

# Applications of codes of teacher ethics in the context of anthropogenic climate change

Helen J Boon

**To cite this article:** Helen J Boon (16 Nov 2023): Applications of codes of teacher ethics in the context of anthropogenic climate change, Teachers and Teaching, DOI: 10.1080/13540602.2023.2282490

**To link to this article:** <https://doi.org/10.1080/13540602.2023.2282490>



© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.



Published online: 16 Nov 2023.



Submit your article to this journal [↗](#)




View related articles [↗](#)



View Crossmark data [↗](#)

# Applications of codes of teacher ethics in the context of anthropogenic climate change

Helen J Boon 

College of Arts, Society and Education, JCU Townsville, Bebegu Yumba Campus, Douglas, Townsville, AUSTRALIA

## ABSTRACT

Current school students, citizens of the future, will inherit urgent, complex, ethically challenging real world problems affecting social and environmental sustainability, such as anthropogenic climate change. Therefore, they must be prepared at school to understand the diverse issues underpinning anthropogenic climate change so they can make informed decisions at voting age. School teachers charged with this task, require professional ethical sensitivity contiguous to politically laden, complex topics such as climate change. This article documents the ethical dilemmas perceived by 98 final year prospective teachers in teaching about climate change, after the completion of a course on ethical professional practice. Results show three quarters of the prospective teachers in this study perceived ethical dilemmas in the context of teaching about anthropogenic climate change. They rationalised their views based on a range of professional ethical considerations.

## ARTICLE HISTORY

Received 19 May 2022  
Accepted 6 November 2023

## KEYWORDS

Prospective teachers; anthropogenic climate change; ethical dilemma; codes of professional ethics

## Introduction and background

Climate change induced disasters overwhelmed the Rawling (2023) summer in the Northern Hemisphere with global air and ocean temperatures setting new records and fuelling fires across Greece and Italy (Rawling, 2023, Aug 9). Climate change impacts were also felt in Asia; Beijing was hit with its heaviest rainfall in at least 140 years, due to Typhoon Doksuri, while in South Korea, over 20 people were killed by landslides and flooding, as thousands had to be evacuated due to the torrential rain (Rawling, 2023, Aug 9). Since late June, monsoon rain also lashed Pakistan, leading to the death of 91 people (Rawling, 2023, Aug 9), while Juneau, Alaska's capital, experienced the bursting of a glacial dam due to unprecedented flooding (Rawling, 2023, Aug 9th).

Calls to mitigate and adapt to climate change are no longer debatable propositions, advocated only by theoretical scientists, because climate change is all too evident right now. Time for debate is over and urgent attention to this wicked problem is nigh. As a researcher advocating for recognition and mitigation of this wicked problem for the last 20 years, I have been documenting Australians' knowledge and awareness of climate

**CONTACT** Helen J Boon  [Helen.Boon@jcu.edu.au](mailto:Helen.Boon@jcu.edu.au)  College of Arts, Society and Education, JCU Townsville, Bebegu Yumba Campus, Douglas, Building 134:114e, James Cook Drive Townsville, Townsville QLD 4811, AUSTRALIA

© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

change in the hope of raising consciousness and mobilising action. My focus has been especially directed to teachers' awareness and knowledge since they are important conduits of knowledge about this urgent problem. Like other educators I believe and trust that all education is transformative (Public Universities Australia (2023).

Along with other researchers in the field, I consider it an ethical imperative to assist current and future generations to mitigate and adapt to deleterious climate change consequences. This ethical imperative emerges from notions of intergenerational justice—what do we, current generations, owe to future generations? (Byskov et al., 2021). Therefore, I have long deemed the role of education to be critical in this endeavour through teachers' agency and ethical imperatives. In order to support teachers' role in mitigating climate change we must support teachers' agency, that is, their confidence, knowledge, and skills to do this, and their awareness of their professional ethics, values and responsibilities.

Individuals across all professions access systems of ethics to clarify their beliefs and attitudes and guide their behaviour (Rennie, 2015). Teachers' professional behaviour is no exception. Moreover, so that they can fulfil societal expectations, including the promotion of respect, human rights, equity and sustainability (e.g. Bamber, 2019; Byker & Ezelle-Thomas, 2021; Cho & Gay, 2022) teachers are expected to be guided in their professional practice by thorough understandings of professional and personal ethical reasoning and decision-making (Arthur, 2010; Bullough, 2011; Campbell, 2008; Hansen, 2001),

Typically, teachers make instructional and pedagogical decisions that support views on what is good and ethical teaching. However, teachers' own values may diverge from those expressed within their communities, resulting in ethical dilemmas (Ball, 2003), which can precipitate differing responses to similar situations. Unsurprisingly, in reviewing 22 articles from *Teaching and Teacher Education*, Bullough (2011) found that teachers conceptualised and reacted to ethical dilemmas in individualised ways, demonstrating differing levels of ethical sensitivity. Some teachers' ethical decisions about appropriate action were based on personal ethics and life experiences, others were based on social or institutional norms, leading them to espouse a wide range of ethical perspectives (Bullough, 2011).

Teachers' daily professional conduct ranges from pedagogical deliberations from how to deliver the curriculum through to personal reflections about how best to deal with unethical behaviour of members of the school community. The importance and potential ramifications of teachers' professional conduct led Biesta (2012) to argue that teacher judgements must be based on virtuosity and a deep study of ethics to ensure the wisest outcomes. The influence of Biesta (2012) and others (e.g. Boon, 2011, 2018; Boon & Maxwell, 2016; Campbell, 2008; Carr, 2006) has led to the introduction of ethics courses in Australian preservice teacher (PST) programs.

The study of ethics, now mandated in Australia, means that all higher education institutions must provide in their initial teacher education degrees courses that cover all aspects of the seven Australian Professional Standards for Teachers (APST), which include professional ethics (Australian Institute for Teaching and School Leadership Australian Institute for Teaching and School Leadership (AITSL) (2013). These courses, which can either be standalone or integral to professional experience units, offer opportunities to prospective teachers to engage in dialogue and reflection around ethical

dilemmas arising in classrooms and school communities, so they are better prepared upon appointment as qualified teachers. Universities in Australia vary in their approach to offering professional ethics instruction; courses might include ethical philosophy, or professional codes of ethics might just be threaded through other units of work, for example linked to developmental science or school placement courses. It is of note that up until 2016 there was a paucity of required standalone ethics courses in teacher education degrees in Australia and elsewhere (Boon & Maxwell, 2016).

