Nurturing secondary students' hope and agency: Educating to live in a climate-impacted world

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Introduction

The effects of climate change are being felt by people and ecosystems world-wide, and it is clear that human action is significantly contributing to these effects (IPCC, 2021). Climate change impacts the natural environment, and, by extension, our social structures, cultural health, and economic stability which all depend on a healthy natural environment. Future generations will be the most affected as they navigate the effects of a climate-ravaged Earth during their lifetimes (Parker, 2020). The likely physical, psychological (Currie & Deschenes, 2016), and economic effects (Aldy, 2016) of climate change on young people have already been documented. Not surprisingly, many young people are feeling pessimistic, hopeless, and helpless in the face of such challenges (Stevenson & Peterson, 2016), but they also want to do something about it.

Education has long been viewed as key to developing citizens who can take informed actions about issues such as climate change (Wals & Benavot, 2017). But, according to the 2015 Programme of International Student Assessment (PISA) data, 15-year-old New Zealand students appeared to be poorly informed about, had a low awareness of, and were more pessimistic about, environmental issues when compared with other OECD countries (Ministry of Education, 2019).

This low level of awareness is very concerning given the challenges of climate change. Since schools are a main source of environmental information for young people (Ministry of Education, 2019), more inclusion of environmental content would seem warranted. However, simply raising environmental awareness and knowledge is not enough to change behaviours (Kollmuss & Agyeman, 2002). Developing competencies to be an active citizen in a democratic society is also needed (Mogensen & Schnack, 2010) as only increasing knowledge can result in pessimism, leading to "action paralysis" (Ministry of Education, 2019, p. 6). Young people, and indeed many adults, struggle to connect their personal actions, such as reducing consumption, to broader issues such as climate change. Recent research with youth leaders within the School Strike 4 Climate movement in Aotearoa New Zealand has highlighted the complex links between knowledge, anxiety and other emotions, and action (Bright & Eames, 2022), which reflect the entanglements of young people within society that influence their ability to act.

Education that acknowledges these complex links and entanglements by focusing on students' emotional awareness is required, since nurturing emotions such as hope can lead to feelings of optimism about the future and motivate people to bring about change for that future (Ojala, 2012, 2015; Sterling, 2017; Stevenson et al., 2017). Current approaches to education can often side-line the role of emotion in learning, instead privileging rational thinking and cognition (Bryan, 2020). But doing so ignores that people are "feeling-thinking beings" (Bryan, 2020, p. 10). According to Freire (2005), hope is an ontological need because it is inextricably entangled with being human. To be human is to have hope because the very meanings of our lives are dependent on how we envisage our future. And, as Hicks (2014) argues, without a future, what is left besides despair?

Hope is a complex construct that consists of cognitive and emotional elements. The cognitive element involves people having a "goal directed thinking process" (Snyder et al., 1998, p. 808). This process has three aspects: being able to set a positive goal for the future; using pathways thinking to find ways to reach the goal; and using agency thinking to motivate oneself to use these ways to reach the goal. There are also emotional elements associated with hope. People with higher levels of hope feel more optimistic, believe that they have the necessary skills to solve problems, are in control and positive that their goal can be achieved. In contrast, lower levels of hope are characterised by the setting of unachievable or very difficult goals with little chance of successfully reaching these, and therefore experiencing negative emotions when working towards a goal (Snyder, 1995; Snyder et al., 1998).

When considering environmental issues, the role of hope is more complex. A person's level of worry about climate change interacts with their level of hope, resulting in differing outcomes (Li & Monroe, 2017; Ojala, 2012, 2015). Being highly worried about climate change is positively related to taking action to address it and termed "constructive hope", whereas a low level of worry, termed "hope based on denial", is negatively related to taking action. In other words, being worried about climate change can lead to action-taking or "problem-focused coping" (Ojala, 2012, p. 636) whereas denial of the problem can render people reluctant to make change.

Hope can play a key role in motivating people to bring about change and, when coupled with action-taking, particularly for young people (Stevenson & Peterson, 2016). This is because by working towards making change, or using pathways thinking, people find a route to a solution and believe they can achieve their goal (agency thinking). This imparts strength to face the issue and motivates action to seek solutions (Stevenson & Peterson, 2016). This purposeful search can be regarded as use of one's agency and illustrates value in exploring the crucial link between the two constructs of hope and agency (Li & Monroe, 2017; Stevenson & Peterson, 2016).

In this project, we used a critical realist lens to explore the links between knowledge, hopefulness, and agency (Cornell & Parker, 2010; Rafe et al., 2019). Using this lens, we recognise that the effects of climate change are a reality that we are facing today and are the outcomes of particular societal factors and systems. People can then critically consider the causes and their influence over these factors and systems or what we term as "structures". In this sense, structures can be seen as global and national (macro) such as climate science and IPCC reports, or government policy; community (meso) such as transport options, school policies, and student organisations; or individual (micro) such as household energy use, or values. In this case, agency can then be thought of as situated practices or the understanding and capacity of individuals to take action over time upon these structures at the various levels (Archer, 1996). Critical realism focuses on the interplay between these structures and agency over time. We also acknowledge that agency recognises young people as reflexive; who both shape, and are shaped by, their family, community, and societal structures (Blanchet-Cohen, 2008).

