Examining the Influence of Gain-Loss Framing on Self-Efficacy towards Climate

Change Mitigation among University Students: Exploring the Role of Eco-Anxiety

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Abstract

Climate change is a major global issue that requires immediate action to mitigate its effects. Governments have taken steps to combat climate change, however individual involvement is critical. Prior research has shown that gain-loss framing in climate change messaging can significantly influence environmental self-efficacy, where eco-anxiety may play a mediating role. This study aimed to investigate the impact of gain-loss framing in climate change messaging on environmental self-efficacy, with a focus on the mediating role of eco-anxiety and the moderating role of personal relevance. A between-participant experiment was conducted involving 209 university students who were randomly assigned to read and evaluate a gain, loss, or neutral framed message about climate change. Contrary to the hypotheses, neither the gain nor the loss frame had a significant effect on environmental self-efficacy. Additionally, the relationship between message frames and environmental self-efficacy was not moderated by personal relevance. Lastly, eco-anxiety also did not mediate the relationship between message framing and environmental self-efficacy but emerged as a predictor. It was however found that personal relevance did have a significant effect on environmental self-efficacy and eco-anxiety was identified as a predictor of environmental self-efficacy. More research is required to fully comprehend the complex interactions between eco-anxiety, personal relevance, and environmental self-efficacy. Further research would provide valuable insights for improving messaging strategies that effectively promote climate mitigating actions.

Keywords: gain-loss framing, eco-anxiety, environmental self-efficacy, climate change

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1 Introduction

Climate change is a growing concern around the world as hotter temperatures, droughts, forest fires, and rising sea levels threaten not only the future of humanity but also animals and ecosystems on this earth. In response to this crisis, many governments are taking action to combat climate change including the Dutch government by setting its own environmental goals of achieving net zero carbon emissions by 2050, in line with Paris Agreement goals(Government of the Netherlands, n.d.). Recent initiatives to reduce carbon emissions are a reform on energy tax, a carbon dioxide (CO_2) levy for industry, a CO_2 price floor for power generation, a car tax reform, and an increase in the air passenger departure tax(Chen et al., 2023). Furthermore, the scheme to stimulate sustainable energy production now provides funding for entities in power generation, industry, transportation, and agriculture to produce renewable electricity, renewable heat, renewable gas, low-carbon heat, and low-CO_2 emissions (Chen et al., 2023). These are some steps already taken however, government efforts alone are not enough to combat climate change.

Individuals also play a crucial role in addressing this issue, and one factor that can influence their actions is their level of environmental self-efficacy, or their belief in their ability to make a positive impact on the environment (Bandura, 1997; Huang, 2016). The Planning Office for the Living Environment (Planbureau voor de Leefomgeving) conducted a survey of over 2,500 Dutch consumers on their consumption patterns and found that while many are already taking steps to save energy and recycle waste, few are buying second-hand clothing or choosing sustainable modes of transportation (PBL et al., 2021). The report suggests that the government should focus its efforts on areas where people are willing to make changes with ease, such as reducing clothes buying, traveling closer to home, and downsizing homes. For other changes, policymakers may need to work harder to encourage a shift in consumer behavior. In this regard, the way the government frames its communication

can play an important role (Corner et al., 2015; Huang, 2016; Nabi et al., 2018). To encourage people to act towards sustainability, the government should focus on areas where individuals are already willing to make changes with ease and frame their communication in a way that enhances environmental self-efficacy, as numerous studies have found that message framing can play an important role in shaping attitudes and behavior towards climate mitigating actions.

Gain-loss framing is a tactic commonly used in climate change, marketing, and health communication however with differing outcomes. Gain frames emphasize the positive consequences of performing a specific action, whereas loss frames emphasize the negative consequences of not performing a specific action. A gym, for example, could frame advertisements in terms of the benefits of losing weight (gain frame) or emphasize the negative consequences of remaining overweight (loss frame). A study conducted by Spence and Pidgeon (2010) found that gain frames were better at creating positive attitudes towards climate mitigating behavior than loss frames, however the study also found that fear responses and the amount of information remembered from the communications can suppress the gain frame advantage. A different study on detection behaviors for cholesterol screening found that loss-framed messages were more persuasive than gain or non-gain framed messages when the issue was personally relevant to the individual (Bosone & Martinez, 2017). Nabi et al. (2018) conducted a study which focused on the impact of gain-loss framing on emotions and discovered that when efficacy information was delivered through a gain frame, it aroused more hope than when the identical information was presented through a loss frame. The most hopeful messages were linked to more supportive attitudes. While gain-loss framing has been extensively studied in the context of climate change, marketing, and health communication, more research is needed to understand the impact of other possible mediator variables that negatively affect environmental self-efficacy.

Besides finding an appropriate frame to effectively communicate environmental self-efficacy, many individuals are experiencing eco-anxiety, a form of anxiety related to the state of the environment and the future of the planet (Clayton et al., 2017). This phenomenon can enhance pro-environmental behaviors in some individuals but induce eco-paralysis in others (Innocenti et al., 2023). Framing environmental issues that emphasizes their severity and urgency, may lead to feelings of helplessness and anxiety amongst individuals who are concerned about the environment(Maran & Begotti, 2021). On the other hand, if environmental issues are framed in a way that emphasizes the potential for positive change and collective action, it may lead to feelings of empowerment and motivation (Maran & Begotti, 2021; Wang et al., 2023). Managing eco-anxiety through message framing plays a vital role in environmental self-efficacy where further research is needed to explore this relationship.

The purpose of this investigation is to gain deeper insights on the relationship between relevant gain-loss framing messages on the environmental self-efficacy to mitigate climate change. Special attention will be brought to eco-anxiety as a mediator variable to see if this will have an impact on environmental self-efficacy. The outcome of this study hopes to fill current knowledge gaps in literature as well as provide practical suggestions to governments or civil organizations to improve current messaging to effectively promote mitigating actions.

2 Theoretical framework

2.1 Environmental self-efficacy

Bandura (1997) defines self-efficacy as an individual's belief in their ability to successfully carry out a course of action, complete a task, or solve a problem. A higher level of perceived self-efficacy can greatly influence an individual's intention to engage in a particular behavior or action, as it gives them confidence in executing that behavior (Lenz & Shortridge-Bagget, 2002). Without this belief, individuals would have little reason to act when faced with challenges (Benight & Bandura, 2004).

In this study, the definition of environmental self-efficacy proposed by Moeller and Stahlmann (2019) will be used, which refers to "an individual's belief in their ability to produce desired effects in the environment through their own actions". The starting point for encouraging pro-environmental behaviors is to increase an individual's belief in their own capabilities to make a positive impact on the environment through their actions. Pro-environmental behaviors refer to actions undertaken to alter the environment from the actor's perspective, such as recycling, resource conservation, and green consumption (Innocenti et al., 2023). It is worth noting that individuals may also engage in activities that do not directly impact the environment but demonstrate their interest or intent, such as searching for additional information about global warming from media sources (Huang, 2016).

2.2 The influence of gain-loss framed messages on environmental self-efficacy and the moderating role of personal relevance.

Media can shape our beliefs and attitudes about environmental issues and can therefore influence our perceived ability to make a difference in the environment (Huang, 2016). This can be done through framing where information is selected, emphasized, left out, and elaborated to influence the audiences' perception and interpretation of a story (Bosone &

Martinez, 2017; Nabi et al., 2018). Numerous methods for implementing framing have emerged in the last few decades (Nabi et al., 2018). Specifically, media can impact environmental self-efficacy using gain or loss framing which is commonly used in climate change communication (Stecula & Merkley, 2019).

Gain-loss framing is built on prospect theory which is a behavioral economics theory. It describes people being more sensitive to potential losses than to potential gains of equal value, a phenomenon known as loss aversion, and that they tend to overweigh small probabilities and under weigh large probabilities (Tversky & Kahneman, 1981).