The inclusion of ethics education in teacher education degree programs to refine teachers' ethical understanding is timely. This is because teaching is inherently dilemmatic, due to its complex, sometimes ambiguous nature (Cabaroglu & Tillema, 2011; Enyedy et al., 2006; Kelchtermans, 2009; Scager et al., 2017), and also because teachers' instructional decisions can shape future generations' understanding of urgent socially sensitive and politically laden topics, or complex 'wicked problems'. 'wicked problems', a term coined by Rittel and Webber (1973) to describe global environmental and social problems (Glenn et al., 2016) such as climate change, food insecurity and overpopulation, are issues teachers can explicate to empower future generations for global citizenship, environmental stewardship, and activism through their professional practice and instructional decisions (Davies et al., 2019).

In relation to climate change, a particularly urgent (IPCC, V et al., 2021) 'wicked problem', teachers' influence is crucial since education is pivotal in helping to ameliorate its impact (UNESCO, 2019). As the most trusted sources of climate change communication (Ashworth et al., 2011) teachers play an important role in empowering future generations for global citizenship. Teachers can and must empower future generations to ameliorate or mitigate global environmental and social problems by helping students to be accurately informed about issues that will impact upon their future survival and wellbeing. Tzaberis et al. (2014) argued that education on environmental issues has the power to establishing a new ethical consciousness that can alter the current materialistic drive which has led to the generation of several 'wicked problems'.

However, teachers experience ethical dilemmas when confronted by 'wicked problems' (Borgerding & Dagistan, 2018). This is because solutions to wicked problems are not true or false; every 'wicked problem' is a symptom of another problem, it can be explained in numerous ways, with the solution depending on the explanation assigned to the problem (Lavery, 2018). Therefore, decisions teachers make around the delivery of curriculum in the context of 'wicked problems' are not only complex, requiring breadth of knowledge and understanding, but also ethically challenging, creating ethical dilemmas depending on individual teacher's personal beliefs and values.

For example, as far as anthropogenic climate change is concerned, several aspects of climate change make it a challenging topic to teach. It is conceptually difficult for students because it involves abstract, non-visible chemical/physical mechanisms, it occurs over extended periods of time, and requires 'systems thinking', the ability to consider the complex interactions of a range of systems. This is true of high school students as well as prospective teachers (Boon, 2010).

Evidence of several commonly held misconceptions (Ranney & Clark, 2016) highlights limited understanding of the chemical and physical processes responsible for climate change, 'the greenhouse effect'. For instance, weather and climate are conflated, such that people rely upon their day-to-day experiences of weather, remembering a day that was

cold as evidence to the more long-term effects of climate change (Lombardi & Sinatra, 2012). People also incorrectly think visible atmospheric phenomena, smog or pollution, lead to climate change, whereas many of the central mechanisms involved in the greenhouse effect are not visible to the human eye (Koulaidis & Christidou, 1999). Crucially too, media and political posturing serves to make people believe that the cause of climate change is a disputed topic, one involving an ongoing debate between groups in the scientific community (Howe et al., 2015) when there is global consensus on the matter (IPCC, V et al., 2021).

When misconceptions and disbelief about the causes of climate change persist (Chang & Pascua, 2016; Pascua & Chang, 2015) teachers might only impart factual information about climate science, that is the processes of the greenhouse effect, without adding that emissions from human activity have been creating higher concentrations of carbon dioxide in the atmosphere in the last one hundred plus years. To date, evidence has shown that when climate change education takes place it still focuses on teaching school students the scientific rather than the social dimensions of climate change together with the scientific/technological rather than political or social solutions (Jones & Davison, 2021; Trott, 2022). Alternative approaches might focus on trying to develop critical thinking skills in their students so they can understand the sources of conflict about climate change (Monroe et al., 2019). Some might present activities that acknowledge the psychosocial and ethical aspects of climate change (Brownlee et al., 2013; Grady-Benson & Sarathy, 2015). The distinction between teaching the curriculum, the facts, or/and also adaptation and mitigating actions, highlights that teachers see a fundamental science topic, i.e. climate change, as political, hence an ethical issue, perhaps too close to advocacy for classroom teachers to address. Because of the politicised public debate around climate change, teachers may fear accusations of political indoctrination, creating for them an ethical dilemma that prevents them from encouraging students to accept, and act on, climate science (Kissling & Bell, 2020). Such fears can lead to teaching ‘both sides’ of the debate in neutral a manner (Colston & Vadjunec, 2015) with the unintended effect of diminishing the urgency and validity of this no longer equivocal ‘wicked problem’.

Perceived uncertainty about the causes of climate change can generate ethical dilemmas and stumbling blocks to action to remediate its impacts. Over a decade ago Dauer et al. (2011) citing Moore and Nelson (2011) urged that ethical reasoning and motivation is the missing link between knowledge and action in relation to climate change. They argued that society has not acted to avert the harms of climate change because the affirmation of moral responsibilities has been missing from public discourse.

No amount of factual information will tell us what we ought to do. For that, we need moral convictions—ideas about what it is to act rightly in the world, what it is to be good or just, and the determination to do what is right. Facts and moral convictions together can help us understand what we ought to do—something neither alone can do (Moore & Nelson, 2011, xvii).

Disconnects between knowledge and moral considerations regularly occur in teaching. A review focused on teachers’ perceptions and challenges in teaching a range of socio-scientific topics such as climate change identified 25 empirical studies published between 2004 and 2019 (Chen & Xiao, 2021). The findings of the review showed that many

teachers feel inadequately equipped to teach these topics when they overlap with ethical issues.

Since children and young people who are particularly vulnerable to the impacts of climate change (Burke et al., 2018), will inherit increasingly deleterious climate change impacts (IPCC, V et al., 2021), teachers have an obligation to assist school students to make reasoned adaptation and mitigation decisions. Given the likely ethical challenges that teachers face when teaching about anthropogenic climate change, partly because of the emotions this topic has been shown to raise (Trott, 2022; Wong-Parodi & Feygina, 2021) it is fair to ask if the introduction of an ethics course in a teacher education program, coupled with the formalised study of professional codes of ethics, can assist teachers' pedagogical deliberations in the context of teaching school children about anthropogenic climate change.

## Aims

This paper reports on an exploration of final year prospective teachers' understanding and use of codes of ethics to justify their views in the context of teaching about anthropogenic climate change after they completed a semester long course on ethics and professional agency. The course comprised of, and explicated, professional ethics, ethical theories such as deontology, teleology, virtue ethics and relativism, and a range of ethical decision-making models, including Rest's Four Component Model of Ethical Decision Making, to guide their deliberations across a number of scenarios commonly encountered in professional practice and likely to raise an ethical dilemma.

