretical concepts have been put into a conceptual framework to relate the two concepts, environmental worldviews and climate emotions, to each other so that the research question can be answered. A simplified visualization of this conceptual framework can be found in figure 1.

When we look at climate education, we see that it consists of three major components, namely the course material or, in this case, the climate education textbook, the teacher, and the student. The book and teacher together form the education materials. Here, the teacher explains the information from the textbooks, however, the worldview of the teacher influences how he perceives the textbook and what they believe is important to teach their students. However, the textbook can also be read separately from the classroom, where the worldview of the teacher cannot interact with the worldview of the textbook. Figure 1 shows that climate education interacts with the worldview of students (Hochachka, 2019) and that communication can be seen as a mediator (Brown, 2005; Stevenson et al., 2014). This shows and explains how education can form the worldview of its students, especially teenagers, since they are still forming their worldview (Stevenson et al., 2014). However, Stevenson et al. (2014) also explain how worldviews can determine how information is interpreted and received. Therefore, it is important to be aware of the worldview that is present in climate education and the worldviews of the students.

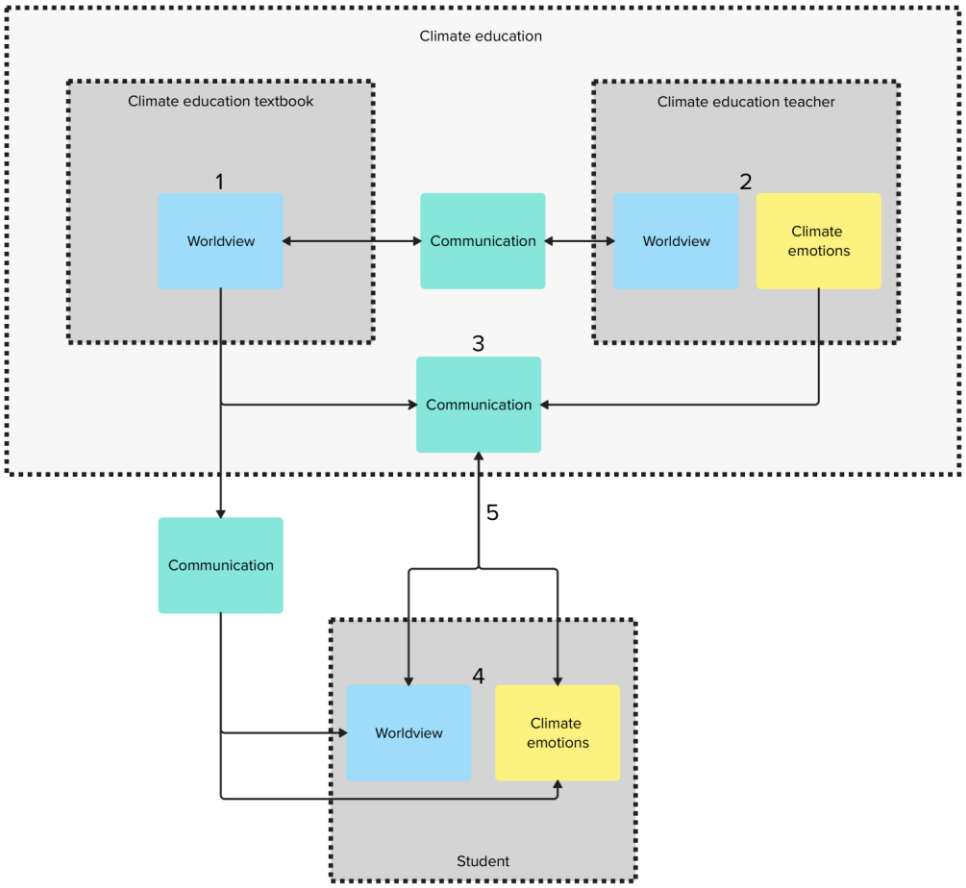


*Figure 1: A Simplified visualisation of the conceptual framework showing the interactions between the theoretical concepts and the research questions.*

Climate education can also evoke climate related emotions within its students (Deisenrieder et al., 2024). These climate emotions that the students experience impact how they understand and engage with the climate and the knowledge they receive from climate education (Deisenrieder et al., 2024; Leichen & O'Brien, 2020). The climate emotions that the youth experiences are not only determent by climate education, but also by the worldview they have (Ramkissoon & Smith, 2014). De Witt et al. (2024) have shown that education systems are becoming more aware of the importance of including emotions in education programmes in order to develop secure students.

This shows the role of worldviews and emotions in climate communication when it comes to climate education. The combination of the four major worldviews with developmental psychology and nature images provides a conceptual understanding of worldviews in a manner that includes student development and includes the ecological view on how individuals see and experience nature. Providing a concept of worldviews that is suitable for climate education that is appropriate to relate to climate education and climate emotions.

# 3 Research questions

This thesis will answer the question: What environmental worldviews and climate emotions do 14-16 year old students at high schools in Haarlem experience, and how does the climate education in geography interact with their environmental worldview and climate emotions? This research question will be answered through the use of five sub-questions.

1. What environmental worldview is present in the climate education in Dutch geography textbooks?
2. What environmental worldview and climate emotions do Dutch geography teachers in Haarlem hold and educate in the classroom?
3. How do environmental worldviews presented in Dutch geography textbooks compare to those held by geography teachers in Haarlem?
4. What environmental worldview and climate emotions do 14-16 year old high school students in Haarlem hold about climate change and climate education?
5. How do environmental worldviews and climate emotions of high school students in Haarlem interact with those presented in geography textbooks and taught by teachers?

# 4 Methodology

This research contains aspects of qualitative and quantitative data, making it mixed-method research. This has been chosen to improve the triangulation of the qualitative narrative analysis that will be done as the main source of data (Turner et al., 2015). The qualitative part of this research will consist of semi-structured interviews with teachers and students. The semi-structured interviews were used to provide the possibility for follow-up questions and create space for the participants to express themselves more freely (Kallio et al., 2016). A transparent interview guide is shared in Annex A and B so that this research could be repeated. In addition to this, the interview questions were created using preexisting scientific knowledge, such as the IWF, to increase the credibility of this research as it improves the reliability and validity (Kallio et al., 2016; Roberts, 2020). Interview questions that are grounded in preexisting theories minimizes bias and ensure comprehensive data collection (Roberts, 2020). The quantitative questionnaire was created similarly (see Annex D). This questionnaire was used to create an understanding of whether the interviews were representative of the high school student population between the ages of 14 and 16 years. Additionally, the research focused on the problem identification and needs analysis phase, which is the first phase when it comes to education design research (de Witt et al., 2024). This means that the focus of this research will be on providing information about and understanding current climate education in geography.

## 4.1 Data collection

This research will work with different ways of data collection, through the analysis of textbook chapters, interviews, and a questionnaire, for a simplified overview and how the methods relate to the research questions see table 4. All the data will be collected at three different Dutch high schools that are located in Haarlem and provide education on the level of preparatory scientific education (VWO). The schools have been selected through personal connections with high school teachers and with a focus on diversity both types of schools or school vision and their course material, which provided a selection of three schools in Haarlem. This research will focus on the course geography since this is one of the courses with a national examination moment that includes climate education and is therefore taught to all students. Other courses that could also be included are physics, chemistry, biology, and social studies. However, I will not focus on these courses since physics approaches climate education from the weather perspective, chemistry from the chemical cycle that plays a role, biology from the perspective of biodiversity, and lastly, social studies is not tested at a national level. Geography contains education about the social, environmental, and mechanical aspects of the climate and climate change, making this the most fitting high school course for this research (SLO, 2015).

*Table 4: A simplified overview of the data collection methods and how they relate to the research questions*

| Question number | Research question | Data collection |
|---|---|---|
| Sub-research question 1 | What environmental worldview is present in the climate education in Dutch geography textbooks? | Textbook analysis and teacher interviews |
| Sub-research question 2 | What environmental worldview and climate emotions do Dutch geography teachers in Haarlem hold and educate in the classroom? | Teacher interviews |
| Sub-research question 3 | How do environmental worldviews presented in Dutch geography textbooks compare to those held by geography teachers in Haarlem? | Textbook analysis and teacher interviews |
| Sub-research question 4 | What environmental worldview and climate emotions do 14-16 year old high school students in Haarlem hold about climate change and climate education? | Student interviews and questionnaire |
| Sub-research question 5 | How do environmental worldviews and climate emotions of high school students in Haarlem interact with those presented in geography textbooks and taught by teachers? | Textbook analysis, teacher interviews, student interviews, and questionnaire. |
| Main research question | What environmental worldviews and climate emotions do 14-16 year old students at high schools in Haarlem experience, and how does the climate education in geography interact with their environmental worldview and climate emotions? | Answers from the sub-research questions |

### 4.1.1 Textbook

I first collected the chapter(s) about climate education in order to generate data about the environmental worldview in climate education. The teachers will provide information about which books they use and which chapters are about climate education and will, therefore, be used as data for this research. These textbook chapters formed the data that was used to answer sub-research questions 1, 3, and 5.

### 4.1.2 Interviews

The second form of data collection consists of one-on-one semi-structured in-depth interviews with three teachers and twelve students that are taught by one of the teachers; see annex A and B for the interview questions. Each teacher was from a different high school in Haarlem, a UNESCO high school, a independently atheneum high school, and a Dalton high school. This means that the vision of each high school is different. Per school four students were interviewed that are taught by the respective teacher that also interviewed for this research. The four students were selected by the teacher to participate in the interviews if they consented; see table 5 for the interviews and their reference code. The number of students was picked based on it being at least ten percent of a class of 30 students and on the timeframe of this research.

*Table 5: Overview of interviews, the grade of the students, and the reference code of the interviews*

| **Interview** | **Grade** | **Reference** code |
|---|---|---|
| Teacher at school A | | Sc-A-Te-I1 |
| Student 1 at school A | 3 VWO | Sc-A-St-I2 |
| Student 2 at school A | 3 VWO | Sc-A-St-I3 |
| Student 3 at school A | 3 VWO | Sc-A-St-I4 |
| Student 4 at school A | 3 VWO | Sc-A-St-I5 |
| Teacher at school B | | Sc-B-Te-I1 |
| Student 1 at school B | 4 VWO | Sc-B-St-I2 |
| Student 2 at school B | 4 VWO | Sc-B-St-I3 |
| Student 3 at school B | 4 VWO | Sc-B-St-I4 |
| Student 4 at school B | 4 VWO | Sc-B-St-I5 |
| Teacher at school C | | Sc-C-Te-I1 |
| Student 1 at school C | 4 VWO | Sc-C-St-I2 |
| Student 2 at school C | 4 VWO | Sc-C-St-I3 |
| Student 3 at school C | 4 VWO | Sc-C-St-I4 |
| Student 4 at school C | 4 VWO | Sc-C-St-I5 |

### *Teachers*

The interviews with the teachers provided data about what the teachers intend to educate their students about and what worldview they hold about climate and climate change. This has been done by asking the teachers which worldview they intend to teach their students and in which worldview they recognise themselves the most. The data from these interviews was used to better understand the teachers, to provide a full picture of the climate education that the students receive and with which worldview this education resonates.

Additionally, the interview with the teacher also included questions about both how they include climate emotions in their classroom and how they experience and feel about climate change and the future. I asked specific questions to the teachers about their climate emotions since affects cannot be observed and observing emotions can be hard (Remmerswaal, 2015). This is in line with Hamilton (2020), who states that emotions are part of the inner and outer dimensions of people, and affects are only in the inner dimension. This means that affects are only felt by an individual, while emotions can be felt but also observed (Hamilton, 2020; Remmerswaal, 2015). Therefore, asking the teachers about their climate emotions can provide a clearer picture of the emotions they experience since this includes the inner dimension of emotions. The data from these questions provided data about the climate emotions that the teachers experience and how they incorporate their and student climate emotions in the classroom. Therefore, the teacher interviews provided data for sub-research questions 2, 3, and 5.

### *Students*

The interviews with the students provided data about their worldview and climate emotions. The students were asked to explain how they define the climate and climate change and to pick a worldview from a list of definitions from different worldviews (see annex C) in which they recognise themselves the most. Other questions focussed on how the students view the future and how the climate and climate change should be managed. The questions are based on the different aspects that are used to classify the worldviews, for example, the complexity of thought and the anthropology/ human nature divide. Providing data about the worldviews that the students hold.

In addition to this, the students were also asked how they feel when thinking and talking about the climate, climate change, and the future. Therefore, inquiring the climate emotions that the students experience. These student interviews provide data about their worldview and the climate emotions they experience, sub-research questions 4 and 5.

### 4.1.3 Questionnaire

The students did an online questionnaire provided by their teacher. The teachers distributed the questionnaire in at least one 3 VWO class and one 4 VWO class. This provided 144 completed questionnaires, however, 26 students retracted their consent, meaning that the data of 118 students has been used for this research. These 118 students consisted of 67 students in grade 3 VWO and 51 students in grade 4 VWO. The online questionnaire consisted of similar questions as the student interviews, see Annex D. However, the questionnaire has more elaborate questions to enable multiple choice questions that focus on separate aspects of worldviews, for example, the complexity of thought and the anthropology/ human nature divide. Therefore, it provided additional data about the worldviews the students hold and the climate emotions they experience. The questionnaire will be a more quantitative form of data that has been used to support the qualitative data from the interviews, providing triangulation for sub-research question 4 and 5.

## 4.2 Data analysis

The data derived from the interviews has been transcribed into verbatim transcripts. These transcripts were then analysed using a narrative analysis plan in Atlas.ti 23. The narrative analysis plan is explained step-by-step in table 6 and consists of both inductive and deductive coding (Azungah, 2018). This means that I will make use of the theories mentioned in chapter 2 as a basis for understanding the worldviews and climate emotions presented in my data. In this research, the traditional worldview is represented by the belief that humans are separate from nature, that there is a wrong or right, and that it is our moral obligation to take care of nature, climate (change), and the planet. The modern worldview acknowledges that humans influence nature and believes that the market, technology, and innovation will be the answer to the climate crisis. People with the post-modern worldview acknowledge humans and nature are interconnected, they acknowledge the pluralistic views when addressing the climate, and that the climate, nature, and the planet can be protected with social knowledge and movements. Lastly, in this research the integral worldview is summarised as valuing nature and humans based on a wholistic views and as interconnected with the universe. Additionally this worldview beliefs in the define where the world will keep on living with or without humans.

Additionally to these worldview descriptions that were based on existing literature, I was also able to acknowledge relevant or remarkable data that was not covered by these previous theories. The step-by-step narrative analysis plan has not been done linearly, but more in an iterative manner.

*Table 6: The step-by-step narrative analysis plan used for this research*

| Analysis step | Purpose | Action | Supporting theory or signal words |
|---|---|---|---|
| Step 1: General reading | Gaining an impression of and becoming familiar with the data | Highlight remarkable, relevant or striking quotes | n.a. |
| Step 2: Look for environmental worldviews | Separate data that indicates worldviews | Highlight relevant quotes | Use IWF from Hedlund- de Witt (2013) and the three aspects of developmental psychology (Hochachka, 2019). |
| Step 3: Look for climate emotions | Separate data that indicates or refers to climate emotions | Highlight relevant quotes | Use Hiser & Lynch (2021) spectrum of climate emotions, see table 3 Emotions, feelings |
| Step 4: Code environmental worldviews | Determine the worldviews that are present (sub-research questions 1, 2, 4) | Code the previously highlighted quotes | Using Hedlund- de Witt, (2013), Pender (2023), and Buijs (2009) as theoretical guidelines that suggest signal words such as interconnected. |
| Step 4: Determine climate emotions | Determine the climate emotions that are present (sub-research questions 2, 4, and 5) | Code the previously highlighted quotes | Using the climate emotions from Hiser & Lynch (2021), see table 3, and the climate emotions indicated by the students |

The quotes from the interview transcripts have been translated with the use of the AI program ChatGPT using the prompt: “Translate the following sentences in correct English while keeping the same intention and wording.” This eliminated my bias in translating the Dutch quotes to English and made sure they remained the same wording and message.