Tversky and Kahneman tested this through several controlled studies. One of these experiments known as the disease problem demonstrated how framing influences a respondent's decision. Keep in mind that self-efficacy has implications on decision making as self-efficacy is the belief in one's capacity to carry out specific actions to achieve a desired outcome (Bandura et al., 1997). In the study, responders are prompted to pick one of two possible policies to deal with a sickness outbreak that has affected 600 people. Tversky and Kahneman split the respondents into two answer groups. In each group, participants had to make a binary decision between in the following scenario (Tversky & Kahneman, 1981):

> Imagine that the U.S. is preparing for the outbreak of an unusual Asian disease, which is expected to kill 600 people. Two alternative programs to combat the disease have been proposed. Assume that the exact scientific estimate of the consequences of the programs are as follows:
>
> If Program A is adopted, 200 people will be saved.

If Program B is adopted, there is 1/3 probability that 600 people will be saved, and 2/3 probability that no people will be saved. Which of the two Programs would you favor?

Instead of Programs A and B, two alternate Programs with the same situation were presented to the second group of respondents.

If Program C is adopted, 400 people will die.

If Program D is adopted, there is 1/3 probability that nobody will die, and 2/3 probability that 600 people will die. (p.453)

Despite the equal weight of the choices offered, when the two prospects were framed in terms of lives saved, the majority (72%) chose Program A over Program B because it was the safer choice. However, the majority (78%) chose the riskier option of Program D over the more secure option of Program C when the two prospects were framed in terms of the number of deaths. This shows that human perception is not rational. It is important to note that framing not only affects decision-making but has implications for individuals' self-efficacy beliefs. By framing the choices in terms of lives saved or deaths avoided, this can affect people's confidence in their ability to contribute to the problem's resolution.

This brings us to gain-loss framing which is a psychological phenomenon where individuals react differently when an outcome is presented in terms of gains or losses. People tend to be more risk-seeking when presented with a situation framed in terms of potential gains, and more risk-averse when presented with a situation framed in terms of potential losses (Bosone & Martinez, 2017; Mandel, 2001). When given a loss frame, individuals will act in accordance with the message to lessen the perceived threat and avoid negative

outcomes. When adopting this mindset, they might be more inclined to believe they can adopt the advised behavior and therefore have a higher self-efficacy (Helme-Guizon et al., 2021).

This is why it is proposed that:

H1: A loss frame has a stronger positive effect on environmental self-efficacy than a gain frame.

However, the results vary when different moderator variables are considered. A meta-analysis conducted by O'Keefe and Jensen (2007) has suggested that a range of moderating factors such as contextual elements, individual ideologies, and prior attitudes, play a more significant role than the relatively minor effects of message frames. One such factor is personal relevance. Bosone & Martinez (2017) found that loss framed messages were more persuasive than gain framed messages, only when the situation personally relevant which was caused by a contextual element. This was the inverse when the participant perceived a low relevance where the gain frame worked better, however the difference is minimal. Rothman and Salovey (1997) mention that when a health issue is personally relevant to a message recipient, the differences between gain and loss framed messages are likely to be greater. The reasoning behind this is that when a message is personally relevant, individuals will process the message carefully or systematically (Rothman & Salovey, 1997). This type of message processing magnifies the framing effects, as there is increased examination of the advantages or risk associated with the behavior(Rothman & Salovey, 1997).

Thus,

H2: The moderating role of personal relevance strengthens the relationship between message framing and environmental self-efficacy.

2.3 The mediating role of eco-anxiety

It is worth noting that eco-anxiety may also play a mediating role in how individuals react to gain-loss framing in relation to environmental issues, as this emotional response can impact decision-making and risk-taking behavior (Stanley et al., 2021; Wang et al., 2023). Eco-anxiety can be triggered by personal experiences to climate change (e.g., heatwaves, flooding, pollution, rising sea levels) or exposure to media coverage of climate change-related events (Maran & Begotti, 2021; Wang et al., 2023). This term is sometimes used interchangeably with climate anxiety or environmental anxiety (Baudon & Jachens, 2021). This can lead to negative emotional and physical symptoms such as distress, despair, feelings of hopelessness, sleep disorders, and anxiety (Baudon & Jachens, 2021; Clayton et al., 2017; Coffey et al., 2021). Clayton et al. (2017) describes it as "a chronic fear of environmental doom," where other articles mention it is an emotional and mental state as a response to a climate crisis where individuals think negatively of the future (Clayton et al., 2017; Innocenti et al., 2023). Younger people have stronger reactions to the effects of climate change on their mental health putting them more at risk (Corner et al., 2015; Ojala, 2012).

There seems to be some merit in the "practical" forms of eco-anxiety with the question of reducing the paralyzing effects of eco-anxiety (eco paralysis) but increasing the adaptive forms of eco-anxiety (Innocenti et al., 2023; Panu, 2020). A study involving coping mechanisms found that young adults used problem-focused or emotional coping mechanisms to deal with eco anxiety. Problem-focused coping behaviors address the stressor directly by the individual doing something concrete such as donating to an environmental conservationist website, or actively looking for online articles to reduce plastic waste (Ojala, 2012). Emotional coping focuses on individuals finding ways to negate the stressor either through distancing themselves from the stressor or ignoring the stressors(Ojala, 2012). It was found

that 44.2% of students at university or college would use problem-focused coping behaviors versus emotional coping mechanisms at 39.0% (Ojala, 2012). It is worth noting that problem-focused coping may be more effective in building environmental self-efficacy than emotional coping. This is because problem-focused coping involves taking action, which can lead to a sense of accomplishment and self-efficacy, while emotional coping may reinforce feelings of powerlessness and lack of control.

A study conducted by Innocenti et al. (2023) suggests that climate change anxiety has a dual impact on pro-environmental behaviors. On the one hand, it can encourage people to adopt behaviors that mitigate the effects of climate change, which may be seen as a means of coping. By giving people a feeling that they are improving the environment, this reduces ruminating and worrying. On the other side, concern about climate change might lower one's perception of general self-efficacy by causing one to think negatively about global warming and thus feel helpless and despairing about the state of the world. Since self-efficacy is positively associated with pro-environmental behaviors, individuals whose self-efficacy is impaired by climate change anxiety may not engage in pro-environmental behaviors and may experience eco-paralysis.

In the case of eco paralysis, high levels of eco anxiety can have a negative effect on a person's environmental self-efficacy. Panu (2020) states that to cope with eco-paralysis participatory action as well as emotional work is advised to build resilience, however Innocenti et al (2023) mentions that these individuals' self-efficacy for engaging in pro-environmental behavior is nonexistent. Based on the foregoing, it is proposed that:

H3: The effect of loss and gain frames on environmental self-efficacy is mediated by eco-anxiety.

In summary this study investigates the following hypothesis: (H1) a loss frame has a stronger positive effect on environmental self-efficacy than a gain frame; (H2) personal relevance has a moderating role in the relationship between message framing and environmental self-efficacy; and (H3) The effect of loss and gain frames on environmental self-efficacy is mediated by eco-anxiety. Figure 1 depicts the conceptual framework of this study.