The course completed by the prospective teachers consisted of nine distinct overarching topics designed to develop their ethical sensitivities and understanding in their transition to the profession and enhance their perceived agency in their future role as classroom teachers. The course focused on developing professional ethics, agency and philosophy of teaching through the analysis of authentic school-based scenarios. A considerable time was spent on unpacking ethical theories to allow prospective teachers to examine their personal ethics, to help them understand with which theory their personal ethics were most congruent, for example, deontology, virtue ethics and so on. A number of complex ethics and judgement frameworks were used through the course to identify sources of knowledge, and resources, to guide responsive, informed, expert decision making in relation to professional practice. Prospective teachers also discussed a range of 'wicked problems' currently identified as of concern, such as climate change, overpopulation, water and food security, poverty, as well as power generation. During this process, prospective teachers applied ethical philosophy, deontological, utilitarian, and virtue ethics as well as relativism, to analyse their responses to scenarios, to understand how their own values, morality and beliefs interact with situational contingencies and other actors' perspectives to derive most appropriate solutions to professional ethical dilemmas.

A range of ethical decision-making models were examined throughout the duration of the course, mostly derived from Kohlberg's model of ethical development (Kohlberg, 1984), with Rest's Four Component Model (Rest, 1986) the preferred reference model. This model, with its four distinct stages of ethical reasoning, was frequently used during

instruction to analyse scenarios to help prospective teachers clarify their deliberations around their decisions and behaviour. The four components are:

- (1) Ethical sensitivity, which refers to the interpretation of a particular situation, recognition of the ethical issue(s), awareness of the possible actions and the effect on the parties concerned.
- (2) Ethical reasoning and judgement, which is about which course of action is ethically justifiable (i.e. what ought to be done).
- (3) Ethical motivation and commitment, which refers to integrating the values of one's professional discipline with one's own personal values (identity formation) and prioritising professional values over personal ones (showing moral motivation and commitment).
- (4) Engaging in ethical behaviour, which refers to perseverance, competence and courage to follow through on one's intention (i.e. implementing the chosen course of action).

Throughout the teaching of the course, teachers' leadership role in facilitating individual, class, and whole of school improvement was consistently emphasised with the Code of Ethics for Teachers in Queensland (Queensland College of Teachers., n.d.). Teacher leadership was used repeatedly to professionally situate scenarios and assist prospective teachers to filter their reasoning, justify their reflections and identify their agency.

Much like codes of ethics described in international studies, teacher codes of ethics in Australia focus on evaluating and choosing desirable responses and actions associated with human rights and responsibilities for other people. Ethical dimensions of teachers' practice identified in diverse earlier studies are: (1) care for students' learning and well-being, (2) professionalism, (3) collegial relationships, (4) adherence to the law, school rules and students' rights, and (5) respect for parents and school community members (Shapira-Lishchinsky, 2019).

Reflecting international codes of ethics, the Code of Ethics for Teachers in Queensland (Queensland College of Teachers., n.d.) consists of six overarching expected professional behaviours based on demonstrating particular values. Hence the tenets of the Code are prefaced by 'We demonstrate . . .':

**Integrity** by: creating and maintaining appropriate professional relationships acting with impartiality, truthfulness and honesty.

**Dignity** by: valuing diversity and treating students equitably and with care and compassion while respecting the uniqueness of family backgrounds valuing the effort and potential, and acknowledging the uniqueness, of each student.

**Responsibility** by: giving priority to the education and welfare of all students in our care engaging in ongoing professional development and improving teaching and learning strategies working collaboratively and cooperatively with colleagues in the best interests of the education and welfare of our students.

**Respect** by: acknowledging that relationships with students and their families must be based on mutual respect, trust and, where necessary, confidentiality and acknowledging the contribution these qualities make to students' wellbeing and learning acting with educational colleagues and the wider community in ways which enhance the profession.

**Justice** by: being fair and reasonable being committed to the wellbeing of individuals and the community and to the common good resolving competing claims of different ethical principles and different interest groups through reflective professional discussion.

**Care** by: having empathy for and rapport with students and their families and caregivers, colleagues and communities committing to students' wellbeing and learning through the practice of positive influence, professional judgement and empathy in practice.

## Participants

Data was obtained from a number of final year prospective teachers enrolled in a 4 year Bachelor of Education degree ( $N = 98$ ), comprising primary/elementary education specialists and secondary/high school education specialists after all ethical considerations were met as determined by the university to allow for their responses to be analysed. These prospective teachers attended and completed a mandated ethics course as part of their final year of a Bachelor of Education degree. The course was designed by the author several years earlier as part of the degree's reaccreditation requirements to assist prospective teachers to better understand their agency, that is, their confidence and skills in the realm of their profession, along with their professional ethical responsibilities. As described above, the course included several ethical reasoning frameworks to enable students to tease out their ethical reasoning and to help them anticipate how their proposed actions might influence their school community members including their students. Participants' average age was 23, as most had started their degrees immediately after completing their secondary schooling. The participants comprised 64 primary/elementary specialists and 34 secondary/high school specialists.

## Data collection

All data was collected through online written reflective statements completed for an assessment item at the conclusion of the course. Prospective teachers were instructed to respond to the following situation as part of their assessment in the subject:

Imagine you are involved in teaching about anthropogenic climate change in the context of your teaching.

- (1) Would teaching about anthropogenic climate change constitute an ethical dilemma for you?
- (2) Describe why, or why not, and justify your answer by referring as appropriate to the QCT code of ethics.

The research approach followed an explanatory sequential method. It involved the use of a quantitative and content analysis interpretive approach to inform the study (Creswell & Poth, 2016) as this research method was deemed most suitable to address the research aims. Two independent researchers conducted the analyses. After tabulating respondents' answers according to whether an ethical dilemma was declared by them to obtain a quantitative overall rate of ethical dilemmas experienced, a qualitative content analysis of the extended answers was conducted to understand the ethical reasoning behind each



**Table 1.** Participant gender and specialist areas ( $N = 98$ ).

| GENDER | SPECIALIST AREA |       |         |       |
|--------|-----------------|-------|---------|-------|
|        | Secondary       |       | Primary |       |
|        | N               | N %   | N       | N %   |
| Male   | 14              | 41.2% | 12      | 18.7% |
| Female | 20              | 58.8% | 52      | 81.3% |

response. Through the qualitative analyses, we interpreted and categorised prospective teachers' responses according to the code of ethics each prospective teacher identified as guiding their reasoning and views. In this way, we systematically categorised prospective teachers' responses around the QCT Code of Teacher Ethics. This provided a lens with which to explore prospective teachers' understanding of the ethical contingencies they believed they would face in teaching about anthropogenic climate change, and gave us a glimpse of their ethical reasoning around the QCT Code of Teacher Ethics.

In summary, prospective teachers' data were organised and categorised and then read multiple times to ensure that their intent and meaning was accurately captured. Finally, a list of notable or representative statements was compiled to illustrate prospective teachers' understanding and perspectives (Creswell & Poth, 2016).

## Results

Table 1 documents the participants' gender and specialist areas. As is characteristic of teaching cohorts generally the majority of the participants across both specialisations were female.