# 5 Results

The results from the narrative analysis are presented per school which provides a comprehensive overview of the intricate interactions between the textbook, teacher, and students. Below, the result of each school are presented by first discussing the worldview that can be found within the textbook that is used. After this I look into the worldview and climate emotions of the teacher, what he wants to teach his students, and how he teaches them. Lastly, I discuss the worldviews and climate emotions of the students and how they experience climate education. The final part of this chapter explore a generalised overview of the worldviews and climate emotions experienced by the high school students of Haarlem.

## 5.1 School A

### 5.1.1 Textbook

High school A uses the buiteNLand textbook for geography. This textbook has a chapter dedicated to explaining the climate and touches upon climate change in other chapters, such as 'The river area.' The textbook begins its climate chapter by explaining concepts that are needed to understand what the climate is and how it works. These concepts are explained in a factual manner without involving values or beliefs, making them seem devoid of a worldview. See for example how the textbook explains the high-pressure system.

> *"Around 30° N and S, the air has cooled sufficiently to begin descending. The air is dense and exerts significant pressure on the Earth's surface. We refer to this as a high-pressure system." (Bloothoofd et al., 2022, p.92)*

After explaining the relevant climate concepts, the textbook delves into explaining the climate change that is happening at this moment. They call this section "modern-day" climate change thereby separating this from the previously mentioned climate change that happened over centuries. The textbook explains this difference in this section and includes the consequences of "modern-day" climate change and climate change policies. When it comes to explaining "modern-day" climate change, buiteNLand remains explaining the related concepts in a factual manner. See for example below the explanation of the role that oceans have played in mitigating the enhanced greenhouse effect.

> *"However, our era is still dominated by negative feedback mechanisms, which mitigate the effects of the enhanced greenhouse effect. The oceans play the most significant role in this process, having absorbed ninety percent of the additional heat from the enhanced greenhouse effect." (Bloothoofd et al., 2022, p.118-119)*

Both examples show that the textbook explains the relevant concepts of climate change based on scientific knowledge from the natural sciences, without much regard for the social and political sciences. Indicating that the textbook gives a monist explanation of the relevant concepts. On the other hand, other disciplines are included when the textbook starts to explain the consequences and policies.

> *"The climate issue affects society in all its aspects. This means that each stakeholder group tries to create its own narrative around it. Broadly speaking, we distinguish three approaches.*
>
> 1. *You can first take a very pragmatic approach to the issue. In the Netherlands, for example, this is done by developing an action plan in consultation with the business*

*sector. In this approach, climate change is seen as a problem that simply needs to be solved.*

2. *You can also see climate change as a signal that something is wrong with the way we have organised our economy on a more fundamental level. This is then not only about the enormous amount of energy that is consumed but also about the growing divide between rich and poor.*

3. *Finally, you can see climate change as a sign that we have become alienated from nature. We plunder the Earth as if it were a treasure chest and then worry about the problems that arise as a result." (Bloothoofd et al., 2022, p.122)*

This quote shows that the textbook includes the different views individuals, specified for Dutch people, can have concerning the climate based on different scientific disciplines. These pluralistic views are also included when the textbook addresses the topic of climate change solutions. This is done by explaining that there are multiple ways to address climate change.

*"Science is often presented as the (only) neutral source of information. To some extent, this is true. Most attempts to challenge scientific findings stem from a resistance to climate policy. However, scientists frequently overlook the fact that there are multiple ways to address climate change, and that the choice depends on one's personal vision of what "a better world" should look like." (Bloothoofd et al., 2022, p.121)*

The textbook includes the pluralistic views in multiple way. For example, the textbook addresses the different impacts climate change solutions can have on other economic classes, explaining how low income communities have more difficulty to participate in some climate change solutions while they are usually the communities that suffer the most from climate change. Another view that is included in the textbook is the political view where the textbook explains that, sometimes, other reasons are used to participate in climate friendly transition. The textbook gives the example of the energy transition that is happening which is also happening to become less dependent on Russia for their gas. Therefore the textbook explains the topic of climate change with a pluralistic view, namely by including natural, social, and political science.

### 5.1.2 Teacher

*Worldview*

During the interview, the teacher acknowledged the interconnectedness of humans, nature and, the climate. Additionally, he mentioned that climate change has been happening for ages and that it is a natural phenomenon. However, he further explained that the rate at which current climate change is happening is no longer natural and influenced by human actions.

*"People, nature, and climate—these are deeply interconnected. Nature responds to the climate and also influences it. So, there is a very strong interaction. In that sense, it is also natural that climate change occurs. […] However, the pace at which things are happening and the role that humans play in this process is truly saddening." (Sc-A-Te-I1)*

The teacher mentioned that we humans should take action to reduce climate change. When talking about the actions that need to be taken he stated that "We should start with ourselves". The actions, that the teacher mentioned, are focused on preventing climate change contribution through "behavioural shifts" or preventative actions rather than mitigating actions such as carbon capture.

*"I am very much in favour of a preventive approach, meaning we must ensure that we no longer emit those molecules. Reducing consumption is the preventive aspect. The mitigating aspect, I don't actually believe in this in the long term. For instance, I think carbon capture and storage is very effective, but only as a transitional measure to something new." (Sc-A-Te-I1)*

This indicates that the teacher prefers preventative social change over technological innovations. Further into the interview, the teacher mentioned his view on technological innovations as the solution for climate change, stating "This is absolutely not something that will save us". After this, he once again brought up the need to "change our behaviour". Thereby, repeatedly mentioning the importance of social and individual actions when it comes to reducing climate change.

At the end of the interview, the teacher was asked to select a worldview that resonated with his values and beliefs. Here the teacher selected both the post-modern (worldview 3) and the integral worldview (worldview 4), stating that: "worldview 4 is how I see the world and what I want to strive for, worldview 3 is more when you talk about the present."

### *Climate emotions*

The teacher approached his emotions and climate emotions by thinking about which of "the four B's" he experienced, meaning boos (angry), bang (fear), blij (happy), and bedroefd (sad). This means that when asked about his emotions the teacher was prone to mention multiple emotions related to these four B emotions.

During the interview, the teacher mentioned being "fascinated by the phenomena" of climate change, especially as a geologist. This was the only time he mentioned a positive emotion. During the interview, the teacher mentioned multiple negative emotions regarding climate change. He indicated feeling saddened by the role humans play in climate change, see the first quote of the teacher.

Additionally, he expressed feeling anger when asked about the actions that are currently taken to reduce climate change. This anger stems from the lack of adequate action taken to reduce climate change.

*"I also feel angry at times, angry about the fact that... If I think as a geographer, you have different scale levels, and at the largest scale level, humanity seems unable to reach agreements that are truly feasible and implementable." (Sc-A-Te-I1)*

This indicates that the teacher experiences multiple climate emotions ranging from positive to negative.

### *Education*

In the classroom, the teacher aims to create a basic understanding of the climate and climate change. He mentioned doing this by explaining the important concepts of 'climate' and 'climate change' with the use of the textbook, but also by providing his own pluralistic view through examples of the impact that climate change has, by including political, social, and cultural dimensions. Explaining, how the different dimensions are impacted by climate change and how the dimensions view climate change. The teacher elaborated by providing an example of the additional explanations he provides in the classroom.

*"At a certain point, I decided to structure a lesson very differently by saying, "I will no longer focus on the Netherlands. Let's look at the United States instead, for example, the Colorado River." That isn't covered in the textbook, by the way, because it only discusses the Netherlands,*

*but the Colorado River. Well, the problem there is actually the opposite, instead of too much water, there is drought. Yet, the same ideas and geographical concepts still apply." (Sc-A-Te-I1)*

The teacher mentioned including examples like this to show his students that the impact of climate change can look different depending on where you are, thereby expanding the scope of the textbook. In addition to this, the teacher also mentioned including the different perspectives and views on climate change within the Netherlands by exploring the differences between the east and west of the Netherlands. The teacher explained including the different views that are present in the cities and those on the rural countryside. This indicates that the teacher wants to show that there are multiple views on what climate change entails for an individual.

Aside from focusing on educating his students, the teacher also mentioned that he wants to trigger his students into thinking about the impact their actions have on the climate. He aims to do this by explaining that actions have consequences and can lead to regrets.

*"We have to give things up for a future that is safe and can be called sustainable. But yes, that involves making fundamental choices: do we want to keep the Netherlands as it is, or do we want to completely redesign it? I hope that, at the very least, this question is triggered." ( Sc-A-Te-I1)*

Lastly, the teacher is tentative when it comes to including climate emotions in the classroom. He acknowledges that students might experience negative climate emotions, however, he mentioned believing that addressing these emotions can create an unsafe environment within the classroom. Therefore, he does not include climate emotions during his lessons since he prioritises safety above all. The teacher, however, did mention that the age of his students play a role in whether or not he includes climate emotions in the classroom. He mentioned believing that climate emotions are a delicate subject for students between the ages of 14-16 years as they are in puberty. On the other hand, the teacher mentioned that students between the ages of 11-13 years are more open to express their climate emotions in the classroom and therefore the teacher expressed feeling able to include climate emotions within the first grade.

*"I think that for me, it's also a factor that I am cautious in discussing things that could personally cause stress or anxiety. But it's not to brush it off, it's purely because safety in the classroom is, for me, the most important thing. Honestly, I think that is easier in a first-grade class. An example is, well, these students, and this relates to the development of children, are still very responsive when questions are asked, or when they have conversations with each other; they are also very open when it comes to sharing experiences they have had." (Sc-A-Te-I1)*

### 5.1.3 Students

#### *Worldviews*

The four interviewed students of school A all mentioned the influence that humans have on climate change. Explaining their view of how humans "ruin" nature and the climate, while also highlighting how dependent we are on nature.

*"Without climate, we cannot really live. [...] We really need to take action if we want to continue living here in the future. It will still be a long time, but it is necessary." (Sc-A-St-I3)*

The student also mentioned that action needs to be taken to reduce climate change. However, when they mention the actions there is a duality in how we should approach reducing climate change. The students express the importance of individual actions such as reducing emissions, such as showering less and separating trash so that it can be recycled. On the other hand, they

mention not believing that these individual actions will not lead to real change and that the government needs to step in.

*"I think the government should help with that, but at the same time, it is also up to individuals. It's important to consider what you can do yourself, like thinking about how to use green energy." (Sc-A-St-I5)*

*"Because if I do it on my own, not much will happen. But I do need to start with myself. […] Of course, you have the government and local municipalities. If you have a government that doesn't do much, then there's not much you can do on your own either. In the Netherlands, the government is still taking action, for example, with wind turbines and solar panels, which are definitely needed. But we also have to do our part because only by working together can we make a difference. On our own, it won't work." (Sc-A-St-I3)*

This second quote also shows the way the interviewed students highlight technological innovations as potential solutions, while also mentioning the importance of individual actions. One student also mentioned the importance of education when it comes to taking climate action saying that experts will be able to provide technological innovation and when people understand they will take action to protect the climate, as is visible now.

*"I think the future will look better, because there are more educated people for this, and more people are taking action now, unlike in the past" (Sc-A-St-I2)*

The interviewed students from school A mentioned both arguments based on natural and political dimensions, linking multiple disciplines when it comes to reducing climate change.

### *Climate emotions*

When it came to climate emotions the students needed many probing questions. The students frequently mentioned that they did not know how they felt or that they experienced no emotions concerning the climate. With continued probing questions that included the five basic climate emotions from Hiser & Lynch (2021) one student mentioned feeling "curious" about how the climate would look like in the future and "fear" about the liveability of the earth for future generations. Indicating that the students experience both positive and negative emotions.

Another student mentioned that she did not have to think about climate change much due to her age. Expressing climate emotions were something that she might experience in the future, but not now.

*"I just think, when I grow up, I think I'll be more concerned. Right now, I'm a kid, so it doesn't matter." (Sc-A-St-I3)*

### *Education*

The interviewed students mentioned that they felt like they were able to talk about their climate emotions if they wanted to during class. However, one student also mentioned that she doubted if students would dare to share their climate emotions in class. In addition, another student approached the lack of climate emotions mentioned in the classroom as a lack of interest.

*"Actually, I would say it doesn't matter much to them because I don't hear many people, especially kids, talking about climate issues. Of course, older people do, but kids themselves wouldn't typically bring up the topic of climate." (Sc-A-St-I3)*

The whole topic of climate education was something about which the students had no real opinions. Two out of the four students mentioned that they learn more about the climate and

climate change on social media and the news. This indicates that climate education at high schools might not be the main source of climate information for the students.

When specifically asked about the worldviews in climate education at school, all four students mentioned that they felt like it was closely related to the post-modern worldview. The students stated how they felt like the lessons highlighted both the relation between humans, nature, and the climate and that humans need to take action to reduce climate change.

## 5.2 School B

### 5.2.1 Textbook

School B uses another textbook for geography, namely De Geo. This textbook does not have a specific chapter dedicated to the climate however it does approach the topic in multiple chapters, such as in 'the vulnerable earth'. This title of this chapter already expresses the belief that the earth is vulnerable and the chapter indeed focuses on the vulnerability of the environment and climate.

The De Geo first explains important concepts that are needed for understanding the climate and climate change. The textbook explains these concepts in a factual manner without any visible values and beliefs, making them seem devoid of any worldviews. However, the textbook approaches the concepts from a monist view, including only natural science.

> *"Due to the natural greenhouse effect, the average temperature on Earth is +15 °C rather than -18 °C. Without greenhouse gases in the atmosphere, such as methane, nitrous oxide, water vapour, and carbon dioxide, Earth would be uninhabitable." (de Boer et al., 2022, p.134)*

On the other hand, the textbook puts an emphasis on how climate change impacts humanity and societies. This means that the textbook includes social, economic and political dimension that are relevant for the climate concepts are explained, highlighting the need to incorporate all dimensions to understand the implications of climate change, indicating a pluralistic view.