With the aim of exploring the interplay between hope, agency, and structures, we designed a hopeful climate change education programme. It was co-designed by the two researchers (Sally Birdsall and Chris Eames), two secondary science teachers with a chemistry specialisation, and an environmental psychologist (Niki Harré). Drawing on research that identified strategies for nurturing hope and agency (e.g., Li & Monroe, 2017; Mogensen & Schnack, 2010; Ojala, 2012), this programme involved:

- learning about the science of climate change and its causes and effects
- discussing and experiencing projects where the effects of climate change are being successfully mitigated
- expert speakers who discussed their work in the climate change field
- learning about societal structures and how change has been brought about in society over time
- learning about how to take action
- deciding upon, planning, and taking action, either in groups or individually
- reflecting on the efficacy of their action-taking for mitigating climate change's effects.

By incorporating learning from both a scientific and societal perspective, we hoped to encourage students to gain a deeper understanding of the way they are entangled in societal structures. We were hoping to develop their understanding about how structures in society both enable and constrain the choices they can make, both in terms of their lifestyle decisions and the actions they can take to bring about change in society. By including examples of successful projects and people who are working to mitigate for climate change's effects, we sought to nurture hope as well as their feelings of agency.

Consequently, the overarching research question that guided this study was:

How does a hopeful climate change education programme foster hope and develop agency for climate action in secondary school students?

These sub-questions guided our research:

How do secondary school students perceive their understanding, agency, and hope in relation to climate change over the course of the climate change learning programme?

What are secondary teachers' perceptions and experiences of planning and implementing the climate change learning programmes?

Research design

This study used an interpretive-qualitative paradigm to construct two case studies to analyse students' learning and teachers' reflections. Two classes of secondary students and their teachers participated in this study. Both schools were co-educational catering for students in Years 9–13. They were of a similar size with approximately 1,700 students in 2022. Both of these teachers were interested in teaching about climate change and education for sustainability.

One class of 31 students (Class A) were Year 10s. Their school had a decile ranking of 9 and is located in the Waikato, drawing from a town and surrounding rural areas. According to the school's website, students are offered a progressive education with a wide range of academic, cultural, and sporting opportunities. The student population is predominantly European (80.5%) with 13.3% students identifying as Māori, 1.2% Pacific, and 3.5% Asian. These students were selected because their teacher had an existing relationship with Chris Eames. She had been carrying out her research Master's degree with him as her supervisor.

The other class consisted of Years 12 and 13 students (Class B). There were 23 students in this class at an inner suburban Auckland-based school with a decile ranking of 8. The student population was more diverse with 50.6% of students identifying as European, 27.6% Māori, 5.7% Pacific, and 11.7% Asian. The emphasis at this school is for students to become "self-managers" of their learning. Mixed ability teaching takes place in innovative learning environments in 90-minute blocks. These students were selected because Sally Birdsall and Chris Eames had an existing relationship with their teacher. However, this teacher then won a scholarship to study full time, but the teacher who took her position was willing to participate.

Although the aims of the programme were similar, the programme for the Year 10 students was guided by the achievement objectives of *The New Zealand Curriculum* (Ministry of Education, 2007) and the learning focus was structures associated with transport. The criteria for Education for Sustainability Achievement Standards AS 90810 (Year 12 students) and AS 90828 (Year 13 students) from the National Certificate of Educational Achievement (NCEA) drove the learning for Class B. These students were able to choose the focus of their study. Both groups of students began by learning about the science of climate change.

After learning about the science, Class A explored connections between climate change and Mātauranga Māori, and between emotions and hope linked to climate change led by the environmental psychologist Niki Harré. They explored carbon footprints and ideas presented by a climate chemistry expert scientist. Next, students learnt about taking action from Chris Eames, an environmental education expert, and they practised action skills through letter writing. Finally, they planned and implemented action projects, with learning culminating in classroom presentations.

In contrast, Class B then discussed and analysed examples of successful projects and progress towards mitigating the effects of climate change. Besides using media resources, they had a variety of speakers: a paleoecologist and ecological modeller; leader of a youth advocacy group; and the environmental psychologist Niki Harré. Sally Birdsall presented ideas about societal structures and students discussed how these impacted and they could impact upon them. There was a visit to a city farm and community garden. Students were also working towards their respective NCEA achievement standards, where they were identifying a personal action, planning, implementing, and then reflecting on its efficacy. They were asked to consider how societal structures could impact on their action and how they could influence these structures.