Table 2 details the majors that the two groups of specialists were enrolled in. Primary specialists comprised of generalist and some HPE (Health and Physical Education) and science specialists. Secondary specialists major in two learning areas.

The first step in the analysis was to assess whether prospective teachers considered that the teaching of anthropogenic climate change presented them

**Table 2.** Contains participants' majors within their specialist areas ( $N = 98$ ).

| PRIMARY SPECIALISTS | N  | N (%) | SECONDARY SPECIALISTS      |    |       |
|---------------------|----|-------|----------------------------|----|-------|
|                     |    |       |                            | N  | N (%) |
| General             | 50 | 78.1  | Science/Maths              | 7  | 20.6  |
| HPE                 | 8  | 12.5  | English/Humanities/Various | 14 | 41.2  |
| Science             | 6  | 9.4   | HPE/Various                | 10 | 29.4  |
|                     |    |       | Geography/History          | 3  | 8.8   |
| Total               | 64 | 100   |                            | 34 | 100   |

**Table 3.** Prospective teachers' ethical perspectives around teaching about anthropogenic climate change by specialist area ( $N = 98$ ).

|                          |     | SPECIALIST AREA       |      |                    |      |
|--------------------------|-----|-----------------------|------|--------------------|------|
|                          |     | Secondary/High school |      | Primary/Elementary |      |
|                          |     | N=34                  | N %  | N=64               | N %  |
| IS IT AN ETHICAL DILEMMA | YES | 26                    | 76.5 | 50                 | 78.0 |
|                          | NO  | 8                     | 23.5 | 14                 | 22.0 |

**Table 4.** QCT code of ethics selected for justification of position by PST specialist area (N = 98).

| QCT code of ethics to justify response | SPECIALIST AREA               |      |          |      |                            |      |           |      |
|--|-------------------------------|------|----------|------|----------------------------|------|-----------|------|
|  | Secondary/high school (N= 34) |      |          |      | Primary/elementary (N= 64) |      |           |      |
|  | IS IT AN ETHICAL DILEMMA      |      |          |      | IS IT AN ETHICAL DILEMMA   |      |           |      |
|  | YES (N=26)                    |      | NO (N=8) |      | YES (N=50)                 |      | NO (N=14) |      |
| N                                      | N %                           | N    | N %      | N    | N %                        | N    | N %       |      |
| CARE                                   | 5                             | 19.2 | 0        | 0.0  | 7                          | 14.0 | 1         | 7.1  |
| RESPECT                                | 3                             | 11.5 | 1        | 12.5 | 3                          | 6.0  | 0         | 0.0  |
| INTEGRITY                              | 6                             | 23.1 | 1        | 12.5 | 6                          | 12.0 | 4         | 28.6 |
| RESPONSIBILITY                         | 2                             | 7.7  | 6        | 75.0 | 0                          | 0    | 9         | 64.3 |
| JUSTICE                                | 0                             | 0.0  | 0        | 0.0  | 1                          | 2.0  | 0         | 0.0  |
| DIGNITY                                | 7                             | 26.9 | 0        | 0.0  | 33                         | 66.0 | 0         | 0.0  |
| CARE AND RESPECT                       | 3                             | 11.5 | 0        | 0.0  | 0                          | 0.0  | 0         | 0.0  |

with an ethical dilemma. This was accomplished by examining the two cohorts of specialists separately. The results of this stage of the analyses are presented in Table 3. Overall, over three quarters of all participants, determined that the teaching of anthropogenic climate change would present them with an ethical dilemma.

Next, prospective teachers' rationale to justify their decision was examined, by compiling the code of ethics they cited from the Queensland Code of Teacher Ethics (Table 4). Those who saw no ethical dilemma in teaching about anthropogenic climate predominantly cited *responsibility* as their professional duty determining their decision, with a handful also citing *integrity* as influential.

Prospective teachers who reported an ethical dilemma in having to teach this topic cited a diverse range of reasons and codes of ethics. Demonstrating *dignity* most often underpinned their ethical dilemma (40 prospective teachers or 40% of participants), being an important consideration in their cautiousness around the teaching of anthropogenic climate change (Table 4), with some prospective teachers citing *integrity* and *care* (24 prospective teachers or a quarter of the participants). The analysis of the extended responses underpinning these results evidenced varied understanding of each of the values underpinning the Queensland Code of Teacher Ethics across the two cohorts.

### Rationales for no perceived ethical dilemmas in teaching anthropogenic climate change

The majority of secondary and primary specialists (75% and 64.3%, respectively) who saw no ethical dilemma arising would tackle the topic in the classroom unreservedly, citing *responsibility* as the justification for their views. Moreover, these prospective teachers explained they considered the cause of climate change to be unequivocally and largely anthropogenic. Their reasons for teaching the topic in the classroom were based on their duty to help future generations to better understand the causes of climate change so that they can adapt and mitigate its impacts. They saw this as their professional *responsibility*.

*Responsibility* as a reason for the absence of an ethical dilemma in the teaching of this topic:

For example:

... we have a responsibility to students. This responsibility is for the education and welfare of our students, therefore if we were not to teach about man-made climate change students would be ill-equipped when they become of age citizens. **Secondary specialist.**

I am aware that the concept of man-made climate change could be considered controversial in some spheres of society, however, according to an overwhelming amount of scientific research, anthropogenic climate change is real, and my personal beliefs are aligned with this scientific research. I believe it is my ethical duty and responsibility to teach the topic to the best of my ability and as accurately as I possibly can. **Secondary specialist.**

Prospective teachers also showed an understanding of the ethical sensitivities around the matter, applying Rest's Four Component Model, along with the application of the QCT Code of Teacher Ethics when citing *responsibility* as a professional driver in the context:

"Teaching about anthropogenic climate change does not constitute an ethical dilemma; however, the way it is taught does ... teachers should demonstrate responsibility by 'giving priority to the education' of our students. Nonetheless, the method of teaching this topic presents a dilemma. It should be taught as factually as possible, explaining the current scientific evidence (this fulfils our responsibility to act in the best interests of the students' education). Conversely, students from various backgrounds may hold beliefs against anthropogenic climate change, and it is important to teach in a respectful way, demonstrating sensitivity'. **Primary/elementary specialist.**

And:

... ethical concerns arise when encountering those who work in areas that cause anthropogenic climate change. When teaching ... I would express my passion about saving our earth ... I would endeavour to provide learning experiences so that students are able to form their own opinions to assist them in developing their own agency in how they can change their world for the benefit of their future and the future generations. **Primary/elementary specialist.**

It is of interest that *Integrity*, in the sense that prospective teachers should act with impartiality and honesty, was cited by 5 prospective teachers (5%) as a reason for the absence of an ethical dilemma in teaching this topic:

... students must understand that they are involved in climate change and accept that they unknowingly contribute to the problem. This may be confronting but students must be confronted in order to cause positive change ... the QCT code of ethics mandates that teachers must display integrity by acting with impartiality, truthfulness and honesty. **Primary/elementary specialist.**

One prospective teacher cited *care* as the primary reason for being compelled to teach about anthropogenic climate change. They stated that helping students face the impact of climate change demonstrated care for them.