> *"The number of Earths needed if the global population lived like people in these countries: If the entire world population lived as we do in the Netherlands, 2.9 Earths would be required. " (de Boer et al., 2022, p.134)*

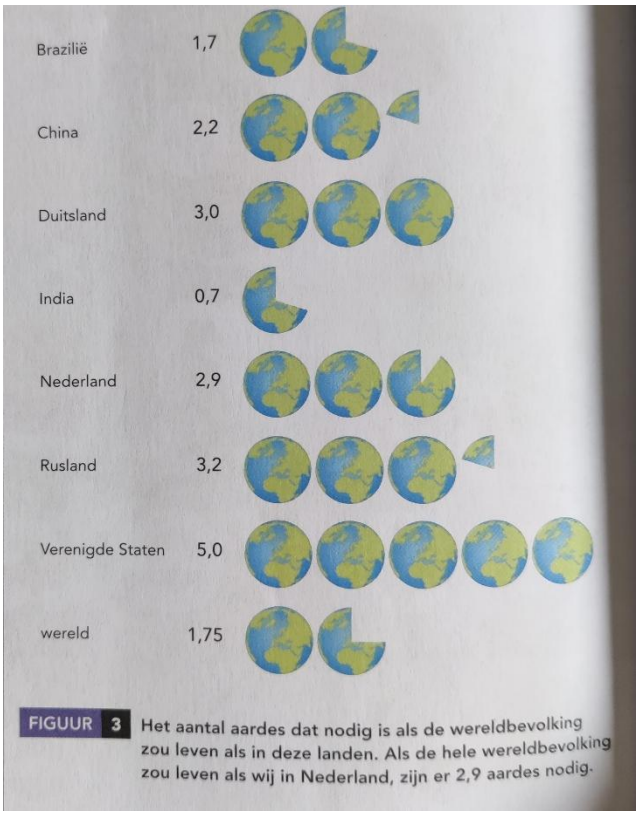


*Figure 2: Picture from the textbook De Geo about the amount of Earths that are needed if the global population uses the same amount of natural resources as the mentioned countries (de Boer et al., 2022, p.134)*

Additionally, The De Geo textbook emphasize the vulnerability of the climate and the importance of adapting our actions to more sustainable options. This textbook provides possible actions that can be taken to reduce our emissions and impact on climate change in order to keep the world habitable. These actions range from actions that can be taken by an individual or by societal collectives. Some of these actions are technical innovations.

> *"Farmers are increasingly utilizing the latest technologies, such as GPS, sensors, and robots, to increase yield per hectare. The exact treatment is then applied per square meter or even per plant, allowing for the maximum possible production with minimal loss of natural resources, while minimizing the impact on soil, air, and water. This is known as precision agriculture or smart farming." (de Boer et al., 2022, p.139)*

The textbook repeatedly applies its explanations to the global social relevance and implications. For example, the quote above is shown with a picture of an Indian farm. On other occasions the textbook explains the need to acknowledge economic differences between societies and the implications this has on the actions that can be taken to reduce climate change, highlighting the need to include multiple dimensions when thinking about the climate, climate change, and climate action. This indicates that the De Geo textbook uses a pluralistic view when explaining the climate and climate change.

### 5.2.2 Teacher

#### *Worldviews*

The teacher from school B acknowledged how humans impact the current climate and environment, showing the relation between the three. Meanwhile, the teacher highlighted the fragility of the climate and the contribution of humans to climate change.

*"That is a relationship of exploitation, where humanity essentially exploits the rest, and as a result, we get climate change. […] Well, the changing climate, but also the current climate, of course. Yes, definitely. And along with climate change, we also get all kinds of other negative environmental effects because those come as an added bonus." (Sc-B-Te-I1)*

The teacher mentioned that we as humans need to change our lifestyle if we want to reduce climate change. However, he also mentioned how the current societal systems seems to work against individuals who want to behave in a climate-friendly manner.

*"That is the difficult part, adjusting our lifestyle is practically impossible within the current economic system. In a system focused on growth and consumption, on always having more; continuous increases, continuous economic growth, continuous wage growth. Everything must keep expanding, but that's not sustainable. Growth has its limits. We are already living in an economy that has grown too large. It is already too much." (Sc-B-Te-I1)*

He continuously mentioned the importance of individual actions, such as consuming less or taking a bike instead of a car. However, the teacher was adamant that these individual actions are not enough to create sufficient change. He pointed at the government to take actions that force companies to participate in becoming more climate-friendly. Therefore, acknowledging the power difference between individuals and a government and the importance for them to work together in order to reduce climate change.

*"Of course, as a government, you have a duty to protect your citizens, and as a citizen, you have a duty to behave responsibly. It seems to me that these are aligned goals, and perhaps even shared responsibilities. They should support each other. In my view, the only way to do that is by taking firm action against large companies that pollute, emit harmful substances, and fail to develop sustainable alternatives; despite the urgent need and the fact that it may already be technically possible." (Sc-B-Te-I1)*

In addition, the teacher mentioned that he does not believe that technology will form the solution to reduce climate change. He remained adamantly that fundamental changes need to be made, such as adjusting our lifestyle.

*"I think we have progressed far enough in our development to realize that this approach is not the solution. We continue in the same way we always have, assuming we can solve problems through innovation. But that doesn't truly solve them. Technological solutions can certainly help to some extent, and there will always be things we can do. However, even then, we are still essentially a parasite on the Earth, and that fundamental issue remains unresolved." (Sc-B-Te-I1)*

At the end of the interview, the teacher was asked to select a worldview that resonated with his values and beliefs. Here the teacher mentioned identifying himself with the post-modern worldview since this worldview has a pluralistic view on climate change and does not only focus on technological innovation.

### *Climate emotions*

The teacher mentioned that he sometimes actively sets his climate emotions aside as they are not something that he wants to deal with all the time.

*"If I really think about it, I worry a lot. But that's not something I want to do all the time. So, I choose to set it aside for a while and just leave it at that." (Sc-B-Te-I1)*

During the interview, the teacher mostly mentioned negative climate emotions, such as worry, frustration, and shame.

*"Yes, frustrated that you feel stuck. That you are almost forced to make certain choices. And sometimes even a sense of shame for making that choice; for giving in to something once again." (Sc-B-Te-I1)*

This shame that the teacher mentioned experiencing when being unable to make the climate-friendly choice is followed by a feeling of powerlessness about the limited impact he as an individual has on reducing climate change. The only moment the teacher mentioned a positive emotion was when talking about the actions he is taking now. However, they are overshadowed by negative emotions.

*"But yes, you feel, and this may sound strange, but you feel like you are doing the right thing morally, and that feels good. It's satisfying to do what feels right. At the same time, though, there's an overwhelming sense of powerlessness because, on your own, it seems like you can't do anything and achieving real results alone is even more difficult." (Sc-B-Te-I1)*

*Education*

The teacher mentioned that it is hard to include climate education as a stand-alone topic in the classroom as it is always a part of another topic.

*"If we want to do something with sustainability, we're essentially swimming against the current while the rest of the school just drifts along. It never truly fits into the system, except maybe during a project week. But then, it's just one project week, while the other 39 weeks follow the usual curriculum." (Sc-B-Te-I1)*

Aside from this, the teacher aims to provide his students with basic objective knowledge. However, he acknowledges that being objective is hard and that his lessons are influenced by his values and beliefs. In addition to providing knowledge, the teacher wants to teach his students that people might have different views and opinions concerning the climate and climate change. The teacher wants to achieve this by providing room for discussions and including current affairs in the curriculum.

When it comes to climate emotions the teacher mentioned being involved in learning about how to include it in the classroom but not having been able to do it yet. This is something that the teacher mentioned he wants to be able to do since he acknowledge that his students might experience climate emotions since he learned that students might feel negative emotions concerning the climate. However, the teacher also expressed that currently, including climate emotions in the classroom feels forced and separate from the rest of the climate education curriculum therefore he does not include them in his classroom. This does not mean that the teacher is against including climate emotions in the classroom, but more that he is unaware of how to do it in a constructive manner, therefore he is actively learning about how to do this in the future.

*"Then we don't really go much further into how students feel about it or what they can actually do themselves. It always kind of… how do you say it? It just lingers there; a sort of obligatory part of the lesson." (Sc-B-Te-I1)*

Lastly, the teacher mentioned including technological innovations in his lessons since he feels like this can provide positive climate emotions such as hope. Thereby, being mindful that his teaching can provoke emotions within his students.

### 5.2.3 Students

*Worldview*

All four interviewed students of school B mentioned that humans, nature and the climate are interconnected and influence each other. They all highlight that humans are negatively impacting nature and the climate.

> *"Right now, people aren't taking very good care of the climate. Everything we do affects nature and the climate. […] I think we should be able to live in balance with each other." (Sc-B-St-I4)*

In addition to the students mentioning the negative impact that humans have on the climate, they also mention that people need to take action to prevent further changes in the climate. They mention the impact they have themselves since "every choice I make has of course an impact on the climate", but they also mention the lack of significant impact they as individuals have on reducing climate change.

> *"The people who actually have the power to make a difference don't do it because it's not in their best interest. And the people who do take action don't really have a big impact." (Sc-B-St-I5)*

The students agree that governments are the institutions with the power to reduce climate change. When asked about how we can reduce climate change the students seem adamant that the solution to reduce climate change can be found "of course with clear guidelines".

> *"Maybe set a limit on the amount of greenhouse gases a company is allowed to emit. For example, Tata Steel emits a lot of greenhouse gases, so that needs to be reduced. Or there should be more sustainable alternatives, like electric buses, electric cars, or more things that run on water energy [hydropower]; just more sustainable options in general." (Sc-B-St-I4)*

This last quote also shows that the students mention technological innovations as options to reduce climate change. However, the students seem to prioritize government actions and legislation over these technological innovations.

Three of the students also mention that there is a difference in the power/capacity of countries and that therefore the actions of less powerful countries are also less effective at reducing climate change. Here they focus on the fact that the Netherlands is a small country compared to America or China and therefore the actions of the students or even the Netherlands to reduce climate change can seem futile.

> *"I don't think we will really make a difference if countries like the U.S., Russia, and others don't take action as well." (Sc-B-St-I3)*

> *"If we take actions here in the Netherlands and China just continues to build more factories, it won't be very effective" (Sc-B-St-I5)*

Additionally, the students acknowledged how different parts in world were affected differently by climate change. One of the students mentioned how climate change influences and increases the water scarcity that is happening in Gaza.

*Climate emotions*

During the interview, all four students seemed disinterested when asked if they felt emotion about the climate. Even with probing all four students mentioned not really feeling anything about the climate.

*"It doesn't seem very good, and it probably isn't great for the people who have to live with climate change in the future either." (Sc-B-St-I3)*

One student seemed more susceptible to the probing questions and mentioned being angry and frustrated that no real action is taken to reduce climate change.

*Education*

The interviewed students mentioned that they felt like they were able to talk about their climate emotions if they wanted to during class. However, they also mentioned that no student had shared or talked about their climate emotions during class.

*"Yeah, in theory, you could talk about it, but it doesn't really happen." (Sc-B-St-I5)*

When talking about climate education the students frequently mentioned the news or current affairs. Two students mentioned that the teacher uses current affairs to illustrate the impact of climate change with photos or videos. These two students say that the teacher aims to improve their awareness of the consequences of climate change and their own actions.

*"I think he wants to make us aware of the consequences of our actions as a society. And that he... how do I put it? That he's not trying to blame us, but rather to create a clear picture of which country plays what role in climate change. Some countries, of course, have a bigger impact on the climate than others." (Sc-B-St-I4)*

Two of the four students mentioned that they learn more about the climate outside of school, namely at home with documentaries or on social media.

Lastly, when asked which worldview the students thought was present in their climate education all four interviewed students mentioned the post-modern worldview. Stating how humans influence and depend on nature and the climate. There was, however, one student who mentioned that in addition to the need for societal action, technological innovations are also mentioned as a solution in class.

## 5.3 School C

### 5.3.1 Textbook

High school C uses the buiteNLand textbook for geography. This is the same textbook as used by school A, therefore I will only summarise the results in this section. For a full overview of the results of the buiteNLand textbook see chapter 5.1.1.

The buiteNLand textbook has a chapter dedicated to explaining the climate and relevant climate concepts in a factual manner, seemingly without a worldview. However, the textbook focuses on one scientific discipline when it comes to explaining the relevant concepts.

This changes when the textbook explains the consequences of climate change, climate policies, and climate change solutions, with a specific focus on the Western world. In these parts of the chapter, the textbook explains the topic of climate change with a post-modern pluralistic view, namely by including natural, social, and political science and the need to include all dimensions when approaching climate change.

### 5.3.2 Teacher

*Worldview*

During the interview, the teacher acknowledged the interconnectedness of humans, nature, and the climate. He went on to mention that humans are now influencing nature and the climate and that the impact of humans on nature and the climate is greater than the impact of nature and the climate on humans. Thereby, the teacher highlighted the impact humans have on the changing climate.

> *"We influence nature and the climate, and the climate influences us in return. That's just how it works; it's a continuous cycle. In a way, it's an interesting model. Right now, though, we are affecting the climate more than nature is influencing it." (Sc-C-Te-I1)*

The teacher mentioned that we as individuals should take action to reduce climate change. However, he also mentioned that these individual actions are not sufficient enough to reduce climate change. He believes that the government should take action to reduce climate change as they have more power and impact. In addition to this, the teacher also mentioned thinking that the current government is unable to make the necessary changes to reduce climate change. This lack of trust in the current government and governing system leads him to seek a solution outside of the democratic system since tough decisions need to be made in order for real change to happen in reducing climate change.

> *"Sometimes, I wish we had a strong leader who would just say, "This is how it's going to be, and that's it. We're taking action now." I know that might sound a bit wrong, but that's how I feel." (Sc-C-Te-I1)*

The teacher mentioned the difference between countries in their contribution to climate change and therefore their responsibilities to reduce climate change. Mentioning how the "rich countries" are responsible for climate change and therefore have to take the lead in reducing climate change.

*Climate emotions*

The teacher mentioned that his belief in the importance of individual actions and his lack of trust in the role they play in reducing climate change make him feel split in half. He mentioned that this struggle makes him feel frustrated.

> *"There is no balance and that is something with which I struggle. I already take action by eating less meat and taking other actions. And that's what makes it so difficult. I think a higher level of governance should take action because they could be more efficient and effective. But it's not happening there. That's the dilemma I struggle with." (Sc-C-Te-I1)*

In addition to the frustration, the teacher also mentioned feeling melancholy for the days in which we did not have to think about the climate and the impact our actions have on it. Losing the carefree attitude that we had in the past.

On the other hand, the teacher finds positive emotions within his interest in the climate and climate change, stating that it is a phenomenon that has always been there. This makes him view the current climate change more as a challenge than as something that he needs to fear.

*Education*

In the classroom, the teacher wants to make climate change less complex to understand by providing tangible examples from current news items such as storms or floods. After this, when

a basic understanding of climate change is formed, the teacher wants to explain that climate change is a wicked problem. This is then followed by the teacher asking his students probing questions so that they form a better understanding of how they think about the climate.

*"I'm really focused on how it's actually a wicked problem. Because one issue often leads to problems elsewhere—there's a feedback mechanism involved. I want them to form their own opinions about it, like, okay, what are the actual solutions? What are not solutions, and how do they connect with each other? I'm also working in a more scientific way, like getting them to work with pollen analysis, for example. So that the students see that climate science can be interesting" (Sc-C-Te-I1)*

The teacher uses the same method, asking probing questions, to include climate emotions and the perspectives of the students during class. He mentioned approaching this both with the whole classroom and with the students one-on-one when given the opportunity.

*"Talking, asking questions like, "What do you think about this? Why do you think that way? Can you explain why you came to that idea?" That kind of thing. Just keep probing and asking deeper questions." (Sc-C-Te-I1)*

In addition to this, the teacher aims to teach his students that their own actions can have an influence on reducing climate change. Highlighting the impact individual actions can have during his lessons even though he does not really believe that this will provide significant change himself. The teacher mentioned that he wants to give his students hope that climate change can be reduced in the future.