Data were gathered in a variety of ways. Two of the data gathering tools were designed by the researchers, teachers, and environmental psychologist at the start of the programme. One tool was a 20-item questionnaire that focused on understanding of climate change, hopefulness, and perceived agency. The questionnaire items had a 5-point rating scale from Strongly Disagree to Strongly Agree. The items were derived from a combination of instruments previously designed and tested through unpublished Master's thesis research, and new items drawing from literature reporting students' conceptions about and attitudes to climate change, impacts of climate change published in scientific reports, and school contexts.

The second tool was called a perceptions barometer and designed by the researchers, teachers, and environmental psychologist. Its aim was to capture students' perceptions of three constructs, namely their:

· **_understanding_** about the science of climate change
· level of **_hope_** for their future
· level of **_agency_** in terms of their ability to make change.

It was completed five times throughout the programme, including at the start and conclusion. It had three scales, one each for understanding, hope, and agency, and students were asked to rank themselves on each of these scales using a rating of 1–7, with 1 the least and 7 the highest level. Space was provided for them to reflect on their perceptions. We hoped to be able to use these data to explore both overall trends and how particular pedagogical strategies influenced students' perceptions.

In order to answer the sub-questions, data were gathered as follows:

1. How do secondary school students perceive their understanding, hope, and agency over the course of a climate change unit?

a. Prior to, and at the completion of, the programme, the questionnaire was administered to students.

b. A perceptions barometer was completed by students five times during the unit, including at the beginning and end. These were completed under the student's name, which allowed the researchers and teachers to track individual as well as class perception change in these elements over time.

c. Five focus groups of three to five students each (three at School A and two at School B) were held at the completion of the programme that more deeply explored students' perceived understanding, hopefulness, and agency towards climate change and its structures. These were conducted by each researcher partner in a quiet space and lasted from 15–25 minutes.

2. What are secondary teachers' perceptions and experiences of planning and implementing a climate change unit?

a. A semi-structured interview was held with each teacher before and after the programme to explore their perceptions and experiences.

b. Each teacher kept a reflective journal in which they noted observations and thoughts about their own teaching and the student responses to the climate change unit.

To address the overarching question: Reflection meetings involving the teachers, researcher, and expert consultant examined the findings and formed conclusions from the study.

Analysis of data

The questionnaire generated quantitative data that were analysed to calculate a mean for each item and were reported as a class. The perception barometers generated a mix of quantitative and qualitative data. The quantitative barometer data were treated similarly to the questionnaire data, with rating means and standard deviations calculated for each construct for each class. The qualitative data were thematically analysed. The first step was carried out by the researchers, the environmental psychologist, the teachers, and a research assistant. This was a process of initial inductive coding and sorting (labelling extracts with meaningful ideas, clustering commonalities together, developing initial categories). The research assistant carried out the second step, which was to create two types of maps—overall thematic maps for understanding, hope, and agency, and barometer maps for each construct. The overall thematic maps helped to see all the different codes and how they might be clustered together into higher level themes. The barometer maps showed where themes began in the data, if they persisted across the dataset or not, and if the nuances within them changed. Once the second step was completed, the research team met again to discuss and reflect on the coding and maps. They also noted individuals with interesting perceptual focus and/or change trajectories. During this meeting any anomalies with coding were discussed and resolved.

Focus groups and teacher interviews were audio-recorded and transcribed. The teacher interviews were participant-checked. These data and teacher reflective journal data were coded. Coding was both inductive using ideas identified from the data and deductive using criteria drawn from existing understandings of the identified structures and theoretical positions on climate change, agency, and hope. Thematic analysis followed the method of Terry et al. (2017), eliciting themes within the data for interpretation through the critical realism lens.

The research's trustworthiness was enhanced by using triangulation of data collection strategies and having a range of participants. We undertook piloting of the questionnaire and member checks as appropriate for interview transcripts. Regular interactions between teachers and researchers during the data gathering, reflections, and co-analysis processes were used to enhance the credibility of the findings and conclusions.

Key findings

In this section, we report the findings from the students' questionnaires, barometers, and focus group interviews. Findings related to the teachers' perceptions and experiences are also included.

Student questionnaire

As shown in Table 1, for Class A, there were only minor shifts in students' perceptions of their understanding, agency, and hope over the duration of the programme. Only two items showed a change of more than one point over the course of the programme, namely items 3 and 4 (highlighted), which appeared to show an increased understanding about the science of climate change. A difference of almost one point was found in the final item, indicating an increased sense of agency.