To demonstrate high ethical behaviour in the school community, teachers must practice and demonstrate care by aiming to be a positive influence. Educating students how to reduce climate change at home is demonstrating care. **Primary/elementary specialist.**

Nevertheless, an acceptance of the anthropogenic nature of climate change did not preclude prospective teachers from experiencing an ethical dilemma when contemplating teaching about anthropogenic climate change. Ethical sensitivity is evident in the

reasoning and the range of professional QCT codes that would be employed in teaching this topic:

On one hand teachers maintain professional integrity, through acting impartially, truthfully and honestly in informing students of the researched understandings of climate change, and its impact on them and their families' immediate futures. Further ethical considerations include dignity, (specifically family backgrounds, for example they could be fourth generation graziers), respect (strained relationships with families and wider community), and justice (wellbeing of individuals and community, while trying to resolve competing claims of differing ethical principles). **Primary/elementary specialist.**

This reflection illustrates ethical sensitivity around the complexities involved in ethical reasoning in the context of teaching about anthropogenic climate change while acceding to the view that the causes of climate change are incontrovertible. A succinctly summarised perspective showing ethical sensitivity and understanding of the range of ethical responsibilities was found in the response of another prospective teacher:

... teaching about anthropogenic climate change should not cause an ethical dilemma. As long as the teacher demonstrates integrity (by maintaining appropriate relationships), dignity (by valuing diversity and treating students equitably), justice (be being fair and reasonable) and care (by having empathy for and rapport with students), there is no reason for an ethical dilemma to occur. **Primary/elementary specialist.**

### **Rationales for a perceived ethical dilemma in teaching anthropogenic climate change**

The prospective teachers who felt that teaching this topic would lead to an ethical dilemma stated they would avoid teaching it for a range of reasons. Unpacking their rationales showed diverse ethical reasoning. That is, various tenets of the Queensland code of ethics were cited in a range of ways to support prospective teachers' perspectives around the matter in question.

On the evidence of their responses, this group largely appeared to contest the consensus on the causes of climate change, thus the term anthropogenic was equivocal. For example, a demonstration of *integrity*, which is supposed to show acting with impartiality, truthfulness and honesty, was the leading reason an ethical dilemma was generated, since teaching anthropogenic climate change:

... offers a one-sided view and does not discuss natural causes of climate change. As both natural and anthropogenic influences impact the severity and progression of climate change, it would be imperative to teach about both. **Primary/elementary specialist.**

Of particular interest was a response of a science specialist who thought that there would be an element of indoctrination in their teaching if they taught about anthropogenic climate change, reflecting prior research findings (Kissling & Bell, 2020) perhaps suggesting that ethical relativism might influence their ethical reasoning.

... I could bring in personal bias and opinion, influencing the students' perspectives on the topic. If I bring in personal opinions to my teaching I cannot demonstrate integrity as I will not be acting with impartiality, truthfulness and honesty. **Science specialist.**

The above cases show that the prospective teachers believe there are multiple (correct) perspectives around the causes of climate change and therefore they would not demonstrate *integrity*, defined by impartiality truthfulness and honesty in the Queensland Code of Ethics, if they did not teach all views relating to this topic.

When calling upon *dignity*, interpreted as valuing diversity and treating students equitably and with care and compassion while respecting the uniqueness of family backgrounds, as the reason for experiencing an ethical dilemma in teaching anthropogenic climate change a wide range of considerations were mentioned, often entangled with concerns about arousing negative emotions in the students:

... .because responsibility, blame, future obligation may arouse conflicting moral thinking... due to aspects of diversity... **Primary/elementary specialist.**

Or concerns about students' families' religious beliefs and how they might impact upon any discussion about anthropogenic climate change:

... a teacher must value the diversity of students and their backgrounds as some students would have religious beliefs which may contradict the belief it is anthropogenic ... **Secondary specialist.**

Those who cited *care* as a reason for an ethical dilemma arising were also mainly concerned about how their students might feel, or react, about contributing to climate change:

... *don't make children feel bad about contributing to climate change.* **Primary/elementary specialist.**

... teachers need to be wary ... tensions may also arise between students who have differing opinions about climate change most commonly from family influences. **Secondary specialist.**

Demonstrating care for student wellbeing tramped the acknowledgement of the veracity of anthropogenic climate change; suggesting the concern for students' current wellbeing being considered more important than their long-term wellbeing in a climate change impacted Earth.

Everyone is aware climate change is happening, especially because it's made by mining and factories. If students' parents work in factories or mines, it is important to be cautious about saying so ... **Secondary specialist.**

Prospective teachers' understanding of *respect*, whose intent is to help teachers' relationships with students and their families, based on mutual respect, trust and, where necessary, confidentiality and acknowledging the contribution these qualities make to students' wellbeing and learning as an ethical imperative, was sometimes conflated with what might be covered under the code of *dignity*:

Many people are defensive about whether climate change is real, and in a classroom, if the students are old enough, it will also become a topic of debate. Respect, which is a part of the QCT code of ethics, is not upheld if we are purposefully teaching something that goes against the opinions of our students and families. **Primary/elementary specialist.**

## Discussion

The aim of this study was to explore prospective teachers' perceptions, understanding and use of codes of professional ethics in the context of teaching about anthropogenic climate change after being immersed in an ethics course designed to help them analyse their ethical reasoning and justify their views. The results of this short study indicate that ethical considerations around the teaching of anthropogenic climate change present difficulties for the majority of prospective teachers, possibly because of a heightened ethical sensitivity as a result of the influence of the ethics course. Furthermore, their reasoning appears to be variously influenced by the Queensland professional code of ethics, further moderated by their beliefs about climate change and its causes.

This small sample of prospective teachers expressed much concern to ensure they demonstrate value for student diversity, including their students' family circumstances, employment contexts and religious inclinations. This was particularly evident in the elementary/primary school specialists. Valuing student diversity, the student's family circumstances, employment contexts and religion, were considered by almost three quarters of this sample of prospective teachers to be most critical when deliberating whether they should teach their students about anthropogenic climate change.