*"They have influence through their own actions and also by what they vote for. If enough people want something, it can definitely succeed. I also try to instil some optimism in them, like, "Hey, things can still turn out well if we all work together." But I do that as a kind of... well, I'm not sure if I completely believe it* [the success of many individuals taking action to reduce climate change] *myself, but I try to convey that message to them." (Sc-C-Te-I1)*

### 5.3.3 Students

*Worldview*

At school C two students had very different views on the climate and climate change. One of the students repeatedly mentioned that individuals can have different perspectives on climate change and whether climate change is occurring or not. He acknowledged humans have increased the rate at which climate change is currently happening. However he also mentioned that it is unclear how much impact and consequences climate change will have. The other student mentioned the devastating impact humans have on the climate and how immediate action is needed to even have a possibility to reduce climate change. Indicating that she approaches climate change from a worst-case scenario perspective.

However, all interviewed students from school C tend to acknowledge the interconnected relation between humans, nature and the climate, but they all explicitly mentioned how humans depend on nature and the climate in order to survive while nature and the climate do not need humans to survive.

*"Yes, we humans need the Earth, but the Earth and the climate don't necessarily need us to exist."(Sc-C-St-I2)*

*"The climate is like a supreme god" (Sc-C-St-I3)*

The students also mentioned that humans need to take action to reduce climate change. They mentioned both the importance of individual actions and technological innovations.

> *"It's important that everyone eventually participates in reducing their impact. But yeah, it remains a choice to do so. […] So I do think that maybe nuclear energy is the future, or, for example, water energy or wind energy." (Sc-C-St-I5)*

> *"I think there are two possibilities: either we continue with green energy and the climate improves, or some people try, but not everyone listens, and as a result, we won't have a very good climate." (Sc-C-St-I4)*

Both quotes indicate the lack of trust the students have in the feasibility of the solutions, mentioning how individuals have to take action but also how unclear it is if they will participate. The students agree that the government needs to make sure that individuals participate in taking action to reduce climate change.

### *Climate emotions*

The students at school C were able to mention their climate emotions without the need for probing questions. The emotions that were mentioned by the students were: curiosity, depression, anger, fear, disappointment and worry. The curiosity, depression, and fear were about the future. The worry was also mentioned with regards to the future but then in the context of being worried for the future generations and how life will look like for them. Lastly, the anger and disappointment we mentioned about the lack of sufficient action that is being taken to reduce climate change.

### *Education*

The students at school C mentioned that they felt like they were able to talk about their climate emotions if they wanted to during class. However, none of the students mentioned that they felt the need to use this opportunity. This means that even though the students feel like they can share their emotions they do not want to do this themselves as they feel no need to share their climate emotions.

One student mentioned that he enjoys the way the teacher approaches some of his lessons by asking the students questions and providing the opportunity for the students to participate in these discussions.

> *"[*I like it*] When we can also participate in the conversation [*during class*], like when I hear a teacher talk for 40 or 90 minutes, I find it boring. So it is nice when we can have our say too. […] Sometimes, we can just talk along with the teacher. […] The teacher can ask us questions, and we can share our ideas with them. So, yes." (Sc-C-St-I5)*

The other students shared no real opinions about the climate education they received at school. However, two of the four students mentioned that they learn more about the climate outside of school, namely on social media or sometimes the news.

Lastly, when specifically asked about the worldviews in climate education at school all four interviewed students mentioned that they felt like it was closely related to the post-modern worldview. Stating that there is a focus on the interdependence of humans, nature, and the climate and that humans need to take care of the climate together.

## 5.4 Students in Haarlem

The previous results have focused on the data from the interviews putting the focus on the schools. This part of the results shows the data from the generalised student population in Haarlem.

### *Worldviews*

In the questionnaire, the students were given the opportunity to link their beliefs to different worldviews regarding certain climate aspects. The data showed that, when asked about the relationship between humans, nature and the climate, 58% of the students acknowledge the interconnectedness of humans and the climate (post-modern) and 36% in the dependency of humans on nature and the climate (integral). Additionally, when asked with which worldview the students identified themselves the most 47% of the students identified with the post-modern worldview, see figure 3.

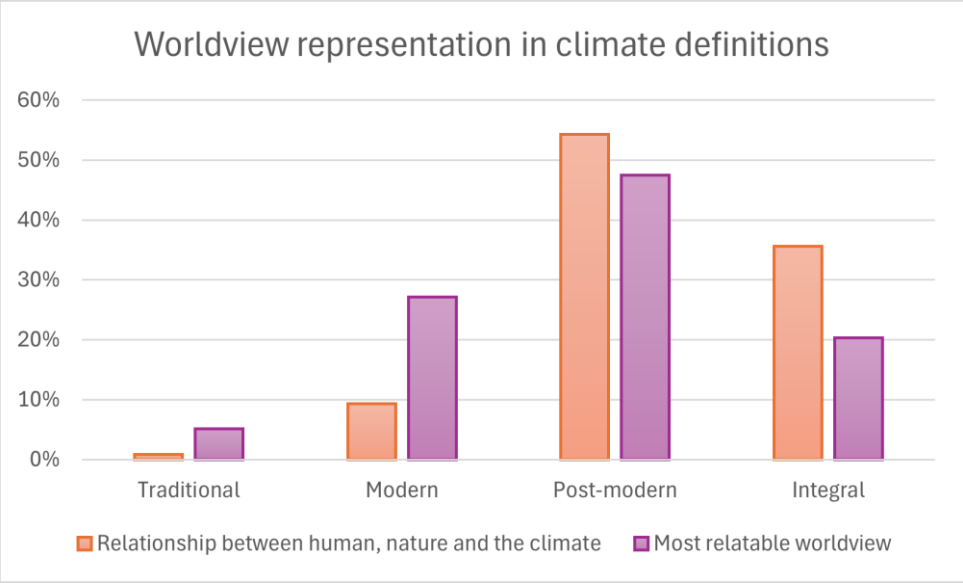


*Figure 3: an overview of the values and beliefs of the students defining their view on the climate. Divided by how the students view the relationship between humans, nature and the climate (orange) and how they view the climate and climate change as a whole (purple).*

The integral worldview is less represented in the students when we look at the result of how the students think we can use and should manage the climate, see figure 4. Here the values and beliefs of the students are more in line with the post-modern worldview (53%) saying that humans should use environmental resources in a sustainable manner and that individuals should take actions to care for the climate and the modern worldview (31%) saying that humans can use environmental resources and that we should use our technological resources in order to take care of the climate.

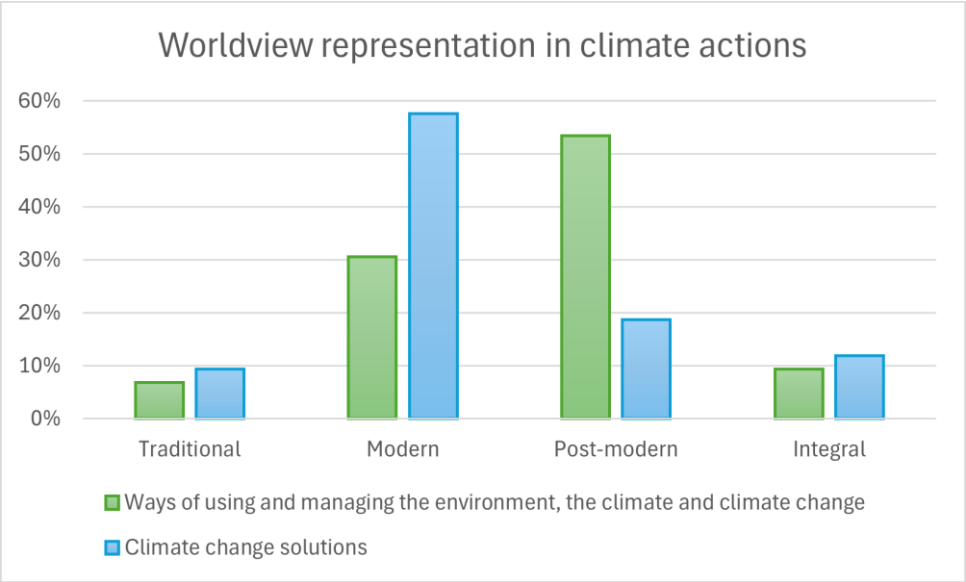


*Figure 4: an overview of the values and beliefs of the students about climate use and solutions. Divided by explaining how humans can use and should manage the environment, the climate and climate change (green) and how they think climate change can be solved (blue)*

The representation of these two worldviews is flipped, when the students are asked about what the possible solutions to reduce climate change are, see figure 4. Here 58% of the students believe in technological innovations (modern) and 19% believe in societal action or change (post-modern). This shows a duality in how the students believe we can use environmental resources and how we should solve climate change.

### *Climate emotions*

When we start to look at the results of the climate emotions that students, experience four emotions stand out 'no climate emotions' (other), 'powerlessness', 'worry', and 'disappointment'. These are the climate emotions that at least 10% of the students experience, see figure 5. When it comes to the 'no climate emotions', the students mentioned feeling neutral and nothing. Additionally, it is important to acknowledge that students were able to mention experiencing multiple emotions.

The questionnaire shows that more students mention experiencing climate emotions when we move away from the abstract concept of climate education and towards the current climate, and lastly the climate of the future. Figure 5 shows that less students experience no climate emotions when asked about the climate of the future compared to being asked about climate education. A similar but reversed change can be found in the number of students who feel worried about the climate. Their worry seems to grow when they think about the climate and the future climate. Additionally, worry is the most represented experienced climate emotion by the students. While both 'the absence of climate emotion' and 'worry' change, the number of students who feel powerless remains almost constant. The number of students that experience the last of these four climate emotions, disappointment, grows when they think about the current climate and declines when thinking about the future.

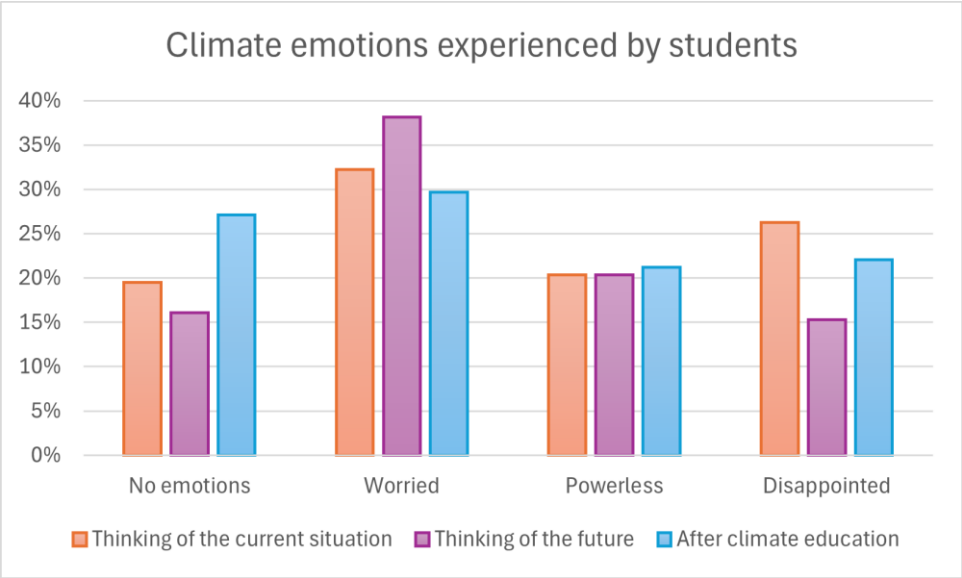


*Figure 5: An overview of the number of students that experience no climate emotions, worry, disappointment, and powerlessness regarding certain moments. Namely, after they when thinking about the current climate (orange), when thinking about the future climate (purple, and received climate education (blue),).*

The emotions from figure 5 are all negative with the exclusion of the no climate emotions. This however did not mean that the students did not experience any positive emotions. The data shows that when the students think about the future, they also feel hope, namely 21% of the students.

### *Education*

The students were asked to identify which worldviews was most represented within the climate education, see figure 6. 19% of the students were unable to identify a worldview within the climate education. From the remaining 81%, 34% recognised the modern worldview in climate education and 32% recognised the post-modern worldview.

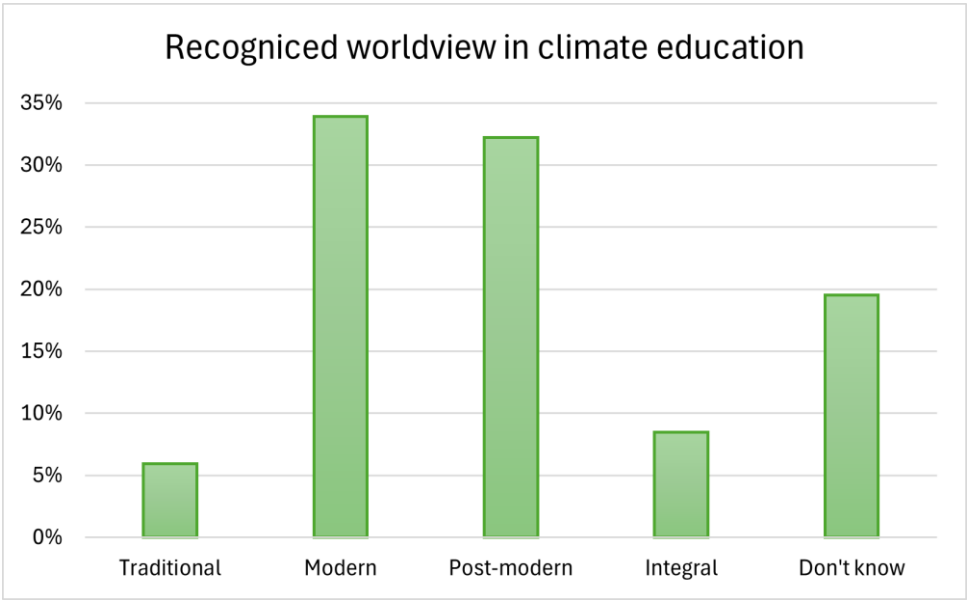


*Figure 6: an overview of the worldviews that the students feel are represented the most in climate education*

It should be noted that of all the students only 36% mention that they learn most about the climate in school. A combined 56% of the students learn most about the climate from social media or the news, see figure 7.