TABLE 1   Class A questionnaire data

Item	Pre-teaching mean (n = 31)	Post-teaching mean (n = 24)
Climate change is happening	4.61	4.81
I am confused about what climate change is about	2.51	2.04
I know which gases are greenhouse gases	2.9	3.96
I understand the relationship between greenhouse gases, global warming, and climate change	3.19	4.21
Things I do make no difference to climate change	2.22	2.08
I want to do things to reduce the effects of climate change	4.19	4.33
It is already too late to do something about climate change	2.39	2.21
I am not worried that climate change will affect my future	2.35	2.71
Learning more about climate change at school would make me feel more hopeful that I can deal with climate change	3.4	3.29
The Earth is warming because a hole in the ozone layer is allowing more heat to enter the Earth's atmosphere	3.35	3.29
Human activity is emitting more greenhouse gases into the atmosphere	3.84	4.21
Global warming is causing more intense storms and flooding	3.81	4.17
Carbon dioxide levels are increasing in the atmosphere because humans are burning more fossil fuels	3.84	4.37
Altering the temperature of oceans can lead to droughts in New Zealand	3.35	3.17
Plants and animals can easily adapt to a changing climate	2.42	2.04
I am powerless to influence the Government about climate change	2.9	2.92
Engineers will find ways to stop climate change with new technology	3.19	3.21
I am both part of the problem and part of the solution to climate change	3.74	4.0
I feel like I can bring about transport changes in my town	2.58	3.04
I think my school listens to my views on climate change	2.32	3.13

As shown in Table 2, in Class B there was little change in students' perceptions of their understanding, agency, and hope over the duration of the programme. In this older cohort, there was strong agreement that climate change was happening, that humans were causing it by burning fossil fuels, and that it was leading to more intense impacts such as storms.

TABLE 2   **Class B questionnaire data**

Item	Pre-teaching mean (n = 22)	Post-teaching mean (n = 18)
Climate change is happening	5.0	4.83
I am confused about what climate change is about	1.59	1.50
I know which gases are greenhouse gases	3.5	3.89
I understand the relationship between greenhouse gases, global warming, and climate change	4.05	4.22
Things I do make no difference to climate change	2.45	2.89
I want to do things to reduce the effects of climate change	4.68	4.61
It is already too late to do something about climate change	2.27	3.22
I am not worried that climate change will affect my future	2.45	1.94
Learning more about climate change at school would make me feel more hopeful that I can deal with climate change	3.82	3.33
The Earth is warming because a hole in the ozone layer is allowing more heat to enter the Earth's atmosphere	3.14	3.0
Human activity is emitting more greenhouse gases into the atmosphere	4.77	4.94
Global warming is causing more intense storms and flooding	4.73	4.94
Carbon dioxide levels are increasing in the atmosphere because humans are burning more fossil fuels	4.73	4.83
Altering the temperature of oceans can lead to droughts in New Zealand	3.73	4.28
Plants and animals can easily adapt to a changing climate	1.41	1.44
I am powerless to influence the Government about climate change	2.73	3.0
Engineers will find ways to stop climate change with new technology	2.45	2.78
I am both part of the problem and part of the solution to climate change	4.05	3.82
I feel like I can bring about transport changes in my town	2.77	3.28
I think my school listens to my views on climate change	3.64	3.72

Overall, this snapshot revealed that these students took a definite position about climate change, identifying strongly that they thought it was happening, with the older students showing more confidence. Both groups identified some growth in their understanding about the science and effects of climate change, with the Year 10 students acknowledging more growth. In terms of hope, the younger students seemed more hopeful about their future than their older peers, as can be seen in the seventh item where Class B's responses went from a mean of 2.27 to 3.22. The younger students also felt more agentic about their ability to bring about change.

Student barometer and focus group data

The barometer tool revealed more nuanced changes over the course of the unit. Table 3 shows the numerical barometer data for Class A, while Table 4 presents the numerical barometer data for Class B.

TABLE 3 **Class A barometer data**

	1	2	3	4	5
	6 May	20 May	14 Jun	30 Jun	26 Jul
Understanding					
Mean	3.68	4.39	4.69	5.48	5.60
St Dev	1.33	1.10	0.89	0.85	0.76
Agency					
Mean	2.89	3.71	3.97	4.41	4.84
St Dev	1.45	1.46	1.26	1.34	1.14
Hope					
Mean	3.61	4.04	4.14	4.56	4.44
St Dev	1.72	1.45	1.01	1.28	1.33

TABLE 4 **Class B barometer data**

	1	2	3	4	5
	5 May	19 May	11 Jun	09 Jul	16 Aug
Understanding					
Mean	4.55	5.5	4.95	5.38	5.5
St Dev	0.77	0.76	1.23	0.81	1.29
Agency					
Mean	4.64	4.88	5.2	4.94	5.36
St Dev	1.45	1.64	1.54	1.39	1.39
Hope					
Mean	3.09	3.13	3.1	4.13	3.14
St Dev	1.48	1.81	1.25	1.63	1.51

Understanding

Students' perceptions of their understanding of the science and effects of climate change showed a rise over the course of their learning for both classes. As shown in Table 3, Class A students identified a steady upward trend in their understanding, starting with an average level of 3.68 and tapering to 5.6 at the final barometer. Although there was an upward trend in Class B, the students' responses peaked at the second barometer and then stayed high for the remainder of their learning. Their average level began higher than Class A at 4.75 (supporting the questionnaire result) and finished at 5.4. For both classes, this result could be indicative of the programme's sequence, where they began by learning about the science of climate change and then shifted to focus on hope and agency around the time of barometers 3 and 4.