These sorts of teacher considerations have been previously reported in the USA (Borgerding & Dagistan, 2018). In their study, Borgerding and Dagistan (2018) found that prospective teachers were not able to distinguish between societally denied science, scientific issues that have reached widespread consensus but remain nonetheless rejected by segments of society, and socio-scientific issues, that is societal issues that have a strong scientific basis as well as ethical, political, or religious dimensions. As the present study is the first one based in the Australian context to explore prospective teachers' views around the ethical contingencies of teaching anthropogenic climate change, it is uncertain how prevalent these results are in Australia at this time. The focus on student diversity via dignity as the main code of ethics to guide prospective teachers' teaching about anthropogenic climate change is perhaps inevitable given the priority that Australian Professional Standards for Teachers (AITSL, 2013) have assigned to issues of diversity and inclusion within education degrees.

Yet the results of this study are surprising given the events of late November 2018, when thousands of Australian school students went on strike, held rallies across Australia, to protest about lack of governmental action on climate change, and gave the government a 'Fail' on climate action, ethics and responsibility (Australian students defy PM with climate protests SBS News, 2018). Clearly, those prospective teachers whose personal views aligned with the scientific consensus on climate change and its causes, only a quarter of the sample, were unequivocal about their responsibility around teaching about anthropogenic climate change. Yet, concern about student welfare, in the here and now, rather than the future, was noted even by science specialists who endorsed the anthropogenic nature of climate change. They felt that:

Yes, teaching about anthropogenic climate change can constitute an ethical dilemma for secondary teachers depending on the context of the school. And The first element of

responsibility is giving priority to the welfare of all students in our care. **Secondary science specialists.**

This fear of raising unpleasant emotions and reactions from the students and their families when teaching about climate change is also widely reported in the literature, especially in the United States (e.g. Trott, 2022; Wong-Parodi & Feygina, 2021). It seems that understandings of student welfare are limited, focused on the present. The idea of giving priority to students' education for their future safety and wellbeing appears to be differentially understood across this cohort of prospective teachers. Preparation for the impacts of climate change, potentially critical education for the future survival of their students is not considered as important as preserving their present wellbeing, a surprising response given the science specialisation of some of these prospective teachers. Interestingly, what the participants of this study were clearly unaware of, is that when a strong emotional response is elicited through the teaching of climate change children have been shown to acquire stronger pro-environmental attitudes, a deeper respect for nature, and a greater sense of urgency towards the need for climate action (Trott 2022) also found that children's fear, worry and other negative emotions are mitigated by hope and optimism grounded in youth-led climate activism in community contexts. Other researchers working with adults in the United States also report that experiencing negative emotion increased acceptance of, concern about, and willingness to take action on climate change (Wong-Parodi & Feygina, 2021).

Perhaps as has been reported before in the USA with science prospective teachers (Borgerding & Dagistan, 2018) the majority of the prospective teachers in this study, even science specialists, believe that climate change is still a controversial, disputed topic.

Alternatively, as was recently reported in a US study (Nation & Feldman, 2021) while teachers have strong beliefs about the anthropogenic causes and implications of climate change, and a genuine concern for future generations, the perceived controversial nature of the topic, political climate, and resistance from a range of stakeholders represses teachers from openly stating these beliefs in their classrooms. Earlier scholars (Lemke, 2001) reflecting on sociocultural perspectives proposed that individuals' beliefs are interwoven with practices related to the community they are associated with. In the case of this study's results the effects of the community makeup with its large mining population may have been an important factor in generating considerations about diversity.

It is also possible that for some prospective teachers, the general descriptors of the Queensland Code of Ethics for Teachers do provide enough direction and clarity about what is exactly meant by, for example, the phrase: 'Giving priority to the education and welfare of all students in our care', a key descriptor of 'Responsibility'. Perhaps it leaves its interpretation to be decided by the teacher in charge, based on the contingencies of the context and their personal ethics and beliefs about appropriate professional practice. Another ambiguous code descriptor that leads to opposing views around the teaching of climate change was 'Integrity'. Integrity was cited as leading to a dilemma in teaching climate change by some respondents and no dilemma by others.

With respect to ethical sensitivity, as defined and practiced through Rest's Four Component Framework, this group of prospective teachers were careful to unpack the ethical contingencies embedded in the teaching of this topic and relating them to the

Queensland Code of Ethics. Many of these prospective teachers also endorsed the anthropogenic causes of climate change.

Climate change is a phenomenon empirically observed. It is also a complex socio-scientific issue, a ‘wicked problem’, whose causes and solutions demand more engagement than merely the teaching of scientific content. The very complexity of the problem, its ethical contingencies based on the latest scientific understanding of its anthropogenic causes (IPCC, V et al., 2021), means it is best addressed in the classroom by allowing all students to explore the nature of the problem, to discuss and debate appropriate pathways forward and take positive actions. The diversity of views that may be present in the classroom is the very reason to pursue its teaching, it is this reason that it is teachers’ *responsibility* to inform students and allow the various voices to be heard and for debate to ensue. As a study of Singapore teachers reported (Seow & Ho, 2016) teachers who introduce controversy into the teaching of climate change did so because they believed the purpose of climate change education should develop students’ critical thinking skills, so students are better able to make logically justified decisions.

Although it was evident from participant responses whether or not they believed in the anthropogenic causes of climate change, the number of who did not gives rise for concern given the urgent need for climate action (IPCC, V et al., 2021). It is important for the Bachelor of Education curriculum to help prospective teachers understand that to present climate change science in what they see as an unbiased way, actually results in a bias that supports unscientific beliefs of climate change deniers (Nation & Feldman, 2021). Ho and Seow (2017) and Davies et al. (2019) propose initial teacher education should help teachers address the complex dimensions of climate change outside of their comfort zones to help prospective teachers to be able to challenge traditional subject-matter curricula and assessment methods. Moreover if the urgency of climate change amelioration is to be addressed the Australian National Curriculum needs to more forcibly and explicitly mandate the teaching of climate change. Explicit links to the topic of climate change in the Australian National Curriculum are found within the senior secondary (Years 11 and 12) and secondary (Years 7 to 10) Humanities, Geography and Science learning areas (Chemistry, Physics, Biology, Earth and Environmental Science), and in primary school years 2, 3, 5 and 6 through the HASS (humanities and social work) curriculum, with some compulsory and some elaboration units to be used with discretion according to the context of the school and year group. Climate change education in the Australian National Curriculum is also meant to be threaded through the cross-curriculum priority of Sustainability. This priority is intended to serve as a vehicle for students to develop the knowledge, skills and values required to sustain patterns of living that enable Earth’s capacity to maintain life. Yet the most recent update to the Australian National Curriculum still neglects to include climate change education in other influential learning areas such as English and the arts. Additional opportunities, should teachers and schools choose to use them, exist to elaborate this critical topic through what the Australian national curriculum refers to as ‘elaborations’ whereby particular skills and understandings can be enhanced. For example, the concept of systems can be taught through the study of climate change showing the interdependence of Earth’s systems, the atmosphere, biosphere and so on, and their role in support of all life on Earth including social and economic aspects. However,



school and teacher priorities currently in place in Australia imposing a very crowded curriculum prevent the teaching of climate change and likely add to the uncertainty faced by classroom teachers. As Irwin (2020) argues the climate crisis has not only been ignored in the political space, but also ignored by the educational establishment, even in the face of school students' climate change strikes. The currently mandated Australian National Curriculum is largely unaffected by climate awareness.