Figure 1: Conceptual framework
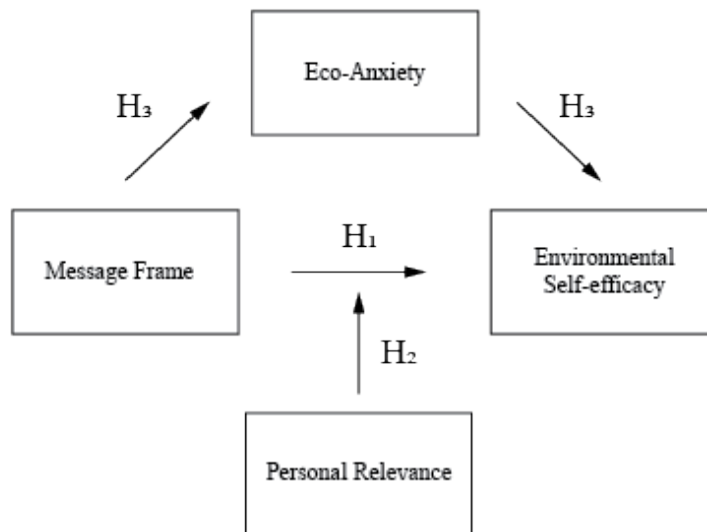
3 Methods

Two pre-studies have been conducted with around 30 university students each to control for relevant variables in the stimulus material before testing the effect of gain-loss framing on environmental self-efficacy and eco-anxiety. Pre-study 1 aimed to determine the content for the stimulus material that will be used in the main study, while Pre-study 2 aimed to assess the intended effect of the manipulation in the message frame.

3.1 Pre-study 1

The United Nations Act Now Campaign has listed ten impactful actions to reduce greenhouse gas emissions in private households. This study focuses on the environmental self-efficacy of university students. Therefore, it is important to select environmental actions from the United Nations Act Now Campaign which university students have a high self-efficacy for. This will also show that university students can identify with the actions presented in the stimulus material that will be created. In an online questionnaire the participant was instructed to rate how certain they were to do each of the environmental actions on a regular basis. It was further emphasized that the actions are not asking them what they would have done or are sure to do in the future, but what they can do. This is to ensure environmental self-efficacy is measured. An adapted version of the Environmental Self Efficacy scale (ESE10) by Moeller and Stahlmann (2019) was used where the statements indicated ten environmental actions from the United Nations Act Now Campaign (e.g., I can eat more vegetables, I can switch to an electric vehicle, I can save energy at home). These statements were scored on a 10-point Likert scale (1 = *Cannot do at all*, 10 = *Highly certain to do*). $N = 30$ university students through convenience sampling filled out this online questionnaire where the results are indicated in Table 1. "I can eat more vegetables" ($M = 8.43$, $SD = 1.63$), "I can walk, bike, or take public transport instead of using a car" ($M = 8.27$, $SD = 2.00$), "I can save energy at

home" (M = 8.27, SD = 1.39), "I can throw away less food" (M = 8.07, SD = 1.50), and "I can reduce, reuse, recycle, and repair" (M=7.57, SD = 1.82) scored highest in environmental self-efficacy. To keep the stimulus material not too information dense, only the three actions of, "I can eat more vegetables," "I can walk, bike, or take public transport instead of using a car," and "I can save energy at home," will be used in the stimulus material.

Table 1

Environmental self-efficacy of the United Nations Act Now campaign's ten actions

Action	Mean	Standard deviation
I can save energy at home. E.g., lowering your heating and cooling, switching to LED light bulbs.	8.07	1.39
I can walk, bike, or take public transport instead of using a car.	8.27	2.00
I can eat more vegetables.	8.43	1.63
I can consider my travel options when traveling long distance. E.g., take a train, or skip that long-distance trip altogether.	5.43	1.80
I can throw away less food.	8.07	1.50
I can reduce, reuse, recycle, and repair. E.g., buy fewer things, shop second-hand, repair what you can, and recycle.	7.57	1.82
I can change my home's energy source.	2.93	2.05
I can switch to an electric vehicle.	3.23	1.73
I can make my money count by choosing products from companies who use resources responsibly and are committed to cutting their gas emissions and waste.	6.00	1.84
I can speak up and get others to join in taking climate action.	6.00	1.83

3.2 Stimulus material

Having identified the environmental actions for which university students exhibit high environmental self-efficacy, the next step is to create the stimulus material for the different framing conditions. The stimulus material comes in the form of a written prompt based on the findings of pre-study 1 (Appendix 1). The first sentence of "A message about climate change" was used for all three different framing conditions. This was followed by either the gain, loss, or neutral frame manipulation. Gain-framed messages highlighted the positive outcome of carrying out the environmental action (e.g., "By lowering your heating and cooling and switching to LED light bulbs and energy-efficient electric appliances you can reduce your carbon footprint by up to 900 kilograms of CO_2 per year"). On the other hand, loss-framed messages highlight the negative consequence of not carrying out the environmental action (e.g., "By not lowering your heating and cooling and not switching to LED light bulbs and energy-efficient electric appliances you can increase your carbon footprint by up to 900 kilograms of CO_2 per year"). A neutral frame was created as a controlled condition to remove the variance caused by variables unrelated to the gain-loss frame's experimental intervention. In the neutral frame neither the positive outcome nor the negative consequences of taking environmental action were emphasized. Information was presented objectively and without persuasion (e.g., To manage the temperature in homes and offices as well as for cooking, people need a reliable and not too expensive energy source). The environmental actions of, "I can eat more vegetables," and "I can walk, bike, or take public transport instead of using a car," were respectively framed in a similar manor. A closing sentence linked the activities to the process of climate change where the gain frame slowed down the process, loss frame sped up the process, and neutral frame varied the process at differing degrees. The messages for each of the different conditions were

approximately of the same length (neutral frame:77 words; gain-frame: 91 words; loss frame: 95 words).

3.3 Pre-study 2

In pre-study 1, we identified the environmental actions for which university students exhibit high environmental self-efficacy and based on these findings have created stimulus material for the different framing conditions. The next step is to assess how the gain, loss, and neutral frames, see 3.2, are actually perceived by participants. This is necessary to ensure the success of the manipulations. If this manipulation proves successful, the stimulus material will be used for the main study.

To accomplish this, all three frames as text were presented at random in an online questionnaire to a sample of $N = 30$ students. After each text, participants were asked to answer a question to assess the perceived framing which goes as follows: "Please rate the text you have just read on the following (five-point) Likert scale ranging from very much focused on the negative consequences of *not* performing climate change actions to very much focused on the positive consequences of performing climate change actions." The neutral framed message had a mean of 3.13 ($SD = 0.76$), the gain framed message a mean of 4.03 ($SD = 1.14$), and the loss framed message a mean of 1.77 ($SD = 1.09$). This shows that the manipulation is successful.

4 Participants and design

A between subjects' online experiment was administered to 209 university students (39.80% male, 57.65% female, 0.51% nonbinary/ third gender, 0.51% other, and 1.53% prefer not to say). Their ages ranged from 18 years to 29 years (M_{age} = 22.09; SD = 2.26). There were slightly more Dutch participants (61.23%) and the majority studied in the Netherlands (98.97%). These participants were randomly assigned to one of three conditions: neutral frame (N = 73), gain frame (N = 67), or loss frame (N = 69).

4.1 Measurement items

For each of the framing conditions participants were asked to carefully read the message presented before proceeding to answer a questionnaire regarding the following dimensions:

A framing manipulation check was performed to determine whether the gain, loss, or neutral framed messages had the desired effect of the respective frame. Participants rated the message prompt on a 5-point Likert scale which asked the following question: "Please rate the text you have just read on the following (five-point) Likert scale ranging from very much focused on the negative consequences of *not* performing climate change actions to very much focused on the positive consequences of performing climate change actions." The results aligned with the findings of Pre-study 2: neutral frame M = 3.12, SD = 0.58; gain frame M = 4.00, SD = 1.11; and loss frame M = 1.36, SD = 0.66.

Following this, the condensed environmental self-efficacy scale (ESE10) was given to the participants. The scale consists of the first 10 items of the environmental self-efficacy scale by Moeller and Stahlmann (2019), such as "I can contribute to resolving environmental issues in my community if they arise. To measure the level of agreement to the statements a 10-point response scale was used where 1 indicated "Cannot do at all" and 10 indicated "Highly certain to do." As advised by Moeller and Stahlmann, environmental self-efficacy

was not mentioned to the participants prior to the survey and the following instructions were given, "Please rate how certain you are that you can do each of the following environmental actions on a regular basis. Remember, these are not asking what you have done or are sure to do in the future, they are asking what you can do." Cronbach's Alpha was 0.88.