When asked to comment on their perceptions of their understanding, students from both classes attributed their learning to the programme. For example, W1B[1] said, "*I've had the opportunity to learn a lot more information … develop a deeper understanding.*" Students at both schools also explicitly referred to learning by engaging in their research projects with C1B stating, "*Because I've had the opportunity to do my own research about climate change and therefore get an even better understanding of it.*"

By the end of the programme, some students recognised the significance of this topic and the need for change. W2B opined, "*… climate change is caused by human activity … is the biggest threat to our environment. We need to find ways to decrease human activity …*", while C2B stated, "*It is a very important topic.*"

A small number of students reflected deeply on their learning and realised they were beginning to grasp the scope and complexity of climate change, with C3B saying, "*While I believe I understand most of the important things, I didn't realise how much I'd missed before …*" For another student, they realised how much they didn't know at the start. W3B said, "*I studied recycling and I definitely understand more than I did when we started. However, when we started this project I rated this a 5 or 6. You could say that I know what I don't understand …*" and rated their understanding at 3 at the programme's end. While these students recognised the complexity of the knowledge required, they also recognised there were limits to their understanding.

Agency

There was a clear difference between the classes in the barometer data related to agency. Class A's data showed an upward trend throughout the programme, rising from an average level of 2.89 at the start to 4.89 at the conclusion. For Class B, there was a smaller upward trend, starting with a higher average of 4.64 and rising to 5.36, perhaps reflecting a more agentic starting point for the older students. Student comments also revealed different perceptions of agency between the two classes.

Class A identified two types of agency: individual and collective. They tended to evaluate their agency individually but also locate themselves in a collective, making comments that included words such as "we" and "everyone". An example of a student identifying individual agency was C1B who said, "*… I walk to school which has a positive impact on my carbon footprint*", whereas this statement from C4B shows collective agency, "*Everyone can do their part to help with climate change.*"

On the other hand, Class B interpreted agency mostly in terms of having choice when completing their NCEA achievement standard task rather than evaluating their own ability to address climate change. Comments relating to having **Opportunity to explore a topic of choice** was the most common theme in Class B's agency data, appearing in every barometer point. W3B's remark is representative: "*I feel a lot of agency over it because I get to decide the direction of my project and come up with the ideas and find the information.*" This type of agentic learning could be seen as a necessary precursor to engaging meaningfully in climate mitigation and adaptation.

Despite these differences, common themes were identified in comments from both classes. One theme called **Being ill-equipped** related to students' ideas of having a lack of experience, control, credibility, influence, and platform to act. This theme was most commonly found at the start of the programme. A related theme, entitled **Becoming equipped**, encapsulated comments that showed these students knew of ways they could mitigate climate change's effects. The other common theme was **Being collectively agentic**, capturing comments that emphasised a belief in everyone being able to contribute and needing to play their part.

The most common theme identified in Class A's comments was **Being ill-equipped**. Twenty-four comments were identified at the start of the unit and their frequency fell to four at the end. This trend reflects the upward trend in their perceptions of agency. For example, one student said, "*… I don't think I have enough knowledge or confidence to successfully address the issue*" (C5B). The prevalence of **Being ill-equipped** at the start and the reduction over time points to the possibility of greater agency being felt over the structures that can influence climate change.

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1 Student quotes are attributed to a confidential code and the context of the code indicated as either barometer data (B) or focus group (FG).

This possibility was reinforced in the way that comments related to **Becoming equipped** became more prevalent during the programme with a total of 18 comments at the conclusion. C4B's comment was an example: "*Because I know ways I can help. Examples of this are recycling, biking instead of driving, using less power, and cutting down on waste.*" This illustrates that students were identifying structures that they could have agency over in their own lives. The following exchange during CFG3 highlighted students grappling with agency related to catching a bus to school from rural areas and lessening fossil fuel usage:

> S2: We could get more buses, like I am 200 metres away from the limit of the bus stopping. I can't go on the bus because of the limit. I am 200 metres too close to school. So if they had more buses, there would be less cars around.

> S3: I found there was a significant amount of less carbon dioxide and carbon monoxide being released to the air per person on a bus compared to a car. Like a car with two people in it, exposes more carbon dioxide than 30 people on a bus. More relevant to be on a bus.