Findings of this study serve to consider the relative impacts of the various parts of the ethics course. Granted that prospective teachers' ethical sensitivities will always be enmeshed with their personal beliefs and values, borne out of cultural influences that emanate from their homes and communities; nonetheless, professional codes of ethics need to be better explicated by the bodies who are responsible for their codification, to prevent prospective teachers, and likely practicing teachers, from conflating the various tenets. Prospective teachers and teachers in general need a professional code of ethics that is largely unambiguous. One that helps all teachers to exercise their agency and to be clear about their professional responsibilities not only around the teaching of climate change but also on how to approach education about health, obesity, drug education, pollution, nuclear power and other important matters that affect the young and future generations. Young people who will be the citizens of the future with powers to vote on important tissues need to be able to make critical decisions and be able to distinguish accurate information from mis- and dis-information that might assail them, as was evident through the recent COVID pandemic.

Higher education institutions can support prospective teachers and the community at large in the face of anthropogenic climate change. As they work closely with prospective teachers and in-service teachers and schools, teacher educators can see the misfit of current policies and practices with the looming and current impacts of climate change upon communities. Seeing how education institutions are not assisting prospective teachers' to objectively respond to a changing world presents an ethical and pedagogical challenge to teacher educators to invest in future thinking (Brennan, 2019).

## Limitations

Limitations of this study include the nature of the methodology employed, since the limited time allowed for prospective teachers to respond to the questions could have prevented them from fully expounding their reasoning around the study questions. Interviews might have been more successful at extracting greater more fine-grained elaboration from the participants. It is also possible that prospective teachers responded in ways that they believed were most likely to show their respect and value for student diversity, a powerful drive in the current educational milieu, and in society more widely. A future study should include interviews to allow prospective teachers to explain how their personal ethical philosophies interact with their professional ethical obligations, and whether ethical decisions about appropriate action were based on personal ethics and life experiences or social and institutional norms or other moral prerogatives (Bullough, 2011). A future valuable addition to the research literature would emanate from observations of prospective teachers on professional practice to establish how they approached teaching about anthropogenic climate change *in situ*.

## Disclosure statement

No potential conflict of interest was reported by the author(s).

## ORCID

Helen J Boon  <http://orcid.org/0000-0003-3842-9622>

## References

- Arthur, J. (2010). *Of good character: Exploration of virtues in values in 3-25 year olds*. Imprint Academic.
- Ashworth, P., Jeanneret, T., Gardner, J., & Shaw, H. (2011). *Communication and climate change: What the Australian public thinks* Report No. EP112769 CSIRO Publishing.
- Australian Institute for Teaching and School Leadership (AITSL). (2013). *Annual report: Promoting excellence in the profession of teaching and school leadership* AITSL.
- Australian students defy PM with climate protests. (2018, December 1). *SBS News*. <https://www.sbs.com.au/news/australian-students-defy-pm-with-climate-protests>.
- Ball, S. J. (2003). The teacher's soul and the terrors of performativity. *Journal of Education Policy*, 18(2), 215–228. <https://doi.org/10.1080/0268093022000043065>
- Bamber, P. (Ed.). (2019). *Teacher education for sustainable development and global citizenship: Critical perspectives on values, curriculum and assessment*. Routledge.
- Biesta, G. (2012). The future of teacher education: Evidence, competence or wisdom?. *Research on Steiner Education*, 3(1), 8–22.
- Boon, H. J. (2010). Climate change? Who knows? A comparison of secondary students and preservice teachers. *Australian Journal of Teacher Education*, 35(1), 104–120. <https://doi.org/10.14221/ajte.2010v35n1.9>
- Boon, H. J. (2011). Raising the bar: Ethics education for quality teachers. *The Australian*, 36(7), 76–93. <https://doi.org/10.14221/ajte.2011v36n7.2>
- Boon, H. J. (2018). Explicit ethics education for prospective teachers - an essential precursor for quality teaching - ethics training for preservice teachers. In S. S. Sethy (Ed.), *Higher education and professional ethics: Roles and responsibilities of teachers* (pp. 204–222). Routledge.
- Boon, H. J., & Maxwell, B. (2016). Ethics education in Australian preservice teacher programs: A hidden imperative?. *Australian Journal of Teacher Education*, 41(5), 1. pp. 1–20. <https://doi.org/10.14221/ajte.2016v41n5.1>
- Borgerding, L. A., & Dagistan, M. (2018). Preservice science teachers' concerns and approaches for teaching socio-scientific and controversial issues. *Journal of Science Teacher Education*, 29(4), 283–306. <https://doi.org/10.1080/1046560X.2018.1440860>
- Brennan, M. (2019). Changing teaching and teacher education in the 'anthropocene'. *On Education: Journal for Research and Debate*, 2(4). [https://doi.org/10.17899/on\\_ed.2019.4.6](https://doi.org/10.17899/on_ed.2019.4.6)
- Brownlee, M. T. J., Powell, R. B., & Hallo, J. C. (2013). A review of the foundational processes that influence beliefs in climate change: Opportunities for Environmental education Research. *Environmental Education Research*, 19(1), 1–20. <https://doi.org/10.1080/13504622.2012.683389>
- Bullough, R. V., Jr. (2011). Ethical and moral matters in teaching and teacher education. *Teaching and Teacher Education*, 27(1), 21–28. <https://doi.org/10.1016/j.tate.2010.09.007>
- Burke, S. E., Sanson, A. V., & Van Hoorn, J. (2018). The psychological effects of climate change on children. *Current Psychiatry Reports*, 20(5), 1–8. <https://doi.org/10.1007/s11920-018-0896-9>
- Byker, E. J., & Ezelle-Thomas, V. (2021). Preparing teacher candidates with global competencies: Taking action on the global Water crisis with service learning. *Journal of Research in Childhood Education*, 35(2), 268–280. <https://doi.org/10.1080/02568543.2021.1880996>