Afterwards the participants rated their frequency of experiencing eco-anxiety using the Hogg scale, which included 13 items (e.g. Feeling nervous, anxious or on edge, unable to stop thinking about future climate change and other global environmental problems) on a 4-point frequency scale (ranging from 0 = *not at all*, 1 = *several of the days*, 2 = *over half of the days*, 3 = *nearly every day*). The instructions were given as follows, "Over the last 2 weeks, have you been bothered by the following problems, when thinking about climate change and other global environmental conditions (e.g., global warming, ecological degradation, resource depletion, species extinction, ozone hole, pollution of the oceans, deforestation)?" The Cronbach's Alpha was 0.87.

Finally, to assess personal relevance, participants were asked to respond to three statements regarding how interesting, involving, and, relevant the message was to them (e.g, "I found the information in the message interesting"). This was based off the relevance scale used by Spence and Pidgeon (2010). Participants could respond on a five-point Likert scale (1 = *Strongly Disagree* and 5 = *Strongly Agree*). Cronbach's Alpha was 0.84.

5 Results

Data was collected from 209 students where all respondents who did not consent to participate in the study, individuals who do not currently attend university, and incomplete surveys were omitted from analysis leaving us with 195 observations. Mean scores for environmental self-efficacy, eco-anxiety, and personal relevance were calculated.

Randomization of each of the conditions was successful as there was no substantial difference between the neutral, gain, and loss framed conditions in terms of the respondents age (neutral: M_{age} = 21.93, SD = 2.30, gain: M_{age} = 22.27, SD = 2.26, loss: M_{age} = 22.03, SD = 2.23, (F (2) = 0.40, p < 0.67), gender (neutral: 54.41% female, 44.12% male, 1.47% prefer not to say, gain: 54.69% female, 42.19% male, 1.56% other, 1.56 prefer not to say, loss: 65.08% female, 31.75% male, 1.59% non-binary/third gender, 1.59% other), nationality (neutral: 58.82% Dutch, 41.18% non-Dutch, gain: 57.81% Dutch, 42.19% non-Dutch, loss: 66.67% Dutch, 33.33% non-Dutch).

Firstly, we analyzed the data in relation to H1: A loss frame has a stronger positive effect on environmental self-efficacy than a gain frame.

An ANOVA test was conducted. The effect of the loss frame (LF) on self-efficacy M_{LF} =6.25, SD = 1.57, was not significantly stronger than the effect of the gain frame (GF) b_{GF} = -0.05, SE = 0.26, t (192) = 0.19, p < 0.85, d = 0.12, 95% CI [-0.47, 0.58]. In addition to this we compared the difference in effect of the LF on environmental self-efficacy with the controlled condition of the neutral frame (NF). There was no significant difference in the scores of the LF and NF (b_{NF} = -0.19, SE = 0.26) conditions; t (192) = 0.70, p < 0.49, d = 0.03, CI [-0.34, 0.71]. The difference in effects of each framing condition is depicted in Figure 2.

Figure 2:

Mean environmental self-efficacy across framing conditions
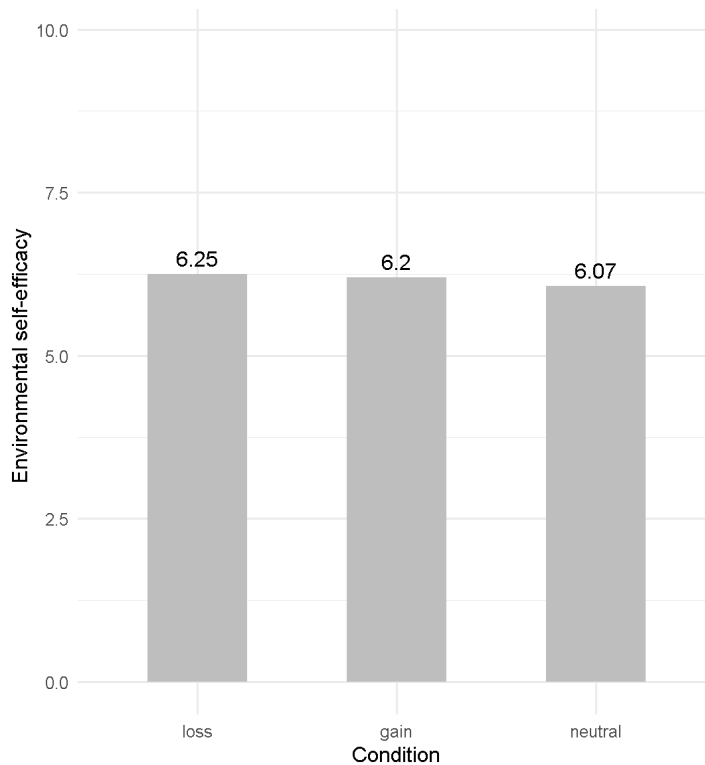
Next, we investigated H2: The moderating role of personal relevance strengthens the relationship between message framing and environmental self-efficacy.

A median split was used to distinguish between low and high personal relevance. The median score for personal relevance is 3.67, $SD = 0.89$. To investigate the effects of framing conditions and personal relevance on environmental self-efficacy, an ANOVA analysis was performed. Personal relevance was found to have a significant effect ($F(1, 189) = 13.01$, $p < 0.01$). The effect of the framing condition, however, was not significant ($F(2, 189) = 0.29$, $p < 0.75$). Furthermore, there was no statistically significant interaction between the framing condition and personal relevance ($F(2, 189) = 0.99$, $p < 0.37$). Therefore, based on these results, we find no support for H2. This interaction is seen in Figure 3.

Figure 3:

Comparing the impact of framing condition and personal relevance on environmental self-efficacy
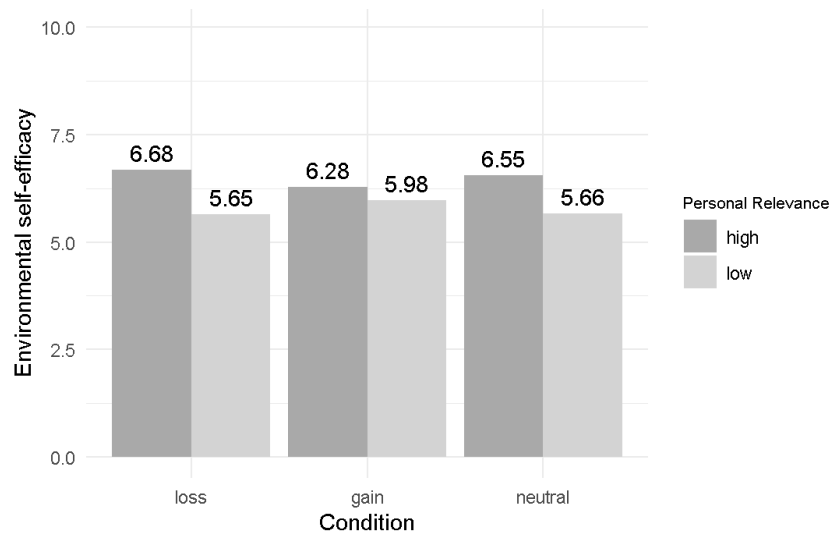
Finally, we investigated H3: The effect of loss and gain frames on environmental self-efficacy is mediated by eco-anxiety.