There were 20 comments coded in the theme of **Being collectively agentic**. C5B's comment that, "*I believe that if we all work together, we can make a point and get people on board to help stop climate change,*" illustrates a belief that collective agency is critical to communities being able to make a difference to climate change's impacts. Comments from CFG3 highlighted this importance and the challenge of persuading others to make changes:

> S5: I was talking to my family about it and my dad was asking if burning wood in our woodburner will affect it, and I was like yeah! But my sister says, it's only a small fire! But I said, yes if it was only us doing it, but everyone is doing it.

> S3: If everyone has a small fire, it makes a big fire!

> S4: What's the point of me making a change, because it's not going to do anything if other people aren't?

Comments relating to **Being ill-equipped** were far less common in Class B and tended to theorise about their limited impact and control. For example, W5B stated, "… *I'm not sure one person being vegan might help*", and then later said, "*I feel like I don't have that much control.*" These seem to indicate that feelings about having agency over structures were less common in this older group of students and that this agency to address climate change structures did not progress, or perhaps got diverted in the focus to achieve the standard. If the latter, this has implications for the role of achievement standards diverting attention away from achieving learning goals and towards standard completion.

On the other hand, **Becoming equipped**-type comments were more common in Class B (11) with W3B stating, "*I feel like I can change my ways easily to be more sustainable, it is just what needs to be done.*" This comment made at the outset of the programme perhaps reflects that these older students already perceived they had some agency.

Class B's actions were largely individual, and four comments were made about their positive impact at the conclusion. W5B, for instance, thought that "… *my action had a significant impact on my household*", and W6B saying that they noticed "… *positive changes in my lifestyle after doing the action*".

Despite their focus on individual actions in their achievement standard, these students were in a dilemma. They questioned the efficacy of individual actions when compared with mass participation. There were musings in the focus group interviews such as, "*I don't think things really work individually, they have to be on a larger scale … if you got like a lot of people doing the same thing together that would probably make an impact, but people don't really do that*" (WFG2). While a "feel good" factor was identified when taking individual action, some students doubted their impact, expressed in this comment, "*I know that like really what I do doesn't have that much of an impact, but I feel like I can actually do little things on a community level can make an impact even though it is not actually making a global impact*" (WFG1).

Furthermore, three students viewed **Being collectively agentic** as a social change process. For example, W7B thought that "*We have identified that we, as the people, are the [main] problem … have identified ways to solve the problem [kind of]. We just need to make them feasible and then do them!*" The mention of "ways to achieve them" harks to consideration of gaining agency over structures.

Hope

The construct of hope was the one with the least amount of change over the course of the programme in both classes. In Class A, the average level rose overall, from 3.61 at B1, to around 4.5 by B5. For Class B, there was less movement with the levels remaining at a low 3 but peaking at B4 (4.13) before falling back to 3.14, which was slightly higher than at the beginning. Comments that identified sources of hope were made by students in both classes (for example **Inspiring class content**), as were comments indicative of less hopefulness for the future, such as **Disengaged people**.

Students in both classes identified sources of hope. The most common theme related to hopefulness was ***Engaged and capable people***. Ten students in Class A and six in Class B made comments that related to why there is hope for humanity, suggesting that people have positive qualities that make a difference, such as tenacity and creativity. For example, C5B thought that "... *people were working very hard on it right now and won't quit*", and C3B said that there were lots of "... *people who do want to help and make a change to help fix climate change.*" C63 identified technological solutions as providing hope and said, "*I have high hopes since humans ... are trying to fix things now e.g., electric cars.*" For the students in Class B, fellow activists were a source of hope as described by W8B as, "... *seeing fellow activists, such as ss4c [School Strike 4 Climate] and Extinction Rebellion gives me hope that things might change for the better*".

Inspiring class content was another theme referenced by students in both classes. Following their trip to a community garden, W8B remarked that, "*Seeing how permaculture can act helped me feel hopeful.*" Invited speakers also influenced feelings of hope as exemplified by C7B saying, "... *the professor that came in seemed to be very positive*".

Specific to students in Class A were comments expressing hope that looked outward and included other people. For example, eight students made comments that were identified as ***Being collectively agentic***, the same theme that was identified in the agency construct, such as C8B who said, "*If we all chip in we can save Earth.*"

However, many of the comments from both classes indicated less hope. Five Class B comments related to the theme of ***Being ill-equipped*** were identified. For example, W9B thought, "*I know there are things that can be done to help our future but I know that these things aren't being done and there's almost nothing I can do at this age to help.*" This appears to show a strong link between hope and agency over structures, in which the student recognises things that can be done but feels powerless to act and despairing at others who are doing nothing. Also placed into this theme were comments expressing anger about their inability to effect change because of their age and lack of financial power. This comment illustrates these feelings: "... *we are students so we don't have the money to vote with our dollar ... we actually can't vote*" (WFG1).