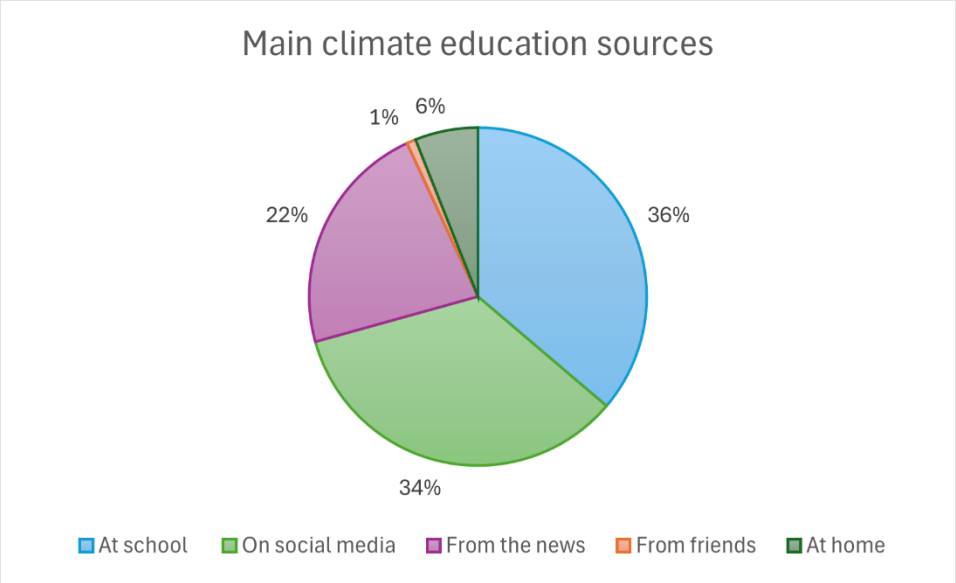


*Figure 7: An overview of where the students learn the most about the climate.*

# 6 Analysis & Discussion

The analysis and discussion consist of five parts: climate education, high school students in Haarlem, interactions between climate education and students, the theoretical and social implications, and the limitations. In the first part, I discuss the key results of the textbooks and teachers to provide an overview of the worldview and climate emotions that are present in climate education. Providing an overview and discussing the results of sub-research questions 1,2, and 3 (*What environmental worldview is present in the climate education in Dutch geography textbooks?, What environmental worldview and climate emotions do Dutch geography teachers in Haarlem hold and educate in the classroom?, and How do environmental worldviews presented in Dutch geography textbooks compare to those held by geography teachers in Haarlem?*). The second part of this chapter discusses the worldviews and climate emotions of the students, which is needed to answer sub-research question 4 *(What environmental worldview and climate emotions do 14-16 year old high school students in Haarlem hold about climate change and climate education?*). The third part discusses the interactions between climate education and the high school student, providing an overview of the results for sub-research question 5 (*How do environmental worldviews and climate emotions of high school students in Haarlem interact with those presented in geography textbooks and taught by teachers?*). In the fourth part of this chapter, I discuss the implications of this research on both a scientific and social level. Lastly, the limitations of this research are discussed.

## 6.1 Content, underlying worldviews and climate emotions in climate education

### *Worldviews*

The results from the textbook analysis showed that both the buiteNLand and De Geo textbooks explain climate and climate change related concepts based on knowledge from the natural sciences. However, there is space for a pluralistic explanation when the concepts are applied to the impacts of climate change and climate actions. This inclusion of a pluralistic view indicates that the textbooks explain the climate and climate change based on a post-modern worldview. Pender (2023) and Cook-Greuter (2013) have stated that Western countries aim to educate their students based on the values and beliefs of the post-modern worldview. Cook-Greuter (2013) expands this statement by explaining that Western education aims to educate students in scientific thinking without specifying which scientific discipline. The pluralistic views that were found in the buiteNLand and De Geo textbooks included multiple scientific disciplines, such as social and political science, and applied these multiple views when discussing climate change solutions. This indicates that the textbooks include the interconnected nature of climate change as multiple disciplines are needed to understand the impact, which is fitting for the post-modern worldview.

Other research suggests that current climate education does not focus on the underlying implications of cultural differences, keeping climate education within the post-modern worldview and excluding integral values and beliefs (de Witt et al., 2024). Textbook analysis indicates similar findings in the buiteNLand textbook, which focusses on the implications of climate change on the Western world. Thereby neglecting to acknowledge the difference between countries and cultures and therefore also neglecting the implications of different impacts on climate change and their views on climate change. The De Geo textbook touches

upon the different impacts of climate change on countries all over the world; however, the textbook does not include cultural differences or other integral values and beliefs. Therefore, explaining the different impacts for countries while excluding the different views countries can have about the climate and climate change. This indicates that both textbooks use pluralistic views, however, they do not apply them in a holistic manner, therefore showing a post-modern worldview.

The results from the teacher interviews showed that they all acknowledge the interconnectedness of humans, nature, and the climate, which is a belief of the post-modern worldview. In addition to this, the teachers mentioned that they do not believe that technological innovation alone will reduce climate change but that political intervention or societal action is needed, suggesting a pluralistic view. This indicates that the teachers have a post-modern worldview.

### *Climate emotions*

All three teachers had a different approach when it came to including or handling climate emotions in climate education. The teacher of school A actively avoided including climate emotions in the classroom as he believed that it could create an unsafe environment for the students, as they might experience negative emotions such as stress and fear. The teacher from school B found it hard to include climate emotions in climate education without "it feeling forced", mentioning that climate emotions are not explicitly part of the climate education but that he feels like they should be addressed in class. However, he mentioned that he is unsure of how to do this, and therefore, he did not include it in the classroom. Lastly, the teacher from school C actively asks probing questions to his students to include climate emotions in the classroom because he wants to include the perspectives of his students during climate education. These are all different ways of handling climate emotions in climate education. However, all three teachers similarly include climate emotions when looking at their intention behind climate education. The teachers mention either including technological innovations or emphasising the impact that the students can have on reducing climate change to provide a hopeful picture of the future for the students. This indicates that the teachers aim to replace negative climate emotions with positive emotions such as hope. Previous research from Ojala (2020) states that this way of approaching climate emotions comes forth out of a danger-oriented view in the inclusion of climate emotions in climate education. This means that the teachers want to replace the negative climate emotions of the students with positive climate emotions since the teachers believe that negative emotions are not constructive for learning and are a heavy burden to carry. Teachers with this worldview are worried about the wellbeing of the students and believe that negative climate emotions are harmful for the students (Ojala, 2020). The results showed that the three teachers who were interviewed actively try to provide their students with positive climate emotions, which could therefore suggest that the teachers from all three schools have a danger-oriented view on the climate emotions and therefore actively try to provide hopeful examples in the classroom. However, Ojala (2020) also mentioned that teachers with this danger-oriented view are likely to actively include climate emotions in their classrooms, which is not in line with all the three teachers that were interviewed. Therefore, the way that the three teachers handle climate change emotions in the classroom is not covered in Ojala (2020). It would, therefore, be interesting to conduct further research on the ways the teachers handle climate emotions and how this impacts the students, as both this research and the research from Ojala (2020) were conducted with a limited number of teachers, making it hard to generalise the data.

## 6.2 Worldviews and climate emotions of high school students

*Worldviews*

The results from the interviewed students show that the students express values and beliefs that belong to two different worldviews. The beliefs of the students about both the relation between humans, nature, and the climate and the way humans should use and manage the climate suggest that the students have a post-modern worldview. All interviewed students mentioned the interconnectedness between humans, nature, and the environment when talking about climate change. In addition to this, the students mention the need for social and individual actions to live sustainably when expressing how the climate should be used and managed. This view is shared by 118 students that filled in the questionnaire, where 54% of the students acknowledge the interconnected relation and 53% of students acknowledged the need for sustainable behaviour, both on a societal and individual level. This suggests that the majority of the students have a post-modern outlook on the climate and climate change; 47% of the students stated that this worldview represents them the most. However, the students believe in expert opinions and technological innovations over societal and behavioural change as the solution to reduce climate change. This would suggest that the students have a modern worldview when looking at the solutions to reduce climate change. This suggests that the students share values and beliefs from both the modern and post-modern worldview, with the modern worldview being present when talking about climate change solutions and the post-modern worldview being present when talking about climate change and climate change management.

On the other hand, it is unclear how and why the students seem to have different worldviews when mentioning climate change solutions, identifying climate change, and discussing climate change management. Previous research suggests that the worldviews of teenagers are still forming and can, therefore, be influenced by climate education (Stevenson et al., 2014). Simultaneously, Leichenco & O'Brien (2020) state how the current climate education does not help students to see opportunities for action and transformation due to the focus on data and scientific evidence in climate education without questioning accepted norms, policies, and practices. This could lead to students having difficulty in critically analysing and thinking about possible climate change solutions, making the students prone to business-as-usual solutions (Leichenco & O'Brien, 2020). In addition, Fischer & Glenk (2011) state that a lack of engagement could influence students to think of business-as-usual solutions against climate change, even when they are not in line with their worldview. However, when students are engaged, they are prone to more holistic and transformative thinking, thereby including their worldview (Cook-Greuter, 2013; Fischer & Glenk, 2011). This implies that students can express a different worldview when addressing climate change solutions compared to their worldview about the climate. These articles provide possible explanations about the presence of two worldviews in the high school students in Haarlem. However, further research is needed to discover the reason that high school students can have different worldviews when mentioning climate change solutions, identifying climate change, and discussing climate change management. Additionally, it should be noted that the post-modern worldview also includes trust in technology, however, people with the post-modern worldview include a pluralistic view when talking about climate change solutions, which was not visible in the results from the student interviews.

*Climate emotions*

The data indicated a difference between the climate emotions that the students experience after climate education, when thinking about the current climate, and when thinking of the future and climate change. After climate education, the worry that the students experience about the climate seems to decrease from 38% (future) and 32% (current) of the students who worry about the climate to 30% who experience worry after climate education. A similar but reversed difference was found in the number of students that mentioned experiencing no climate emotions with an increase from 16% (future) and 19% (current) of the students that experience no climate emotions to 27% that mention not experiencing any climate emotions after receiving climate education. It is unclear what influences this difference and if this difference will still be visible with a bigger sample size. It would be interesting for future research to look into the impact of the abstract concepts of 'after climate education' by conducting research directly after the students received climate education.

The results from both the interviewed students and the questionnaire show significantly fewer students that experience worry about the future than previous research would suggest. Hickman et al. (2021) showed that 84% of the youth is worried about the future due to climate change, while this research suggests that only 38% of the high school students in Haarlem are worried about the future due to climate change. It is unclear where this difference comes from, however, the research from Hickman et al. (2021) included multiple countries from all over the world, while this research is focused on one specific city in the Netherlands. This difference between countries could explain the difference in climate emotions since different climate-related experiences can influence the climate emotions youth experiences (Stevenson et al., 2014). The Netherlands can be seen as a country that experiences a relatively limited impact from climate change compared to other countries (Parsons et al., 2024). This could be an explanation for the difference in the number of youth that experience worry about the future between the Dutch youth living in Haarlem and the global youth.

The climate emotions that the students mentioned experiencing consisted of two basic climate emotions and the absence of climate emotions. The climate emotions of worry and disappointment were two of the four most prevalent climate emotions amongst the high school students in Haarlem. Hiser & Lynch (2021) grouped both these emotions under the general basic climate emotion of fear. Disappointment, another one of the four most prevalent climate emotions, could be grouped under the basic climate emotions of sadness. This would suggest that the high school students predominantly experience negative climate emotions. However, the final of the four predominant climate emotions amongst the students was the absence of climate emotions. More than half of the interviewed students mentioned not experiencing any climate emotions, while the questionnaire showed that, on average, 20% of the students experienced no climate emotions. It is unclear if the lack of climate emotions comes forth out of indifference or from a lack of clarity about the emotions that the students experience. Bailen et al. (2018) state that youth between the ages of 14-17 years old have low emotional clarity. This could explain how the interviewed students had difficulty mentioning their climate emotions and needed probing questions to express the climate emotions they experience. The questionnaire provided examples of climate emotions, which could have made it easier for the students to identify their climate emotions.

A consistent 20% of the students mentioned feeling powerless about the climate and climate change. Leichenko & O'Brien (2020) suggest that acknowledging climate emotions in the classroom can provide feelings of acceptance and empowerment amongst the students. This is

supported by Drumm & Vandermause (2023), who mention the positive impact that sharing climate emotions can have on the perceived isolation that students experience due to their negative climate emotions. It is, however, important to mention that students might experience barriers when it comes to sharing their climate emotions. These barriers arise from a fear of not being taken seriously, a fear that their emotions might be seen as invalid, and a lack of safe space for the students to share their emotions (Drumm & Vandermause, 2023).

## 6.3 Interactions between students and climate education

The results suggest that the post-modern worldview is both present in the textbook and held by the teachers. This would, in turn, suggest that the post-modern worldview is taught in climate education. When looking at the worldviews of the students, there seems to be an overlap between the post-modern worldview in the textbook and that the teachers hold with the post-modern worldview of the students when identifying climate change and discussing climate change management. However, in addition to this, the modern worldview that the high school students seem to hold is also present in the classroom since some of the teachers highlight technological innovations to provide positive emotions amongst the students.

Two of the three schools use the same textbook as a basis of their climate education, namely the buiteNLand textbook. This textbook has a focus on the Western world and touches upon the actions that need to be taken to reduce climate change without including concrete actions that could be taken by governments, society, or the students. Both teachers at school A and C mentioned that they aim to teach their students that their actions have an impact on climate change and can, therefore, help reduce climate change. It is, however, unclear how they actively include this in their classrooms. The students from schools A and C mainly mentioned the general impacts of climate change without including differences between countries or cultures. This is different from the students at school B, who mentioned the impact that countries have on climate change and how this differs. The textbook used at school B, the De geo textbook, includes the difference in how climate change impacts countries all over the world. This textbook includes both the Western and non-Western world when explaining climate change. This shows a difference in how the students that are taught by the buiteNLand textbook approach climate change without acknowledging that climate change has different implications around the world, while the students that are taught by the De geo textbook are able to acknowledge this difference at a certain level.

Additionally, the results show a difference in what the students include when talking about climate change between the students that are taught with the buiteNLand textbook and the De geo textbook. The students who use the buiteNLand textbook (schools A and C) talked about the climate without including other topics that could be related to climate change, while the students who use the De geo textbook included other topics, such as water scarcity in Gaza, when talking about climate change. Similarly, the buiteNLand textbook has a chapter dedicated to the climate and climate change, while the De geo textbook includes climate education as part of other topics. This difference in how climate education is a stand-alone topic or part of other topics was visible in the results from the student interviews.

Lastly, when comparing the engagement of the students between schools, there was a noticeable difference between school C and the other schools. The students at school C were more equipped to both explain their view on the climate and climate change and to express the climate emotions they experienced. The teacher of high school C presents climate change as a wicked problem and asks his students probing questions to reflect on their perspectives and

emotions. Leichenco & O'Brien (2020) state that this inclusion of student views and questioning the students about their views and emotions can improve their engagement with the climate and provide clarity about the climate emotions the students experience. In addition, De Witt (2024) shows that interacting with the students, similarly as teacher C does, can increase the level of self-awareness under the students.

## 6.4 Theoretical and social implications

This research shows that only 36% of the students in Haarlem see the school as their main source of climate education and that 56% of the students mentioned that their main source of climate education comes from social media and the news. This indicates that figure 1 in the conceptual framework (chapter 2.3) does not include all sources of climate education that the high school students in Haarlem receive. Figure 8 is a revised version of figure 1 from the conceptual framework and shows the role of multiple sources where the students learn about the climate. Previous research has shown that climate information that can be found in the news or on social media sometimes consists of so-called 'fake' news (Kresin et al., 2024). Kresin et al. (2024) state that high school students are often unable to detect 'fake' news and therefore receive inadequate climate education. This research provided no information about the worldviews that the students consume when learning about the climate through social media and the news since these climate education sources have not been included within the scope. It would, therefore, be interesting to conduct further research that includes climate education sources that the students mention using to learn about climate change.

The results of this research can be used as an exploratory basis for future research about climate education in the Netherlands. Teachers and high schools can use this research to gain an understanding of how their current climate education interacts with their students. This research shows that climate education is not only provided in high schools but by other sources as well, therefore, teachers need to be aware that the climate knowledge of the students could be influenced by 'fake' news and social media. However, further research about the impact of climate education sources from outside of the school is needed.