Mediation analysis was performed to investigate the relationship between the framing condition and environmental self-efficacy, starting with a linear regression analysis for the direct effect. A pairwise comparison between the constant LF (b_0 = 6.07, SE = 0.18) and the GF was not significant (b_{GF} = -0.05, SE = 0.26, t (192) = -0.19, p = 0.85, 95% CI [-0.57, 0.47]). Similarly, the pairwise comparisons between the constant NF (b_0 = 6.07, SE = 0.18) and the GF, as well as between the NF and the LF, were also not significant (NF vs. GF: b_{GF} = 0.13, SE = 0.26, t (192) = 0.52, p < 0.60, 95% CI [-0.37, 0.64]; NF vs. LF: b_{LF} = 0.19, SE = 0.26, t (192) = 0.72, p < 0.48, 95% [-0.32, 0.69]). Furthermore, the overall model fit was not significant (R^2 = 0.01, F (2, 192) = 0.28, p < 0.76), with a R^2_{adj} of -0.75%. Thus, H3 can be rejected because the basic requirements of mediation were not fulfilled.

We then looked at how the framing condition predicts eco-anxiety. There were no statistically significant differences in eco-anxiety between the constant LF (b_0 = 1.63, SE = 0.08) and the GF, b_{GF} = -0.15, SE = 0.11, t (192) = -1.30, p < 0.20, 95% [-0.37, 0.08]. There were also no statistically significant differences in eco-anxiety between the constant NF (b_0 = 1.69, SD = 0.75) and the GF, b_{GF} = -0.20, SE = 0.11, t (192) = -1.84, p < 0.07, 95% [-0.42, 0.01]. This was also true when comparing the NF to the LF, b_{LF} = -0.06, SE = 0.11, t (192) = -0.51, p < 0.61, 95% CI [-0.27, 0.16]. The overall model fit was not significant (R^2 = 0.02, F (2, 192) = 1.79, p < 0.17) with a an R^2_{adj} of 0.80%. This further confirms that H3 can be rejected. The difference in eco-anxiety in each framing condition is depicted in Figure 4.

An additional analysis was done where there was a significant result between eco-anxiety and environmental self-efficacy, b = 0.40, t (193) = 2.39, p < 0.02. The overall model

fit was significant ($R^2 = 0.03$, $F(1, 193) = 5.73$, $p < 0.02$) with a an R^2_{adj} of 2.38%. All the results are visualized in Table 2 and Table 3.

Figure 4:

Mean eco-anxiety changes across framing conditions
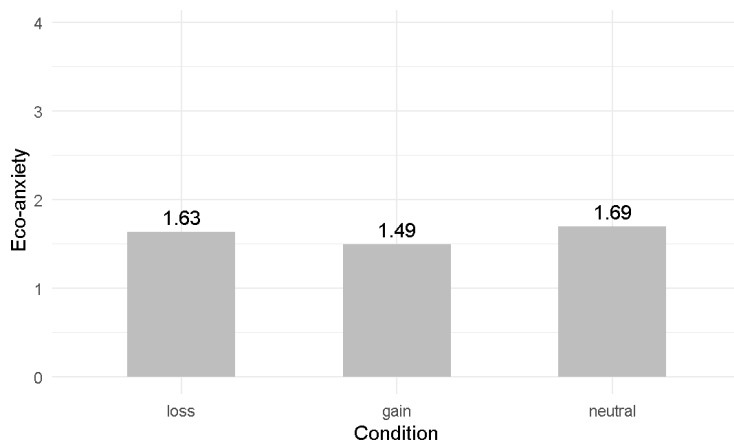
Table 2:

Summary of regression model fit for frame, self-efficacy, and eco-anxiety variables

	F-value	Degrees of freedom (DF)	p-value	R^2	R^2_{adj}
Frame -> self-efficacy	0.28	2, 192	<0.76	0.01	-0.75%
Frame -> eco-anxiety	1.79	2, 192	< 0.17	0.02	0.80%
Eco-anxiety -> self-efficacy	5.73	1,193	< 0.02	0.03	2.38%

Table 3

Mediation analysis path estimates summary

		Effect size (b)	Standard Error (SE)	t-value	Degrees of Freedom (DF)	p-value	95% Confidence Intervals (CI)
Direct effect							
	Constant (NF)	6.07	0.18	33.91		< 0.01	[2.71, 6.42]
	NF vs LF	0.19	0.26	0.72	192	< 0.76	[-0.32, 0.69]
	NF vs GF	0.13	0.26	0.52	192	< 0.60	[-0.37, 0.64]
	Constant (LF)	6.25	0.19	33.63		<0.01	[5.89, 6.62]
	LF vs GF	-0.05	0.26	-0.19	192	< 0.85	[-0.57, 0.47]
Indirect effect							
	Constant (NF)	1.69	0.07	22.16		< 0.01	[1.54, 1.84]
	NF vs LF	-0.06	0.11	-0.51	192	< 0.61	[-0.27, 0.16]
	NF vs GF	-0.20	0.11	-1.84	192	< 0.07	[-0.42, 0.01]
	Constant (LF)	1.63	0.08	20.62		<0.01	[1.48 1.79]
	LF vs GF	-0.15	0.11	-1.30	192	< 0.20	[-0.37, 0.08]
Mediator effect							
	Eco-anxiety	0.40	0.17	2.39	193	< 0.02	[0.07, 0.72]

6 Discussions

This is the first study to investigate the impact of gain-loss framing on environmental self-efficacy with eco-anxiety acting as mediator and personal relevance as moderator in the hopes to promote pro-environmental behaviors. As governments, organizations, communities, and individuals are pushing towards reducing their carbon footprint to fight global warming, understanding these factors becomes crucial. Research prior to this study found varying results to whether the gain or loss frame was most effective for promoting climate mitigating action. In this study, although loss-framed messages had a stronger effect than both gain-framed and neutral-framed messages, they were not more effective in increasing individuals' environmental self-efficacy. The effect size is small, which is in line with several message framing studies which typically discover small-to-moderate increases in mitigation intentions following a climate change message (Hornsey & Fielding, 2016). In the context of sustainable consumer behavior, research has shown that single message frames are not reliable at creating significant differences and propose the use of two frames as being more consistently effective (Florence et al., 2022). A combination of a gain-loss frame and an abstract-concrete frame could be used to improve the current study (Florence et al., 2022). These findings indicate the need for a different strategy to influence environmental self-efficacy through messaging, acknowledging that the effectiveness of written messaging strategies alone may be limited in producing significant environmental self-efficacy. Another tactic could be by using images to stimulate. A study conducted by O'neill et al., (2013) found that images depicting energy futures such as solar panels, home insulation, fuel pumps, wind farms, and electric cars, were often highly efficacious as participants perceived these images to be something they could personally undertake. Visualizations also help conceptualize the complex nature of climate change problem. Images can improve

perceptions of the threat which in turn highlights the issues relevance, however it can also decrease an individual self-efficacy (Bolsen & Shapiro, 2017).

We also found that the moderating role of personal relevance on the relationship between the message frame and self-efficacy was not significant which was contrary to the hypothesis. However, the results do indicate that personal relevance had a significant effect on environmental self-efficacy. This shows support for the findings of Bosone and Martinez (2017) since making a situation personally relevant causes individuals to perceive it as if they are at risk. They will be highly motivated to identify the most practical behavioral response to lower this risk, in this case acting on the advice of the framed messages (Bosone & Martinez, 2017). Another study conducted by Wirtz et al. (2015) also considered the moderating role of personal relevance as well as mood on framing effects. They similarly found that framing effects were stronger when the message were relevant, and more interestingly found that positive moods strengthen loss framing effects. This is because positive moods speed up message processing in the presence of emotionally upsetting but potentially helpful information (Wirtz et al., 2015). These findings suggest that personal relevance is influential in shaping environmental self-efficacy in message framing and that researchers should focus their efforts on determining the role of personal relevance in environmental self-efficacy interventions. This also could indicate that the framing manipulation used in the study was not effective enough to cause participants' responses to differ significantly.