Having less hope connected to recognition of the ***Wicked nature of climate change***. Five comments from Class A linked to the psychological challenges of responding to climate change, such as connecting to the urgency, scope, human complicity, and visibility of impacts. For example, C7B wrote:

> *I mean we can do all we can now, but the results would only start working in another hundred years, won't they? Because the things that are happening now are the result of things that happened a hundred years before us.*

Four students in Class B noted the urgency and global nature of climate change. W9B's comment illustrated the difficulty of connecting to the urgency, saying, "*I feel like it's urgent but it's years away*", whereas another student noted the implications of climate change being a global issue, "... *even if New Zealand were to become the most sustainable country, they have limited control over the rest of the world*" (W3B). The use of the term "control" indicates again a lack of perceived agency over global structures.

A major concern expressed by both classes was ***Disengaged people***. This theme encompassed comments that despaired about people who were either not engaged with the challenges of climate change or else were aware but not doing anything about it. There were 10 comments, with C2B remarking, "*A lot of people think climate change isn't real and won't change how they live.*" These students were pessimistic about their future and said, "*We are just not sustainable as a society, like it is just getting worse*" (WFG2) and expressed

their frustration with the inactions of others who were perceived as older and being more interested in accumulating wealth, "*I think we can do something. It is just, will we? And I don't think we will because people are selfish and they just choose to ignore things if it means they can make big money. They are like, 'I will be dead by then'*" (WFG2).

Students connected this disengagement to **Responsibility** with five responses related to the effectiveness of individual or community actions compared with top-down leadership from government. For example, C1B wrote:

> If our leaders and politicians can't work together and create a solid stance on the matter of climate change, it will be too late to do something by the time they decide if they wish to do something.

Five comments from Class B students were also placed in the **Responsibility** theme. Their focus was on corporations because they believed corporations had the largest impacts and change should be targeted at them, not at individuals. For example, W6B opined, "*... because climate change focus stuff is generally directed at individuals (which it shouldn't be), instead, the source of the problem (big companies and industries) who should be accountable*".

Also captured in this theme were Class B students' comments who felt that corporations were uncaring, not listening, and shirking their responsibilities, such as W5B who thought, "*... most corporations that have the most impacts on climate change do not care*". Another student expressed a cynical view about climate-friendly strategies espoused by corporations saying, "*... a lot of corporations have been trying to be oh look we are doing this it will be better for the climate, but it is mostly green washing, they are not actually really doing much. They are changing little things that don't really matter much. It can be marketed well*" (WFG2). These comments speak to students' realisation that they have little influence over structures such as governmental policies and big corporations, possibly contributing to feelings of low hope.

Class B also discussed **Disappointing decision makers**. Nine comments were linked to critiques of people in power who are not doing enough or else nothing at all. For example, W8B stated, "*I am not satisfied by our government's response, nor that of all the other governments in the world ...*" This type of comment was reiterated as, "*I'm currently doing and researching, like the actual policy and legislation that the government's done and it is still not enough. It's so painful because they have the power to do something and then they are not ...*" (WFG1).

Finally, students from both classes wrote comments that revealed their **Climate anxiety**, including 10 from Class A students (one-third) and 14 from students in Class B (over half). This theme was most dominant in the hope barometer data. Comments within this theme included feeling anxious about one's own future and that of future generations. For instance, C1B said, "*I just want to be alive in 50 years*", and W10B saying, "*I feel like our next generations are going to suffer, in terms of crop extinction, rising sea levels and feeling of being in the dinosaur age.*"

There was also existential angst, with C8B decrying that, "*... not many people even care about climate change, which is very sad because it could be the downfall of this Earth*". Some students thought it was already too late to make a difference. Exemplifying this type of response, C9B said, "*Climate change is very developed and unless we do something soon, the chance to save our planet may be a ship that has sailed.*"

Relationships between constructs

Analysis of the student data gave insights into possible relationships between understanding, agency, and hope.

Greater understanding of climate change seemed to lead students to express **more agency** to address climate change. For example, at the end of the unit, C7B wrote "*... because I understand what small things I can do to influence my own carbon footprint and how they actually relate to the climate*", and W11B commented, "*I believe the more I know, the more I can do to impact on climate change.*"

There was no clear relationship between **understanding** and **hope**. Some students felt more hopeful with more knowledge by the end of the unit, as W8B's comment illustrates: "*Now I know more about the water issue in NZ, I am hopeful that we can make change.*" In contrast, other students felt less hopeful as they learnt more about the effects of climate change. For example, W12B said that, "*getting told a lot of information … it's stressing me out*". Some students felt more anxious, such as W8B who said, "*I have not learnt anything new about how this is good, just bad things*", and W12B stating, "*Learning more means I'm learning how badly the world is doing and how difficult it will be to improve now that everything has gone badly …*" Furthermore, while the students recognised the need to learn about the science of climate change, this understanding itself was a source of anxiety: "*He [paleoecologist speaker] made me less hopeful. He told us how carbon hasn't been this high since before the dinosaur*" (WFG1).