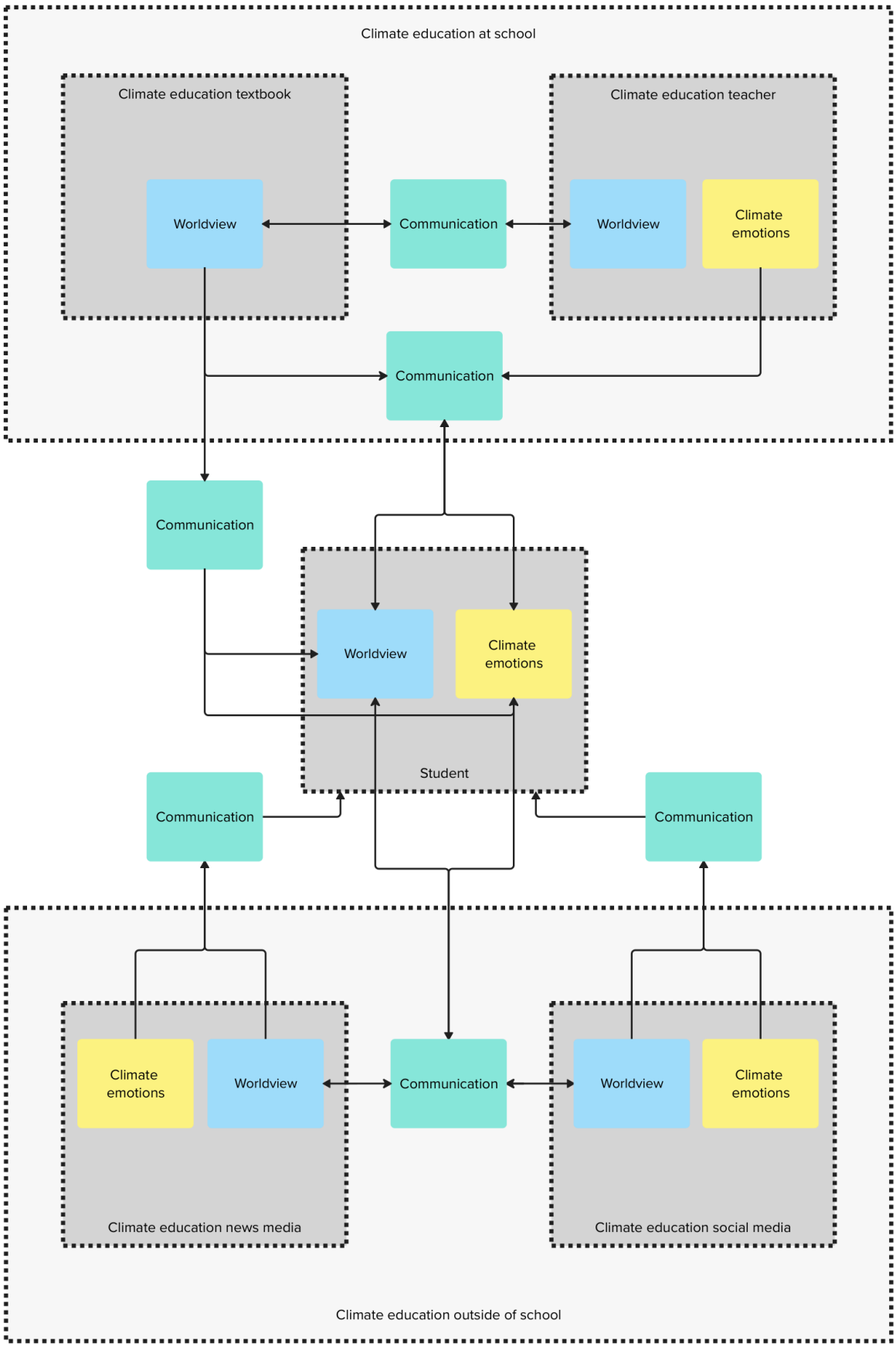


*Figure 8: A revised visualisation of the conceptual framework showing the interactions between the theoretical concepts and including other climate education sources.*

## 6.5 Limitations

This research encountered limitations in both theoretical and methodological aspects. This chapter discussed the implications of these limitations and suggestions for future research.

The inclusion of developmental psychology can be seen as a theoretical limitation since this theory has been criticized by questioning how applicable this theory is for the general population. Pelaez et al. (2008) critiques how developmental psychology portrays the development of children as linear instead of as the fluid way in which children develop. This critique was of minimal relevance for this research since this study does not look into how the students develop or change their worldview but focuses more on understanding the worldview that the students have at a specific moment in time. This critique is, however, visible in the presence of two worldviews amongst the high school students in Haarlem when mentioning climate change solutions, identifying climate change, and discussing climate change management.

Other researchers critique developmental psychology on its focus on Western individuals and excluding non-Western individuals (Fontanella-Nothom, 2024). As this research has been conducted in a privileged city in the Netherlands, there were no non-western participants. However, future research is suggested to adjust for non-western participants to improve the possibility to generalise the understanding of the impact climate education has on high school students.

During the interviews, most of the students had a hard time engaging in the questions and expressing their emotions. The rooms where the interviews were conducted differed per school. At school A, the interviews were in a small office, while the interviews at schools B and C were in big classrooms. With all interviews, I made sure not to sit across from the student during the interview but at a diagonal to make the setting as informal as possible. Walking interviews could be used to provide more engagement as the students will be closer to the topic, namely the climate and environment (Day & Cornell, 2023). The act of walking can help participants feel comfortable and enable them to talk about their emotions (Day & Cornell, 2023; King & Woodroffe, 2017). This will not provide emotional clarity for the students, as mentioned in chapter 6.2. However, it will provide an equal environment, which will enable future research to investigate the origin of the absence of climate emotions amongst high school students.

In addition to this methodological limitation, it should be noted that 64% of the students mentioned that they learn more about climate change outside of school through, for example, new programs or social media. These forums have, however, not been included in this research. Therefore, it is not known what worldviews the students consume when learning about the climate through these sources. It would, therefore, be interesting to conduct further research that includes climate education sources that the students mention using to learn about climate change.

Another methodological limitation can be found when looking at the results from the questionnaire. The questionnaire did not provide a distinction between the three different schools, making it harder for the questionnaire to function as triangulation for the student interviews. The questionnaire could still be used to provide a generalised understanding of the worldviews and climate emotions of the high school students in Haarlem, however, the data could not be linked to the different textbooks. Limiting the data about the impact of different textbooks and teachers on the students.

Another limitation can be found within the sample size due to the time constrains on this research. 3 of the 8 high schools in Haarlem that provide VWO education participated in this research. However, only 1 teacher per school was interviewed, which makes it difficult to conclude whether the interactions between the climate education and the students were influenced by their school or teacher and even their textbook. In addition, all interviewed teachers were male, providing only data about the male teacher perspective. This research can, therefore, not be used for a generalised conclusion about the interactions between climate education and high school teachers. However, it can provide a basis for future research to build upon the exploration of this research on three VWO high schools in Haarlem.

Lastly, this research has been conducted by one individual making it possible for a personal bias to influence the research analysis. I did not have any prejudice about the results that this research could show. However, as an individual, I hold a post-modern worldview, believing for example that a pluralistic view is needed in order to understand and reduce climate change. This could have influenced my interpretation of the data that has been used in this research.

# 7 Conclusion

This research aimed to investigate whether the environmental worldview in current climate education resonates with the worldview of high school students, the climate emotions they experience, and the effect it has on them. The research suggests that even though the two geography textbooks approach climate change differently, both textbooks explain climate change based on a post-modern worldview and include a pluralistic view. They explain the relevant concepts based on natural science while recognising and including other dimensions, such as the social and political, when explaining both the implications of climate change and climate change actions. This post-modern worldview is also shared by the teachers who acknowledge that humans, nature, and the climate are interconnected and in need of both social and political change. In addition to this, the teachers aim to include the post-modern worldview when educating their students about the climate and climate change. They do this by explaining climate concepts based on natural science and including pluralistic views, current affairs, and by highlighting the importance of societal action. This suggests that both the two textbooks and the teachers provide the students with climate education based on a post-modern worldview. This worldview is, in turn, also represented in the students, who similarly highlight the relation between humans, nature, and the climate. However, the students show different worldviews when it comes to the climate and climate change solutions.

Based on the sample of three VWO high schools in Haarlem, this research suggests that the inclusion of climate emotions in the classroom is limited. The teachers expressed experiencing predominantly negative climate emotions and a danger-oriented view about including climate emotions in the classroom. The students, however, expressed that they feel like they could talk about climate emotions if they want to. The climate emotions that the students experience are predominantly negative, especially when thinking of the future. Contrary to previous research, the high school students in Haarlem experience less worry than youth between the ages of 16–25 years around the world. Many students expressed that they did not experience any emotions about the climate. The reason why these students mentioned not experiencing any climate emotions did not become clear in this research. Additionally, this research found no clear interaction between climate education and the climate emotions that the high school students in Haarlem experience because two of three teachers that participated in this study mention not including climate emotions in their climate education.

To conclude, the 14-16 year old VWO high school students in Haarlem hold a predominantly post-modern worldview, which is similar to the worldview that is present in their climate education. The climate emotions of the high school students in Haarlem are mainly negative emotions, such as worry when thinking about the future, and no climate emotions after climate education. It is difficult to conclude the interaction between climate education and the students as only 36% of the students mention that their main source of climate education is at school. However, the data indicates that the VWO high school students in Haarlem experience less worry after climate education.

I recommend future research to include the other sources that students use to educate themselves about the climate and climate change, such as news programs and social media.

# References


Angarita, V. Y. M., Maiorano, L., Dragonetti, C., & Di Marco, M. (2023). Implications of exceeding the Paris Agreement for mammalian biodiversity. *Conservation Science And Practice*, *5*(3). https://doi.org/10.1111/csp2.12889

Azungah, T. (2018). Qualitative research: deductive and inductive approaches to data analysis. *Qualitative Research Journal*, *18*(4), 383–400. https://doi.org/10.1108/qrj-d-18-00035

Bloothoofd, T., Houtenbos, A., Lenders, W., & Wils, T. (2022). *buiteNLand 4 VWO* (4.1 ed., pp.86-129). ThiemeMeulenhoff.

Bailen, N. H., Green, L. M., & Thompson, R. J. (2018). Understanding Emotion in Adolescents: A Review of Emotional Frequency, Intensity, Instability, and Clarity. *Emotion Review*, *11*(1), 63–73. https://doi.org/10.1177/1754073918768878

Buijs, A. E. (2009). Lay People's Images of Nature: Comprehensive Frameworks of Values, Beliefs, and Value Orientations. *Society & Natural Resources*, *22*(5), 417–432. https://doi.org/10.1080/08941920801901335

Brown, B., 2005. Integral Communications for Sustainability. *Kosmos, 4*(2)

Chazan, M., & Baldwin, M. (2020). Granny Solidarity: Understanding Age and Generational Dynamics in Climate Justice Movements. *Studies in Social Justice*, *13*(2), 244–261. https://doi.org/10.26522/ssj.v13i2.2235

Cook-Greuter, S. R. (2013). *EGO DEVELOPMENT: NINE LEVELS OF INCREASING EMBRACE*. https://integralartlab.com/wp-content/uploads/2020/12/9-levels-of-increasing-embrace-update-1-07.pdf

Day, S., & Cornell, J. (2023). Walking interviewing method. In *Springer eBooks* (pp. 1–17). https://doi.org/10.1007/978-3-030-96778-9_60-1

De Boer, M. C., De Jong, C., Jutte, F., Padmos, J. H. A., & Peters, A. M. (2022). *De Geo 3 vwo: Leerboek* (1st ed., pp. 132-149). ThiemeMeulenhoff.

Deisenrieder, V., Oberauer, K., Kubisch, S., Parth, S., Stötter, H., & Keller, L. (2024). Emotions affect learning about climate change – a case study of FFF. *International Research in Geographical And Environmental Education*, 1–20. https://doi.org/10.1080/10382046.2024.2342727

De Witt, A., Bootsma, M., Dermody, B. J., & Rebel, K. (2024). Designing transformative interventions for a world in crisis: How the 'Worldview Journey' invites for personal, cultural, and systems transformation. *Environmental Science & Policy*, *162*, 103896. https://doi.org/10.1016/j.envsci.2024.103896

De Witt, A., De Boer, J., Hedlund, N., & Osseweijer, P. (2016). A new tool to map the major worldviews in the Netherlands and USA, and explore how they relate to climate change. *Environmental Science & Policy, 63*, 101–112. https://doi.org/10.1016/j.envsci.2016.05.012

Drumm, K., & Vandermause, R. (2023). Adolescents Concerned about Climate Change: A Hermeneutic Study. *International Journal Of Environmental Research And Public Health*, *20*(22), 7063. https://doi.org/10.3390/ijerph20227063

*Environmental migration*. (2024). Migration Data Portal. accessed on 24 september 2024, van https://www.migrationdataportal.org/themes/environmental_migration_and_statistics#data-sources

Farber, D. (2020). Climate Perspectives Across the Generations. *Natural Resources Journal*, *60*(2), 297. https://digitalrepository.unm.edu/cgi/viewcontent.cgi?article=4100&context=nrj

Fischer, A., & Glenk, K. (2011). One model fits all? — On the moderating role of emotional engagement and confusion in the elicitation of preferences for climate change adaptation policies. *Ecological Economics*, *70*(6), 1178–1188. https://doi.org/10.1016/j.ecolecon.2011.01.014

Fontanella-Nothom, O. (2024). Bewildering developmentalism: poetic juxtapositions and propositions to ask different questions about and with children. *Pedagogy Culture And Society*, *32*(4), 1033–1049. https://doi.org/10.1080/14681366.2024.2355113

Hamilton, J. (2020). *Emotional methodologies for climate change engagement: towards an understanding of emotion in civil society organisation (CSO)-public engagements in the UK* (Unpublished Dissertation, Doctor of Philosophy). Reading: University of Reading.