The effect of loss and gain frames on environmental self-efficacy was not mediated by eco-anxiety. When looking at the mediating role of eco-anxiety, it was surprising to see that the neutral frame scored highest in eco-anxiety than the loss frame and the gain frame. Keep in mind that the difference between the framing conditions was not significant. A possible explanation is that the gain and loss frames used self-efficacy primes where

statements began with "you can" whereas the neutral frame used an injunctive prime of "people need". The word "need" is defined as, "to require something/ somebody because they are essential or very important, not just because you would like to have them" (Oxford Learners Dictionary, 2023b). On the other hand, the word "can" is defined as, "it is possible for somebody/something to do something, or for something to happen" (Oxford Learners Dictionary, 2023a). The word need is perceived more threatening in the climate change message where there is a sense of urgency as inaction is not possible. This is reflected in eco-anxiety as the threat of not meeting these perceived needs can lead to increased anxiety (Pihkala, 2022).

It should also be noted that the gain frame was approaching significance and a moderate effect size in the relationship between the frames and eco-anxiety. Conducting additional research with larger sample sizes may help determine if the observed effect holds true. This could mean that gain frames are a valid method for reducing eco-anxiety. Since the participants in this study did not have a high level of eco-anxiety nor eco-paralysis in that case, it is still uncertain whether gain frames would be a possible treatment for eco-paralysis. For future research, it would be interesting to investigate the effects of message framing on participants who have eco-paralysis.

Even though by changing the framing condition did not result in a significant effect on eco-anxiety, managing eco-anxiety is vital in managing a person's self-efficacy. Eco-anxiety has a significant effect on environmental self-efficacy. This shows that eco-anxiety is a predictor for environmental self-efficacy, not a mediator.

This could be the result of a limitation in our research which is the measurement tool of the Hogg eco-anxiety scale. It was not recommended for measuring the short-term effects of eco-anxiety because some items, such as difficulty sleeping, would not necessarily change

after the frame was presented (Hogg et al., 2021). What may have happened is that the frame could bring these events to the foreground of the participants thoughts. What should be improved for next time is an improved method, where we would present participants with gain, loss, or neutral frames for a two-week period and measure their eco-anxiety at the end of the two weeks (Hogg et al., 2021). Future research could help develop an eco-anxiety scale which is better at measuring reactive states of eco-anxiety.

Another limitation is that for the current study we chose to use the neutral frame as our controlled condition, however the neutral frame could also have had an effect. A neutral frame presents information objectively which appeals more to rational decision making whereas loss or gain framed messages are prone to cognitive bias. To measure the effect of the neutral frame a no-frame should be introduced as the controlled condition where participants will not be presented a message. This will also help assess the relative effectiveness of the different interventions in general. The validity of the manipulation should be further explored. As mentioned previously the neutral frame should use a self-efficacy prime of "can do" instead of an injunctive prime of "need to do" which is currently used. Apart from this the gain frame should be improves since in the manipulation check in both pre-study 2 and the final study, it was also apparent that the gain frame used in this research could be perceived as more of a gain frame. These combined limitations require a follow up study where the suggested improvements should be implemented to allow for a more comprehensive understanding of the relationship between framing effects, eco-anxiety, and individual responses to climate change messaging.

7 Implications for practitioners

Even though the results for the hypothesis were insignificant we should take a broader look at the effectiveness of message framing to stimulate climate change mitigating action. When looking at the findings in a broader scope, even though the effect sizes were small for the framing effect it still could have an impact on environmental self-efficacy. Practitioners such as those posting on social media, who have a greater audience reach than the sample used in this study, may have a more significant impact. For example, NOS is a Dutch news station with 880,000 followers on Instagram where if 1% were influenced by the message frame, it would result in 8,800 people being impacted. More research needs to be conducted of course to see if the effects are significant, but it is food for thought.

Additionally, considering the numerous gain or lost posts throughout the week, the cumulative effect of multiple messages may be more influential in promoting desired behaviors. By utilizing multiple frames, practitioners can enhance the probability of producing significant differences in climate change mitigating action (Florence et al., 2022). However, when adopting an approach that utilizes multiple frames or interventions, it becomes more challenging to measure the specific influences of each intervention. It would be interesting to see what would happen if an individual was exposed to these posts for a period of a week, for example, and then be presented with a call to action directly after a post such as donating to planting mor trees. Would this have happened without the message frame? Do the short-term effects of framing on eco-anxiety have an effect?

One potential approach which was mentioned before is the use of visual images in conjunction with message framing. Previous studies have shown that images depicting sustainable behaviors and positive environmental outcomes can be highly effective in stimulating personal engagement and self-efficacy (O'neill et al., 2013). Including

visualizations that depict renewable energy sources, energy-efficient practices, and other sustainable actions could help individuals perceive these behaviors as feasible and personally relevant.

Practitioners should also concentrate on understanding and using the elements that make climate change personally relevant to people. Research has already shown that this could be done by personalizing the message by either incorporating recognizable individual features such as the individual's name, gender, age, as well as closing the distance of the issue at hand (Cortese & Lustria, 2012; Dijkstra & Ballast, 2012; Spence & Pidgeon, 2010). Traditional media uses a one size fits all approach where information is dispersed to all users in a similar manor (Kreuter et al., 1999). Understating the target audiences needs beliefs or characteristics are key in tailoring content (Cortese & Lustria, 2012). This does not mean the content of the message needs to be change, it is only the context which changes (Dijkstra & Ballast, 2012). Tailoring content to a significant extent can be time-consuming and resource intensive (Kreuter et al., 1999). Therefore, practitioners should find a balance between personalization and efficiency to optimize the effectiveness of their communication efforts. The use of digital profiles has however made this easier by gathering data from the user's input (Cortese & Lustria, 2012). These profiles are then used in combination with a database to present users with messages which best fit their profile (Cortese & Lustria, 2012).

8 Conclusion

This study examined the impact of gain-loss framed messages on environmental self-efficacy among university students, specifically investigating the role of eco-anxiety as a mediator variable. Even though the results were not significant for the tested hypothesis, this study did highlight the importance of eco-anxiety on environmental self-efficacy and the importance of personal relevance. More research needs to be done on framing effects and their influences on environmental self-efficacy. With the research recommendations provided, we can improve climate change communication and gain a better understanding of the relationship between frames, eco-anxiety, and environmental self-efficacy.

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Appendix A: Stimulus Material

Loss frame	Neutral frame	Gain frame
A message about climate change By not lowering your heating and cooling and not switching to LED light bulbs and energy-efficient electric appliances you can increase your carbon footprint by up to 900 kilograms of CO_2 per year. By not choosing to go by foot, bicycle, or public transportation and rather drive, your carbon footprint can be increased by up to 2 tons per year. By not eating more vegetables, you can increase your carbon footprint by up to 500 kilograms of CO_2e per year. The above-mentioned activities speed up the process of climate change.	A message about climate change To manage the temperature in homes and offices as well as for cooking, people need a reliable and not too expensive energy source. Traveling either by foot, bicycle, car, or public transport, people need a reliable way to get from point A to B. To monitor diets, people should use an app to accurately record what they consume. The above-mentioned activities have differing degrees of influence on the process of climate change.	A message about climate change By lowering your heating and cooling and switching to LED light bulbs and energy-efficient electric appliances you can reduce your carbon footprint by up to 900 kilograms of CO_2 per year By choosing to go by foot, bicycle, or public transportation rather than driving, your carbon footprint can be decreased by up to 2 tons per year. By eating more vegetables, you can reduce your carbon footprint by up to 500 kilograms of CO_2e per year. The above-mentioned activities help slow the process of climate change.

Appendix B: Environmental self-efficacy scale (ESE10)

Please rate how certain you are that you can do each of the following environmental actions on a regular basis. Remember, these are not asking what you have done or are sure to do in the future, they are asking what you can do.