The relationship between **agency** and **hope appeared mutually reinforcing**. This relationship was reflected in the themes that were common in the data of both constructs such as ***Wicked nature of climate change, Being ill-equipped, Being collectively agentic***, and ***Becoming equipped***. It was particularly evident in Class A where, as the students engaged in their projects, they built feelings of agency, which were then (mostly) associated with increased feelings of hope. A total of 19 comments reflected this opinion. For example, C1B said, "*Because the students in our class are working on solutions to climate change and will hopefully be able to educate more of the students at our school about the importance of climate change.*" C10B's comment showed they were thinking beyond their school when they stated, "*… with this assignment … I feel that we have a chance to make a change towards climate change by acting in our local community*".

However, given the small scale of this study and its short duration, further research is needed to explore these relationships.

Teacher perceptions

In her interview following the teaching, Teacher A (Class A) tended to focus on the outcomes of the programme and a global perspective on teaching about climate change. She was impressed with the level of student engagement and learning throughout the programme and said:

> *… a lot of them indicated near the end, that now that they actually know something, they feel like they have enough … some of the kids used the word 'authority', that they themselves have enough authority that they can tell someone else and feel confident they are telling them the right thing. So, I think that really helped them build up the confidence that they could actually go out and use it.*

Teacher A had strong opinions about the importance of teaching about climate change, stating, "*I think if a student goes all the way through education, 13 years of education and they haven't been taught about it, they have a right to be angry, I think that's a disservice to them … I would feel angry if I was an 18-year-old heading out and nobody bothered to teach it.*"

She also recognised the importance of a school modelling climate change mitigation strategies and said, "*… if they go to a school, and they know that nothing's being done, anything sustainably, even if it's got an indirect link to climate change, they'll probably think, 'Well if the school doesn't care about it, why should we?'*"

On the other hand, during the final interview Teacher B (Class B) reflected on what he had learnt about teaching climate change. He discussed how teaching this programme had helped him to understand that the students were interested in more than a science-focused approach. They wanted to know, "*… the what to do about it, the agency stuff …*" While acknowledging his interest in politics, he stated, "*… that sort of stuff, it hasn't been dominant in my teaching before because usually I'm just teaching how chemistry works and how to answer narrow exam questions …*" His comment indicates that he would have liked to have felt more confident when teaching the agency and hope constructs needed in climate change education.

Teacher B showed his awareness of students' climate-related anxiety and the importance of helping students to feel agentic, saying:

> *I'm hoping that the way we approached it with systems-level thinking, the examples we showed them, hopefully that gave students some genuine feelings of agency and that their actions or changes in their behaviour can hopefully have some impact on a climate disruptive future.*

Summary

In summary, the hopeful climate change education programme did have some effect on students' understanding, level of hope, and feelings of agency. Over the programme, students identified that their understanding of the science and effects of climate change deepened, with the younger students reporting more growth in their understanding. The younger students also reported feeling more hopeful and having more agency to mitigate climate change's effects. However, change was less evident in the older students. From the outset, they identified feeling somewhat agentic and their level of hope barely changed.

For the teachers, Teacher A was enthusiastic about teaching climate change and taking an expansive view, regarded its teaching as an imperative for all students. In contrast, Teacher B realised that teaching climate change required going beyond his usual discipline-specific teaching. He also acknowledged that doing so was needed to help students manage their climate-related anxiety.

Implications for educators

The findings from this research suggest several implications for teaching and learning about climate change in secondary schools.

Students need:

- to develop understanding about climate change, particularly scientific, but also about the social, cultural, and economic structures in which people are entangled and how these entanglements impact on managing the effects of climate change at a community, regional, and national scale
- to learn the skills to be individually and collectively agentic towards climate change
- wellbeing support to cope with the climate-related emotions that they are feeling.

Teachers need:

- professional learning in order to engage in the interdisciplinary teaching required
- professional learning in order to support students' climate-related emotions
- to provide opportunities for students to engage in action-taking projects that are meaningful and relevant to their lives.

At a school and policy level:

- age-appropriate resources that support teacher and student knowledge development are needed
- schools need to enable students to engage in action-taking projects
- school counsellors and other support networks might need training to provide support for students' climate-related emotions
- schools need to consider how assessment impacts on the development of understanding, agency, and hope for climate change. For example, if the necessity to complete achievement standards is diverting attention from the development of agency, then consideration needs to be given to how achievement standards could be changed to enhance students' agency to act on the effects of climate change.

Final words

With the effects of climate change already apparent and the level of anxiety these students expressed about their future, there is an urgent need to include effective climate change education that is integrated across classroom learning programmes. While this small study has provided suggestions for approaches and strategies that could enhance students' learning, possibly resulting in them feeling more hopeful about their climate-impacted futures, more research is needed to develop programmes that progressively develop students' learning over their years in formal education.

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