Hedlund-de Witt, A. H. (2012). Exploring worldviews and their relationships to sustainable lifestyles: Towards a new conceptual and methodological approach. *Ecological Economics*, *84*, 74–83. https://doi.org/10.1016/j.ecolecon.2012.09.009

Hedlund-de Witt, A. H. (2013). Worldviews and Their Significance for the Global Sustainable Development Debate. *Environmental Ethics*, *35*(2), 133–162. https://doi.org/10.5840/enviroethics201335215

Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & Van Susteren, L. (2021). Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey. *The Lancet Planetary Health*, *5*(12), e863–e873. https://doi.org/10.1016/s2542-5196(21)00278-3

Hiser, K., & Lynch, M. (2021). Worry and Hope: What College Students Know, Think, Feel, and Do about Climate Change. *Journal Of Community Engagement And Scholarship*, *13*(3). https://doi.org/10.54656/iowf3526

Hochachka, G. (2019). On matryoshkas and meaning-making: Understanding the plasticity of climate change. *Global Environmental Change*, *57*, 101917. https://doi.org/10.1016/j.gloenvcha.2019.05.001

Hochachka, G. (2024). When concern is not enough: Overcoming the climate awareness-action gap. *AMBIO*. https://doi.org/10.1007/s13280-024-01999-5

Jones, C. A., & Davison, A. (2020). Disempowering emotions: The role of educational experiences in social responses to climate change. *Geoforum*, *118*, 190–200. https://doi.org/10.1016/j.geoforum.2020.11.006

Jones, V., & Whitehouse, S. (2021). “It makes me angry. REALLY angry”: exploring emotional responses to climate change education. *Journal Of Social Science Education*, *20*(4), 93–120. https://doi.org/10.11576/jsse-4551

Kallio, H., Pietilä, A., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal Of Advanced Nursing*, *72*(12), 2954–2965. https://doi.org/10.1111/jan.13031

King, A. C., & Woodroffe, J. (2017). Walking interviews. In *Springer eBooks* (pp. 1–22). https://doi.org/10.1007/978-981-10-2779-6_28-1

Kleres, J., & Wettergren, Å. (2017). Fear, hope, anger, and guilt in climate activism. *Social Movement Studies*, *16*(5), 507–519. https://doi.org/10.1080/14742837.2017.1344546

Kresin, S., Kremer, K., & Büssing, A. G. (2024). Students' credibility criteria for evaluating scientific information: The case of climate change on social media. *Science Education*, *108*(3), 762–791. https://doi.org/10.1002/sce.21855

Leichenko, R., & O'Brien, K. (2020). Teaching climate change in the Anthropocene: An integrative approach. *Anthropocene*, *30*, 100241. https://doi.org/10.1016/j.ancene.2020.100241

Lynam, A. (2019). How worldview development influences knowledge and beliefs about sustainability. In *Springer eBooks*. https://doi.org/10.1007/978-3-319-63951-2_22-1

Marczak, M., Winkowska, M., Chaton-Østlie, K., Rios, R. M., & Klöckner, C. A. (2023). "When I say I'm depressed, it's like anger." An exploration of the emotional landscape of climate change concern in Norway and its psychological, social and political implications. *Emotion, Space And Society*, *46*, 100939. https://doi.org/10.1016/j.emospa.2023.100939

Mehta, L., & Srivastava, S. (2020). Uncertainty in Modelling Climate Change. *The politics of uncertainty: Challenges of transformation*, 99-112.

Oberman, R. (2023). Creativity, curiosity and catharsis: positive emotions in climate change education through picturebooks. *Environmental Education Research*, *30*(11), 2031–2056. https://doi.org/10.1080/13504622.2023.2286940

Ojala, M. (2020). Safe spaces or a pedagogy of discomfort? Senior high-school teachers' meta-emotion philosophies and climate change education. *The Journal Of Environmental Education*, *52*(1), 40–52. https://doi.org/10.1080/00958964.2020.1845589

Ojala, M., Cunsolo, A., Ogunbode, C. A., & Middleton, J. (2021). Anxiety, Worry, and Grief in a Time of Environmental and Climate Crisis: A Narrative Review. *Annual Review Of Environment And Resources*, *46*(1), 35–58. https://doi.org/10.1146/annurev-environ-012220-022716

Pelaez, M., Gewirtz, J. L., & Wong, S. E. (2008). A critique of stage theories of human development. *Comprehensive handbook of social work and social welfare*, *2*, 503-518.

Pender, A. (2023). From partial to integrated perspectives: How understanding worldviews can expand our capacity for transformative climate governance. *Earth System Governance*, *16*, 100174. https://doi.org/10.1016/j.esg.2023.100174

Pihkala, P. (2022). Toward a Taxonomy of Climate Emotions. *Frontiers in Climate*, *3*. https://doi.org/10.3389/fclim.2021.738154

Plutchik, R. (2001). The Nature of Emotions: Human emotions have deep evolutionary roots, a fact that may explain their complexity and provide tools for clinical practice. *American Scientist*, *89*(4), 344–350. https://www.jstor.org/stable/27857503

Ramkissoon, H., & Smith, L. D. G. (2014). The relationship between environmental worldviews, emotions and personal efficacy in climate change. *International Journal Of Arts And Sciences*, *7*(1), 91–109. https://www.universitypublications.net/ijas/0701/pdf/DE3C517.pdf

Remmerswaal, J. L. M. (2015). *Persoonsdynamica: Professioneel Omgaan Met Emoties*. Bohn Stafleu van Loghum.

Reyes, R. S., Nguyen, V. M., Schott, S., Berseth, V., Hutchen, J., Taylor, J., & Klenk, N. (2021). A Research Agenda for Affective Dimensions in Climate Change Risk Perception and Risk Communication. *Frontiers in Climate*, *3*. https://doi.org/10.3389/fclim.2021.751310

Roberts, R. (2020). Qualitative Interview Questions: Guidance for Novice Researchers. *The Qualitative Report*. https://doi.org/10.46743/2160-3715/2020.4640

Skeirytė, A., Krikštolaitis, R., & Liobikienė, G. (2022). The differences of climate change perception, responsibility and climate-friendly behavior among generations and the main determinants of youth's climate-friendly actions in the EU. *Journal Of Environmental Management*, *323*, 116277. https://doi.org/10.1016/j.jenvman.2022.116277

SLO. (2015). *Leerdoelenkaart aardrijkskunde havo/vwo* (p. n/a). https://www.slo.nl/publish/pages/5038/leerdoelenkaart-aardrijkskunde-sept-2015.pdf

Schneider, C. R., Zaval, L., & Markowitz, E. M. (2021). Positive emotions and climate change. *Current Opinion in Behavioral Sciences*, *42*, 114–120. https://doi.org/10.1016/j.cobeha.2021.04.009

Stevenson, K. T., Peterson, M. N., Bondell, H. D., Moore, S. E., & Carrier, S. J. (2014). Overcoming skepticism with education: interacting influences of worldview and climate change knowledge on perceived climate change risk among adolescents. *Climatic Change*, *126*(3–4), 293–304. https://doi.org/10.1007/s10584-014-1228-7

Szalma, I., & Szczuka, B. J. (2024). Reproductive Choices and Climate Change in a Pronatalist Context. *East European Politics And Societies And Cultures*. https://doi.org/10.1177/08883254241229728

Tracy, J. L., & Randles, D. (2011). Four Models of Basic Emotions: A Review of Ekman and Cordaro, Izard, Levenson, and Panksepp and Watt. *Emotion Review*, *3*(4), 397–405. https://doi.org/10.1177/1754073911410747

Turner, S. F., Cardinal, L. B., & Burton, R. M. (2015). Research Design for Mixed Methods. *Organizational Research Methods*, *20*(2), 243–267. https://doi.org/10.1177/1094428115610808

United Nations. (2015). *Paris agreement*. https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf

Wolf, J., & Moser, S. C. (2011). Individual understandings, perceptions, and engagement with climate change: insights from in-depth studies across the world. *Wiley Interdisciplinary Reviews Climate Change*, *2*(4), 547–569. https://doi.org/10.1002/wcc.120

# Appendix

## Appendix I: explanation of the five aspects of the IWF

| The five aspects of worldviews, including exemplary questions and concerns for each of them |
| --- |
| 1. Ontology: a perspective on the nature of reality, often enriched with a cosmogony.<br>What is the nature of reality? What is nature? How did the universe come about? If there is such thing as the divine—what or who is it, and how is it related to the universe? |
| 2. Epistemology: a perspective on how knowledge of reality can become about.<br>How can we know what is real? How can we gain knowledge of ourselves and the world? What is valid knowledge, and what is not? |
| 3. Axiology: a perspective on what a 'good life' is, in terms of morals and quality of life, ethical and aesthetic values.<br>What is a good life? What kind of life has quality and gives fulfillment? What are our most cherished ethical and aesthetic values? What is life all about? |
| 4. Anthropology: a perspective on who the human being is and what his role and position is in the universe.<br>Who or what is the human being? What is the nature of the human being? What is his role and purpose in existence? |
| 5. Societal vision: a perspective on how society should be organized and how societal problems and issues should be addressed.<br>How should we organize our society? How should we address societal problems and issues? |

*Explanation of the five aspects of the IWF (Hedlund-de Witt, 2012)*

# Annex

## Annex A: Interview topic and question Teachers

*Opstarten en uitleg interview*

**Introducerende vragen**

1. Wanneer ben je voor het laatst buiten geweest?
2. Wanneer ben je voor het laatst in de natuur geweest?
3. Als ik het over het klimaat heb. waar denkt u dan aan?
4. Wat voor gevoelens komen er naar boven als u over het klimaat en klimaatverandering nadenkt?
    a. Angst/ Boosheid/ Verdriet/ Schaamte/ Hoopvol

**Kern vragen**

5. Hoe ziet u de relatie tussen mens, natuur en klimaat?
    a. Wat houdt deze relatie in?
    b. Staat er iets boven het ander?
    c. Beinvloeden ze elkaar?
6. Hoe gaan we nu volgens jouw met het klimaat om?
7. Hoe denkt u dat het klimaat er in de toekomst uitziet?
    a. Welke rol hebben mensen hierin gespeeld?
    b. Hoe voelt u zich als u zo over de toekomst en het klimaat nadenkt?
8. Zouden we volgens u klimaatverandering moeten aanpakken en waarom?
    a. Wat moet er gedaan worden om klimaatverandering tegen te gaan?
    b. Wie is er verantwoordelijk voor het aanpakken van klimaatverandering?
        i. Zijn ze hier nu succesvol in?
        ii. Hoe voelt u zich bij deze situatie?
        iii. Speelt u ook een rol in het aanpakken van klimaatverandering?
        iv. Hoe voelt u zich als u over deze rol nadenkt?
9. Wat is volgens u de huidige aanpak tegen klimaatverandering?
    a. Is deze volgens u succesvol?
    b. Hoe voelt u zich over de huidige aanpak?
    c. Heeft u het gevoel dat u zelf invloed heeft op deze aanpak?
    d. Hoe voelt u zich hierbij?
10. Heeft u het tijdens de les over hoe klimaatverandering aangepakt moet worden?
11. Wat is de opbouw van uw lessen? / Hoe zien uw lessen eruit?
    a. Hoe leidend is het boek in uw lessen?
    b. Wat vind u belangrijk om uw leerlingen te leren over het klimaat?
        i. Hoe verwerkt u deze kennis (en houding) in de lessen?
        ii. Op welke manier leert u ze dit?
        iii. Kunt u één of twee voorbeelden geven?
    c. Geeft u tijdens uw lessen ruimte om het te hebben over hoe leerlingen zich voelen over het klimaat?
        i. Wat voor emoties komen er dan naar boven?
        ii. Hoe ervaart u deze gesprekken?

**Concluderend**

12. In mijn onderzoek maak ik gebruik van 4 verschillende wereldbeelden en ik wil graag weten in welk wereldbeeld u zichzelf het beste kunt vinden, en waarom. (Geef de leraar hun eigen overzicht, Annex C)
    a. Wereldbeeld 1 (Traditioneel)
        i. Er is maar 1 waarheid en goed of slecht; deze waarheid wordt uitgelegd door een docent, de overheid of een religieus leider. Ik vertrouw erop dat overheid de leiding op zich zal nemen om klimaatverandering op te lossen. Wij als mensen staan los van de natuur en zijn verplicht om voor de natuur en het klimaat te zorgen.
    b. Wereldbeeld 2 (Modern)
        i. Als mens gebruiken en beïnvloedden we het klimaat en de natuur. De oplossing voor klimaatverandering kunnen we vinden in de wetenschap met bijvoorbeeld nieuwe technologische oplossingen.
    c. Wereldbeeld 3 (Postmodern)
        i. Wij als mens zijn afhankelijk van natuur, maar de natuur is ook afhankelijk van ons; de wereld is namelijk één systeem waarin alles elkaar beïnvloedt. Klimaatverandering moet worden opgelost door sociale initiatieven en met een combinatie van lokale, praktische en wetenschappelijke kennis.
    d. Wereldbeeld 4 (Integraal)
        i. De wereld is een complex systeem dat ook nadat de mens is uitgestorven nog zal blijven bestaan. Mens en natuur zijn met elkaar verbonden in het universum en op spiritueel vlak. We moeten in harmonie met de natuur leven.
13. Welk van deze 4 wereldbeeld denkt u dat u overdraagt in de lessen?
14. Is er nog iets wat u wilt vertellen of vragen?

## Annex B: Interview topic and questions students

*Opstarten en uitleg interview*

**Introducerende vragen**

1. Wanneer ben je voor het laatst buiten geweest?
2. Wanneer ben je voor het laatst in de natuur geweest?
3. Als ik het over het klimaat heb, waar denk je dan aan?
4. Wat voor gevoelens komen er naar boven als je over het klimaat en klimaatverandering nadenkt?
    a. Angst/ Boosheid/ Verdriet/ Schaamte/ Hoopvol

**Kern vragen**

5. Hoe zie je de relatie tussen mens, natuur en klimaat?
    a. Wat houdt deze relatie in?
    b. Staat er iets boven het ander?
    c. Beinvloeden ze elkaar?
6. Hoe gaan we volgens jouw nu met het klimaat om?
    a. Hoe zouden wij, al maatschappij, volgens jouw om moeten gaan met het klimaat?
    b. Wat is volgens jouw je eigen rol hierin?
7. Hoe denk je dat het klimaat er in de toekomst uit gaat ziet?
    a. Welke rol heeft de mens gespeeld om deze toekomst te creëren?
    b. Hoe voelt het om nu zo over de toekomst en het klimaat na te denken?

8. Zouden we volgens jouw klimaatverandering moeten aanpakken en waarom?
    a. Wat moet er gedaan worden om klimaatverandering tegen te gaan?
    b. Wie is er verantwoordelijk voor het aanpakken van klimaatverandering?
        i. Zijn ze hier nu succesvol in?
        ii. Hoe voelt je je bij deze situatie?
        iii. Speelt u ook een rol in het aanpakken van klimaatverandering?
        iv. Hoe voelt je je als je over deze rol nadenkt?
9. Wat is volgens jouw de huidige aanpak tegen klimaatverandering?
    a. Denk je dat deze aanpak succesvol is?
    b. Hoe voel je je bij deze aanpak?
    c. Heb je het gevoel dat je zelf invloed hebt op deze aanpak?
    d. Wat voor gevoelens roept dit op?
10. Wordt er in de les behandeld hoe klimaatverandering aangepakt moet worden?
11. Hoe zien je aardrijkskunde lessen over het klimaat eruit?
    a. Hoe leidend is het boek in de lessen?
    b. Wat denk je dat jouw docent je wilt leren tijdens de lessen over het klimaat?
    c. Is er tijdens de les ruimte om het te hebben over hoe je je voelen over het klimaat?
        i. Wat voor emoties komen er dan naar boven?
        ii. Hoe ervaar je deze gesprekken?
12. Waar leer je het meeste over het klimaat?
13. Waar of met wie kan je het beste praten over hoe je je voelt over het klimaat?