Cannot do at all					Moder-ately can do					Highly certain can do
0	1	2	3	4	5	6	7	8	9	10

I can...

1	help mitigate enviromental problems in my community, if they arise
2	find several ways to be part of the solution when I am introduced to an environmental problem
3	reduce the environmental problems that the next generation will need to face in the future
4	have a significant positive impact on the environment
5	reduce the negative impact I have on the planet
6	support environmental policy through political activism
7	do my part in solving the world's environmental problems
8	be environmentally friendly even when the people with whom I have close relationships are not
9	set an example of environmentally friendly behavior, for others to follow
10	continue to take steps towards solving large environmental problems, even when others are overwhelmed by the scale of these problems

Appendix C: The Hogg Eco-Anxiety Scale (HEAS-13)

In the past two weeks, have you been bothered by the following problems, when thinking about climate change and other global environmental conditions (e.g., global warming, ecological degradation, resource depletion, species extinction, ozone hole, pollution of the oceans, deforestation)?

Not at all	Several of the days	Over half the days	Nearly every day
0	1	2	3

1	Feeling nervous, anxious or on edge
2	Not being able to stop or control worrying
3	Worrying too much
4	Feeling afraid
5	Unable to stop thinking about future climate change and other global environmental problems
6	Unable to stop thinking about past events related to climate change
7	Unable to stop thinking about losses to the environment
8	Difficulty sleeping
9	Difficulty enjoying social situations with family and friends
10	Difficulty working and/or studying
11	Feeling anxious about the impact of your personal behaviors on the earth
12	Feeling anxious about your personal responsibility to help address environmental problems.
13	Feeling anxious that your personal behaviors will do little to help fix the problem.

Appendix D: Personal relevance scale

Please indicate your level of agreement with the following statements about the message you read regarding climate change. Use the 5-point scale below to rate each statement:"

Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
1	2	3	4	5

1	I find the information in the message personally interesting.
2	I feel personally involved with the topic displayed in the message.
3	The topic displayed in the message is personally relevant to me.

Appendix E: Framing manipulation check

Please indicate your level of agreement with the following statements about the message you read regarding climate change. Use the 5-point scale below to rate each statement:

Very much focused on the negative consequences of not performing climate change actions	Somewhat focused on the negative consequences of not performing climate change actions	Neither focused on the negative consequences of not performing climate change actions nor the positive consequences of performing climate change actions	Somewhat focused on the positive consequences of performing climate change actions	Very much focused on the positive consequences of performing climate change actions
1	2	3	4	5

1	The message was…

Appendix F: Search log

Date	Source	Search string (databases) or search method (other sources)	Total hits	Remarks
Write the date of your search	*Write the source you used (e.g. database name)*	*Copy-paste the resulting search string (e.g. 'smartphone OR "digital technolog*")', including any limiters or additional settings you used to run the search (e.g. 'searched only from X to Y date'). In case of other sources, simply report narratively but clearly how you approached the search in*	*Write how many total hits or results your search delivered*	*Write down important notes for you to remember about this search (e.g. if or how many relevant publications you identified by quickly reviewing a sample of the search results)*

		a specific source (e.g. describe when and how you browsed around a website of interest, looking for reports or document ation of interest)		
15/03/2023	*Scopus*	"Eco Anxiety"	*163*	*Since 2020 research has been done. Eco-Anxiety scale. Behaviors caused by eco-anxiety. Related to mental health. Treatments to eco anxiety*
15/03/2023	Scopus	"eco anxiety" OR "climate anxiety" OR "environ mental anxiety"	276	More about mental health. Studies done on multiple countries.
15/03/2023	Scopus	"eco anxiety" OR "climate anxiety" OR "environ mental anxiety" OR "climate change anxiety"	283	
16/03/2023	Google	Communi cation strategies to	13,700,0 00	One relevant source, Coping with eco-anxiety: An interdisciplinary perspective for collective learning and strategic communication - ScienceDirect (utwente.nl)

		mitigate eco anxiety		
16/03/ 2023	Scopus	"eco anxiety" OR "environ mental anxiety" OR "climate anxiety" AND communic ation	12	Found sources on how communication is used to aid or affect eco-anxiety. Youtube as a channel.
16/03/ 2023	Chat GPT	"How do different industries communic ate about climate change and their efforts"	5	Sustainability reporting Public statements Industry associations Stakeholder engagement Collaboration
17/03/ 2023	Scopus	"corporat e greening"	85	The term corporate greening is not related to the communication used, but more internal to the organization.
17/03/ 2023	Google	What is corporate greening?	2,950,00 0,000	(PDF) Stage models of corporate 'greening': a critical evaluation (researchgate.net) What are greening companies? | News and insights | Home (bp.com) Greening companies
17/03/ 2023	Google	corporate greening communic ation strategy	1,250,00 0,000	(PDF) GREEN MARKETING COMMUNICATION STRATEGIES: AN INTEGRATIVE LITERATURE REVIEW (researchgate.net) The term Green marketing and Green communication. Also sustainability communication
18/03/ 2023	Google	which industries impact climate change the most	581,000, 000	Transportation, electric power, industry/manufacturing, agriculture, commercial and residential, land use and forestry, livestock, fertilizers, The six-sector solution to the climate crisis (unep.org)

18/03/2023	Google	which industries impact climate change the most united nations	199,000,000	Emissions Gap Report 2022 (unep.org) States 5 key industries impacting climate change: electricity, industry, transportation, buildings sector, food, financial
20/03/2023	Scopus	Industries AND "climate change"	20,498	Trying to get a general overview of which industries impact climate change the most. From this I can possibly start creating Q-sort items
22/03/2023	Google	Eco anxiety and corporate social responsibility	8,470,000	With the lens of CSR, however the term does not seem relevant to my study.
22/03/2023	Supervisor meeting			Meeting with supervisor where research question is too broad. Going to have to narrow. Eco anxiety is still of interest, however, need to focus on a better independent variable.
25/03/2023	Google	causes for eco anxiety	22,400,000	Own experience with an ecological event, news/media,
25/03/2023	Scopus	causes AND "eco anxiety" or "climate anxiety" or "environmental anxiety"	22	Scopus - Document details - Eco-anxiety in youth: An integrative literature review (utwente.nl) Scopus - Document details - Brands as activists: The Oatly case (utwente.nl)
25/03/2023	Scopus	Positioning and branding and "eco anxiety" and sustainability	1	Scopus - Document details - Brands as activists: The Oatly case (utwente.nl)

25/03/2023	Scopus	Positioning and branding and "eco anxiety" or sustainability	52	[Scopus - Document details - Sustainable brand positioning by container shipping firms: Evidence from social media communications (utwente.nl)](#)
25/03/2023	Google	corporate communication and eco anxiety	38,300,000	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8431103/ [(PDF) Eco-anxiety, uncertainty, communication and climate urgency (researchgate.net)](#)
25/03/2023	Google	advertising and eco anxiety	29,800,000	Eco conscious marketing campaign Strategic communication and eco anxiety Brand tactics for eco anxiety Sustainability campaigns [The rise of eco-anxiety and how brands are tackling environmental issues | Tug Agency](#) [IKEA's upbeat sustainable campaign eases eco-anxiety | Canvas8](#) [Brand tactics for eco-anxiety (allthingscommunicate.com)](#)
25/03/2023	Google	strategic communication and eco anxiety	23,900,000	[Coping with eco-anxiety: An interdisciplinary perspective for collective learning and strategic communication - ScienceDirect](#) [Disruptive Communication as a Means to Engage Children in Solving Environmental Challenges: A Case Study on Plastic Pollution - PMC (nih.gov)](#) [Strategic Communication for Sustainable development.pdf (cbd.int)](#) Term sustainable communication
26/03/2023	Google	sustainable communication strategies	253,000,000	Way too broad and nothing specific being mentioned. Also the term sustainable does not always relate to climate change, but to sustainably communicate.
26/03/2023	Scopus	"sustainable communication" AND strategy	39	More focus on branding and positioning of customers.

26/03/ 2023	Scopus	"corporate social responsibility" AND "climate change" OR "environment" AND communication	385	This is the direction I want to take as more communication methods are being mentioned, as well what platforms are being used. YouTube, social media.
26/03/ 2023	Google	sustainable marketing and communication scholarly articles	28,000,0 00	
26/03/ 2023	Google	green marketing communication impacts on eco anxiety	21,000,0 00	
28/03/ 2023	Supervi sor Meetin g			Research question still needs to be revised. Still the focus on eco anxiety, however with the new perspective of looking into conversation organizations such as WWF, Greenpeace, et, and how they communicate. Terms would be media framing, pro climate change behavior. Eco anxiety then as a mediator variable.
28/03/ 2023	Google	Message frame and climate change	19,700,0 00	[(PDF) Message Framing and Climate Change Communication: A Meta-Analytical Review (researchgate.net)](#) topical frames, namely economic frame, morality frame, environment and biodiversity frame, geographical identity frame, and public health frame [Message framing influences perceived climate change competence, engagement, and behavioral intentions - ScienceDirect](#)

				sacrifice-oriented versus motivational-oriented message [Framing climate change for effective communication: a systematic map - IOPscience](#) scientific frame, economic frame, environmental,
28/03/2023	Google	Message frame and eco anxiety	7.630.000	[From anger to action: Differential impacts of eco-anxiety, eco-depression, and eco-anger on climate action and wellbeing - ScienceDirect](#) [Fear for the future: Eco-anxiety and health implications, a systematic review - ScienceDirect](#) More focused on eco anxiety. There seems to be not a lot of research done the effect on framing on eco-anxiety.
28/03/2023	Google Scholar	Eco anxiety and self-efficacy	127,000	Self-efficacy and behavior are closely linked. Some sources focus on the behavior aspect and others on self-efficacy.
30/03/2023	Supervisor Meeting			Research question approved and direction is clear to carry out research. The terms Gain-loss framing, Climate self-efficacy and eco anxiety will be used in the theoretical framework.
03/04/2023	Google scholar	Eco anxiety and climate self-efficacy	45.900	
03/04/2023	Google scholar	Gain loss framing	1.330.000	
03/04/2023	Google scholar	Gain loss framing Climate change	581.000	[Framing Climate Change: Exploring the Role of Emotion in Generating Advocacy Behavior (sagepub.com)](#) This study is helpful as emotions as fear and hope are focused on. Fear is an emotion people feel with eco-anxiety.

Date	Source	Search terms	Results	Notes
				Framing and communicating climate change: The effects of distance and outcome frame manipulations - ScienceDirect
03/04/2023	Scopus	"gain loss framing"	80	Threat, gain-loss,
03/04/2023	Google Scholar	Gain loss framing on climate change and self-efficacy	96,000	
05/04/2023	Google Scholar	self-efficacy and pro environmental behavior	929,000	Focusing on climate self-efficacy. Media use, environmental beliefs, self-efficacy, and pro-environmental behavior - ScienceDirect
05/04/2023	Google Scholar	self-efficacy		Microsoft Word - Self Efficacy.doc (citymax.com)
05/04/2023	Google Scholar	Climate self efficacy	2,080,000	Climate is not a good description for environmental behaviors. Uses direct surroundings as climate.
05/04/2023	Google Scholar	environmental self efficacy	4,830,000	Using the word environmental leads to more related behavior to impacting climate change. Adolescent Environmental Behaviors (sagepub.com)
06/04/2023	Google Scholar	worry on climate change in the Netherlands	129,000	Finding information for the introduction if there is a concern of climate change in the Netherlands. Link to eco-anxiety. Term: public opinion

Date	Source	Search terms	Results	Notes
06/04/2023	Google Scholar	public opinion of the Netherlands on climate change	1,270,000	Outdated article from 2006
06/04/2023	Google	public perception of climate change in the Netherlands	103,000,000	[Majority (62%) of Dutch people think their country will fail to drastically reduce carbon emissions by 2050 (eib.org)](#)
09/04/2023	Scopus	"eco-anxiety" AND measure*	17	[The Hogg Eco-Anxiety Scale: Development and validation of a multidimensional scale - ScienceDirect (utwente.nl)](#)
09/04/2023	Google Scholar	measuring eco anxiety	186,000	[The Hogg Eco-Anxiety Scale: Development and validation of a multidimensional scale - ScienceDirect (utwente.nl)](#) Hogg Scale seems the most reliable scale to date for measuring eco-anxiety. Cannot seem to find another scale which is more condensed than the Hogg 13 item scale for eco anxiety.
09/04/2023	Consensus.ai	how would you measure eco anxiety		Broader answer also giving scales for anxiety.
09/04/2023	Scopus	"eco-anxiety" AND scale	20	Hogg scale seems the most relevant still.
09/04/2023	Google Scholar	measuring environmental self efficacy	2,980,000	More on self-efficacy, however not often relat3ed to the environment as in climate change [Self-Efficacy In Nursing: Research and Measurement Perspectives - Google Books](#)

09/04/2023	Google	measuring environmental self-efficacy		(PDF) Developing a Scale of Environmental Efficacy (researchgate.net) Environmental Attitudes questionnaire (Milfont & Duckitt, 2010).
09/04/2023	Google Scholar	measuring self-efficacy	4,860,000	Can possibly adapt from a self-efficacy scale, however on a different topic. Going to use sources from my searches on environmental self-efficacy
09/04/2023	Google Scholar	measuring self-efficacy and climate change	292,000	Self-Efficacy In Nursing: Research and Measurement Perspectives - Google Books gives good perspective on how to develop your own self-efficacy scale
11/04/2023	Google Scholar	environmental efficacy scale	3,510,000	https://link.springer.com/article/10.1007/s41543-019-00023-y Will be using the condensed 10 item scale for my study.
13/04/2023	Perplexity.ai	how would you test the intended effect of gain loss framed messages	4	https://www.perplexity.ai/search/a96d479c-2b2a-4d12-8755-1e4e93a0b424?s=c
13/04/2023	Perplexity.ai	How does gain loss framing effect eco anxiety	3	https://www.perplexity.ai/search/6ee38d73-d88a-453d-a048-930eeceb9912?s=c

14/04/2023	Perplexity.ai	In gain-loss framing, how would you set up a controlled frame in an experiment	1	https://www.perplexity.ai/search/2873e3fa-d57d-40ed-90ca-03d2bf8f7428?s=c same-consequence frame would then be a control frame
19/04/2023	Google scholar	Gain loss framing on images of climate change	631,000	Started to search for what images to include in my message. Too vague and not in the direction which is relevant to me
19/04/2023	Google scholar	Gain loss framing on images of climate change	265,000	http://sciencepolicy.colorado.edu/admin/publication_files/2018.03.pdf (PDF) Strategic Framing and Persuasive Messaging to Influence Climate Change Perceptions and Decisions (researchgate.net) Found interesting articles on what types of images are used in the media
19/04/2023	Google scholar	Climate change imagery	2,200,000	On the use of imagery for climate change engagement - ScienceDirect By reading a few of the sources on imagery, images, and symbolisms used in climate change communication, it feels that by adding an image, it will alter too much of the material adding in new variables to my study. Therefore my study will only focus on the textual element.
28/06/2023	Google scholar	personalizing messages to increase relevance	32,300	Found interesting articles on how to personalize messages through tailoring. This would be used for making messages more personally relevant.
28/06/2023	Google scholar	Tailoring messages	192,000	Similar results to the first prior. A lot of health messages.