**Concluderend**

15. In mijn onderzoek maak ik gebruik van 4 verschillende wereldbeelden en ik wil graag weten in welk wereldbeeld je jezelf het beste kunt vinden, en kun je uitleggen waarom. (Geef de leerling hun eigen overzicht, Annex C)
    a. Wereldbeeld 1
        i. Er is maar 1 waarheid en goed of slecht; deze waarheid wordt uitgelegd door een docent, de overheid of een religieus leider. Ik vertrouw erop dat overheid de leiding op zich zal nemen om klimaatverandering op te lossen. Wij als mensen staan los van de natuur en zijn verplicht om voor de natuur en het klimaat te zorgen.
    b. Wereldbeeld 2
        i. Als mens gebruiken en beïnvloedden we het klimaat en de natuur. De oplossing voor klimaatverandering kunnen we vinden in de wetenschap met bijvoorbeeld nieuwe technologische oplossingen.
    c. Wereldbeeld 3
        i. Wij als mens zijn afhankelijk van natuur, maar de natuur is ook afhankelijk van ons; de wereld is namelijk één systeem waarin alles elkaar beïnvloedt. Klimaatverandering moet worden opgelost door sociale initiatieven en met een combinatie van lokale, praktische en wetenschappelijke kennis.
    d. Wereldbeeld 4
        i. De wereld is een complex systeem dat ook nadat de mens is uitgestorven nog zal blijven bestaan. Mens en natuur zijn met elkaar verbonden in het universum en op spiritueel vlak. We moeten in harmonie met de natuur leven.
14. Welk van deze 4 wereldbeeld denk je dat je docent overdraagt in de lessen?
15. Is er nog iets wat je wil vertellen of vragen?

## Annex C: Overview sheet interviewee

**Wereldbeeld 1**

Er is maar 1 waarheid en goed of slecht; deze waarheid wordt uitgelegd door een docent, de overheid of een religieus leider. Ik vertrouw erop dat overheid de leiding op zich zal nemen om klimaatverandering op te lossen. Wij als mensen staan los van de natuur en zijn verplicht om voor de natuur en het klimaat te zorgen.

**Wereldbeeld 2**

Als mens gebruiken en beïnvloedden we het klimaat en de natuur. De oplossing voor klimaatverandering kunnen we vinden in de wetenschap met bijvoorbeeld nieuwe technologische oplossingen.

**Wereldbeeld 3**

Wij als mens zijn afhankelijk van natuur, maar de natuur is ook afhankelijk van ons; de wereld is namelijk één systeem waarin alles elkaar beïnvloedt. Klimaatverandering moet worden opgelost door sociale initiatieven en met een combinatie van lokale, praktische en wetenschappelijke kennis.

**Wereldbeeld 4**

De wereld is een complex systeem dat ook nadat de mens is uitgestorven nog zal blijven bestaan. Mens en natuur zijn met elkaar verbonden in het universum en op spiritueel vlak. We moeten in harmonie met de natuur leven.

# Annex D: Questionnaire

## *Klimaatonderwijs* en -emoties

Deze vragenlijst is voor een master onderzoek over wereldbeelden in klimaatonderwijs en hoe deze samenhangen met de klimaatemoties die leerlingen voelen. De vragenlijst bestaat uit 19 vragen en zal ongeveer 5 tot 10 minuten duren. Er zijn geen goede of foute antwoorden, vul in welk antwoord volgens jou het beste past. De antwoorden zijn anoniem en worden niet met je docent gedeeld worden. voor vragen over het onderzoek neem contact op met de onderzoeker Maartje Tolen via maartje.tolen@wur.nl
* Vereist

## *Introductie*

Let op! Bij sommige vragen mag je meerdere opties aankruisen

1. In welke klas zit je? *
   - ○ 3 VWO
   - ○ 4 VWO

2. welke vakken volg je? *
   - ☐ Aardrijkskunde
   - ☐ Algemene natuurwetenschappen
   - ☐ Biologie
   - ☐ Beeldende vorming
   - ☐ Culturele en kunstzinnige vorming
   - ☐ Drama
   - ☐ Duits
   - ☐ Economie
   - ☐ Engels
   - ☐ Filosofie
   - ☐ Frans
   - ☐ Geschiedenis
   - ☐ Godsdienst
   - ☐ Grieks
   - ☐ Handvaardigheid
   - ☐ Informatica
   - ☐ Italiaans
   - ☐ Latijn
   - ☐ Levensbeschouwing
   - ☐ Maatschappijleer
   - ☐ Mens en Natuur
   - ☐ Muziek
   - ☐ Natuurkunde
   - ☐ Nederlands
   - ☐ Natuur, Leven en Technologie
   - ☐ Quest
   - ☐ Scheikunde
   - ☐ Spaans
   - ☐ Techniek
   - ☐ Tekenen
   - ☐ Textiel
   - ☐ Verzorging
   - ☐ Wiskunde
   - ☐ Andere

## *Klimaatonderwijs*

Let op! Bij sommige vragen mag je meerdere opties aankruisen

3. Bij welk(e) vak(ken) krijg je uitleg over het klimaat en klimaatverandering? *
   - ☐ Aardrijkskunde
   - ☐ Algemene natuurwetenschappen
   - ☐ Biologie
   - ☐ Beeldende vorming
   - ☐ Culturele en kunstzinnige vorming
   - ☐ Drama
   - ☐ Duits
   - ☐ Economie
   - ☐ Engels
   - ☐ Filosofie
   - ☐ Frans
   - ☐ Geschiedenis
   - ☐ Godsdienst
   - ☐ Grieks
   - ☐ Handvaardigheid
   - ☐ Informatica
   - ☐ Italiaans
   - ☐ Latijn
   - ☐ Levensbeschouwing
   - ☐ Maatschappijleer
   - ☐ Mens en Natuur
   - ☐ Muziek
   - ☐ Natuurkunde
   - ☐ Nederlands
   - ☐ Natuur, Leven en Technologie
   - ☐ Quest
   - ☐ Scheikunde

- ☐ Spaans
- ☐ Techniek
- ☐ Tekenen
- ☐ Textiel
- ☐ Verzorging
- ☐ Wiskunde
- ☐ Andere

4. Waar leer je het meeste over het klimaat? *
- o Op school
- o Op sociale media
- o Via het nieuws (bijvoorbeeld de krant of tv)
- o Door het er met vrienden over te hebben
- o Door het er thuis over te hebben
- o Andere

5. Hoe voel je je nadat je over het klimaat geleerd hebt? (Het gaat hier om de informatie over het klimaat die je leert op de manier van je antwoord op vraag 4)*
- ☐ Bang
- ☐ Machteloos
- ☐ Bezorgd
- ☐ Overweldigd
- ☐ Boos
- ☐ Gefrustreerd
- ☐ Verdrietig
- ☐ Teleurgesteld
- ☐ Verschrikkelijk
- ☐ Verloren
- ☐ Beschaamd
- ☐ Hoopvol
- ☐ Geïnspireerd
- ☐ Ander

6. Zou je meer uitleg willen over het klimaat en klimaatverandering tijdens de aardrijkskunde lessen? (Is je antwoord nee ga door naar vraag 9) *
- o Ja
- o Nee

7. Was je antwoord op de vorige vraag ja? Leg dan uit waar je meer uitleg over zou willen hebben of welk onderwerp je mist

8. Wordt dit bij een ander vak behandeld? Zo ja kruis aan bij welk(e) vak(ken)
- ☐ Nee
- ☐ Aardrijkskunde
- ☐ Algemene natuurwetenschappen
- ☐ Biologie
- ☐ Beeldende vorming
- ☐ Culturele en kunstzinnige vorming
- ☐ Drama
- ☐ Duits
- ☐ Economie
- ☐ Engels
- ☐ Filosofie
- ☐ Frans
- ☐ Geschiedenis
- ☐ Godsdienst
- ☐ Grieks
- ☐ Handvaardigheid
- ☐ Informatica
- ☐ Italiaans
- ☐ Latijn
- ☐ Levensbeschouwing
- ☐ Maatschappijleer
- ☐ Mens en Natuur
- ☐ Muziek
- ☐ Natuurkunde
- ☐ Nederlands
- ☐ Natuur, Leven en Technologie
- ☐ Quest
- ☐ Scheikunde
- ☐ Spaans
- ☐ Techniek
- ☐ Tekenen
- ☐ Textiel
- ☐ Verzorging
- ☐ Wiskunde
- ☐ Andere

## Hoe zie je het *klimaat*

9. Welke relatie is er volgens jou tussen mens en natuur? *
- o De mens staat los van de natuur (de mens is geen onderdeel van de natuur)

- De mens is onderdeel van de natuur, maar staat er wel boven (de behoeftes van de mens staan dus boven die van de natuur)
- Mens en natuur zijn met elkaar verbonden (de acties van de mens beïnvloeden de natuur en de natuur beïnvloed de mens)
- De mens is afhankelijk van de natuur (de mens kan zonder de natuur niet bestaan, de natuur is belangrijker dan de mens)

10. Hoe moet de mens omgaan met de natuur en het klimaat? *
- De mens moet en mag de natuur gebruiken voor wat we nodig hebben.
- De mens mag gebruik maken van de natuur. Met onze kennis en technologie kunnen we op een duurzame manier de natuur gebruiken en ervoor zorgen.
- De mens moet op een duurzame manier met de natuur omgaan en ervoor zorgen. Dit kunnen we bereiken als iedereen zijn steentje bijdraagt en er naar iedereen geluisterd wordt.
- De mens moet in harmonie met de natuur leven. Mensen moeten op een natuurlijkere manier leven en mogen niet meer van de natuur gebruiken dan nodig is om te overleven.

11. Welke definitie van klimaatverandering past het beste bij hoe jij klimaatverandering zou omschrijven? *
- Klimaatverandering bestaat niet
- Klimaatverandering is het veranderen van het weer. Dit betekent bijvoorbeeld dat de Nederlandse zomers steeds warmer worden en dat er meer regen valt in de herfst en lente. Hierdoor moeten we in de zomer zuiniger zijn met het water en in de herfst en lente oplossingen vinden vinden voor teveel water
- Klimaatverandering is het veranderen van het klimaat. Dit zorgt voor onduidelijkheid over hoe de toekomst eruit komt te zien. Hierom moeten we minder fossiele brandstoffen gebruiken, door bijvoorbeeld minder te vliegen en in elektrische auto's te rijden
- Klimaatverandering omvat het veranderen van het klimaat en de biodiversiteit. Dit houdt bijvoorbeeld in dat we nu geen Elfstedentocht meer hebben terwijl onze voor ouders dat wel meegemaakt hebben en komt de nationale vogel (Grutto) steeds minder voor in Nederland. Als we klimaatverandering willen tegengaan moeten we ook gebruik maken van lokale kennis
- Klimaatverandering is het veranderen van de levensomstandigheden op aarde. Al onze acties hebben een impact op de natuur en het klimaat. We moeten goed met de natuur omgaan, want wij zijn afhankelijk van de natuur.

12. Hoe zal klimaatverandering worden opgelost? In welk van deze opties kan je jezelf het beste vinden? *
- Klimaatverandering is helemaal geen problem
- De overheid zal het oplossen met regelgeving
- Wetenschappelijke innovaties en nieuwe technologieën zullen de oplossing zijn voor klimaatverandering. Denk hierbij aan elektrische auto's en CO2 opslag
- Met sociale bewegingen (vegetariërs of Fridays For Future) en door het combineren van verschillen vormen van kennis (praktisch, wetenschappelijk en ervaringen)
- Klimaatverandering hoeft niet opgelost te worden, het is een menselijk probleem en de natuur zal uit zichzelf altijd blijven leven

13. In welk wereldbeeld kan je jezelf het beste vinden? *
- Er is maar 1 waarheid en goed of slecht; deze waarheid wordt uitgelegd door een docent, de overheid of een religieus leider. Ik vertrouw erop dat overheid de leiding op zich zal nemen om klimaatverandering op te lossen. Wij als mensen staan los van de natuur en zijn verplicht om voor de natuur en het klimaat te zorgen.

- Als mens gebruiken en beïnvloedden we het klimaat en de natuur. De oplossing voor klimaatverandering kunnen we vinden in de wetenschap met bijvoorbeeld nieuwe technologische oplossingen.
- Wij als mens zijn afhankelijk van natuur, maar de natuur is ook afhankelijk van ons; de wereld is namelijk één systeem waarin alles elkaar beïnvloedt. Klimaatverandering moet worden opgelost door sociale initiatieven en met een combinatie van lokale, praktische en wetenschappelijke kennis.
- De wereld is een complex systeem dat ook nadat de mens is uitgestorven nog zal blijven bestaan. Mens en natuur zijn met elkaar verbonden in het universum en op spiritueel vlak. We moeten in harmonie met de natuur leven.

14. Welk wereldbeeld vind je het meeste terug in de aardrijkskunde lessen over het klimaat? *
    - Er is maar 1 waarheid en goed of slecht; deze waarheid wordt uitgelegd door een docent, de overheid of een religieus leider. Ik vertrouw erop dat overheid de leiding op zich zal nemen om klimaatverandering op te lossen. Wij als mensen staan los van de natuur en zijn verplicht om voor de natuur en het klimaat te zorgen.
    - Als mens gebruiken en beïnvloedden we het klimaat en de natuur. De oplossing voor klimaatverandering kunnen we vinden in de wetenschap met bijvoorbeeld nieuwe technologische oplossingen.
    - Wij als mens zijn afhankelijk van natuur, maar de natuur is ook afhankelijk van ons; de wereld is namelijk één systeem waarin alles elkaar beïnvloedt. Klimaatverandering moet worden opgelost door sociale initiatieven en met een combinatie van lokale, praktische en wetenschappelijke kennis.
    - De wereld is een complex systeem dat ook nadat de mens is uitgestorven nog zal blijven bestaan. Mens en natuur zijn met elkaar verbonden in het universum en op spiritueel vlak. We moeten in harmonie met de natuur leven.

## *Klimaatemoties*

Let op! Bij sommige vragen mag je meerdere opties aankruisen

15. Als ik aan het huidige klimaat en klimaatverandering denk voel ik me: *
    - ☐ Bang
    - ☐ Machteloos
    - ☐ Bezorgd
    - ☐ Overweldigd
    - ☐ Boos
    - ☐ Gefrustreerd
    - ☐ Verdrietig
    - ☐ Teleurgesteld
    - ☐ Verschrikkelijk
    - ☐ Verloren
    - ☐ Beschaamd
    - ☐ Hoopvol
    - ☐ Geïnspireerd
    - ☐ Ander

16. Als ik aan de toekomst van het klimaat en klimaatverandering denk voel ik me: *
    - ☐ Bang
    - ☐ Machteloos
    - ☐ Bezorgd
    - ☐ Overweldigd
    - ☐ Boos
    - ☐ Gefrustreerd
    - ☐ Verdrietig
    - ☐ Teleurgesteld
    - ☐ Verschrikkelijk
    - ☐ Verloren
    - ☐ Beschaamd
    - ☐ Hoopvol
    - ☐ Geïnspireerd
    - ☐ Ander

17. Na een aardrijkskunde les over het klimaat voel ik me: *
    - ☐ Bang
    - ☐ Machteloos
    - ☐ Bezorgd
    - ☐ Overweldigd
    - ☐ Boos
    - ☐ Gefrustreerd
    - ☐ Verdrietig
    - ☐ Teleurgesteld
    - ☐ Verschrikkelijk
    - ☐ Verloren
    - ☐ Beschaamd
    - ☐ Hoopvol
    - ☐ Geïnspireerd
    - ☐ Ander

18. Tijdens de aardrijkskunde lessen over het klimaat is er ruimte om het over mijn gevoelens te hebben *

- Ja
- Soms
- Nee

## Toestemming voor verwerken van gegevens

19. Mijn antwoorden mogen anoniem gebruikt worden voor het master onderzoek van Maartje Tolen over de wereldbeelden en klimaatgevoelens in klimaatonderwijs *

- Ja
- Nee