- Byskov, F. M., Hyams, K., Satyal, P., Anguelovski, I., Benjamin, L. (2021). An agenda for ethics and justice in adaptation to climate change. *Climate and Development*, 13(1), 1–9. <https://doi.org/10.1080/17565529.2019.1700774>
- Cabaroglu, N., & Tillema, H. H. (2011). Teacher educator dilemmas: A concept to study pedagogy. *Teachers & Teaching Theory & Practice*, 17(5), 559–573. <https://doi.org/10.1080/13540602.2011.602210>
- Campbell, E. (2008). The ethics of teaching as a moral profession. *Curriculum Inquiry*, 38(4), 357–385. <https://doi.org/10.1111/j.1467-873X.2008.00414.x>
- Carr, D. (2006). Professional and personal values and virtues in education and teaching. *Oxford Review of Education*, 32(2), 171–183. <https://doi.org/10.1080/03054980600645354>
- Chang, C. H., & Pascua, L. (2016). Singapore students' misconceptions of climate change. *International Research in Geographical & Environmental Education*, 25(1), 84–96. <https://doi.org/10.1080/10382046.2015.1106206>
- Chen, L., & Xiao, S. (2021). Perceptions, challenges and coping strategies of science teachers in teaching socioscientific issues: A systematic review. *Educational Research Review*, 32, 100377. <https://doi.org/10.1016/j.edurev.2020.100377>
- Cho, H., & Gay, G. (2022). Social justice teaching beliefs and practices of South Korean novice teachers: Complexity Theory perspectives. *Multicultural Education Review*, 13(4), 285–302. <https://doi.org/10.1080/2005615X.2021.2006119>
- Colston, N. M., & Vadjunec, J. M. (2015). A critical political ecology of consensus: On “teaching both sides” of climate change controversies. *Geoforum*, 65, 255–265. <https://doi.org/10.1016/j.geoforum.2015.08.006>
- Creswell, J. W., & Poth, C. N. (2016). *Qualitative inquiry and Research design: Choosing among five approaches*. Sage.
- Dauer, J., Lettero, C., & Ocana, M. (2011). A review of ethical concepts and moral reasoning integration into climate change curriculum. *Journal for Activist Science and Technology Education*, 3(1): 131–175. <https://doi.org/jc127586/Downloads/titusland,+JASTE3-1hDauerETAL.pdf>
- Davies, I., Evans, M., Fülöp, M., Kiwan, D., Peterson, A., & Sim, J. B. Y. (2019). Taking action for change: Educating for youth civic engagement and activism.
- Enyedy, N., Goldberg, J., & Welsh, K. (2006). Complex dilemmas of identity and practice. *Science Education*, 90(1), 68–93. <https://doi.org/10.1002/sci.20096>
- Glenn, J. C. & Florescu, E. (2016). Millennium project team. *J Socialomics* 5, (3), 168–174. <https://dx.doi.org/10.4172/2167-0358.1000168>
- Grady-Benson, J., & Sarathy, B. (2015). Fossil fuel divestment in US Higher education: Student-led organising for climate justice. *Local Environment*, 21(6), 661–681. <https://doi.org/10.1080/13549839.2015.1009825>
- Hansen, D. T. (2001). Teaching as a moral activity. In I. V. Richardson (Ed.), *Handbook of research on teaching* (p. pp. 826e857). American Educational Research Association.
- Ho, L. C., & Seow, T. (2017). Disciplinary boundaries and climate change education: Teachers' conceptions of climate change education in the Philippines and Singapore. *International Research in Geographical & Environmental Education*, 26(3), 240–252. <https://doi.org/10.1080/10382046.2017.1330038>
- Howe, P., Mildemberger, M., Marlon, J., & Leiserowitz, A. (2015). Geographic variation in opinions on climate change at state and local scales in the USA. *Nature Climate Change*, 5(6), 596–603. <https://doi.org/10.1038/nclimate2583>
- IPCC, (2021). *Climate change 2021: The physical science basis. contribution of working group I to the sixth assessment Report of the Intergovernmental Panel on Climate Change*, Masson-Delmotte V, P. Zhai, Pirani, A., Connors, S. L., Péan, C., Berger, S., Caud, N., Chen, Y., Goldfarb, L., Gomis, M. I., Huang, M., Leitzell, K., Lonnoy, E., Matthews, J. B. R., Maycock, T. K., Waterfield, T., Yelekçi, O., R. Yu and B. Zhou (eds.). Cambridge University Press. In Press.
- Irwin, R. (2020). Climate change and education. *Educational Philosophy and Theory*, 52(5), 492–507. <https://doi.org/10.1080/00131857.2019.1642196>

- Jones, C. A., & Davison, A. (2021). Disempowering emotions: The role of educational experiences in social responses to climate change. *Geoforum*, 118, 190–200. <https://doi.org/10.1016/j.geoforum.2020.11.006>
- Kelchtermans, G. (2009). Who I am in how I teach is the message. Self-understanding, vulnerability and reflection. *Teachers & Teaching Theory & Practice*, 15, 257–272. <https://doi.org/10.1080/13540600902875332>
- Kissling, T., & Bell, J. T. (2020). Teaching social studies amid ecological crisis. *Theory & Research in Social Education*, 48(1), 1–31. <https://doi.org/10.1080/00933104.2019.1673267>
- Kohlberg, L. (1984). *The psychology of moral development: Essays on moral development* (Vol. 2). Harper & Row.
- Koulaidis, V., & Christidou, V. (1999). Models of students' thinking concerning the greenhouse effect and teaching implications. *Science Education*, 83(5), 559–576. [https://doi.org/10.1002/\(SICI\)1098-237X\(199909\)83:5<559:AID-SCE4>3.0.CO;2-E](https://doi.org/10.1002/(SICI)1098-237X(199909)83:5<559:AID-SCE4>3.0.CO;2-E)
- Lavery, J. V. (2018). 'Wicked problems', community engagement and the need for an implementation science for research ethics. *Journal of Medical Ethics*, 44(3), 163–164. <https://doi.org/10.1136/medethics-2016-103573>
- Lemke, J. L. (2001). Articulating communities: Sociocultural perspectives on science education. *Journal of Research in Science Teaching*, 38(3), 296–316. <https://doi.org/10.1002/1098-2736>
- Lombardi, D., & Sinatra, G. M. (2012). College students' perceptions about the plausibility of human-induced climate change. *Research in Science Education*, 42(2), 201–217. <https://doi.org/10.1007/s11165-010-9196-z>
- Monroe, M. C., Plate, R. R., Oxarart, A., Bowers, A., & Chaves, W. A. (2019). Identifying effective climate change education strategies: A systematic review of the research. *Environmental Education Research*, 25(6), 791–812. <https://doi.org/10.1080/13504622.2017.1360842>
- Moore, K. D., & Nelson, M. P. (Eds.). (2011). *Moral ground: Ethical action for a planet in peril*. Trinity University Press.
- Nation, M. T., & Feldman, A. (2021). Environmental education in the Secondary science classroom: How teachers' beliefs influence their instruction of climate change. *Journal of Science Teacher Education*, 32(5), 1–19. <https://doi.org/10.1080/1046560X.2020.1854968>
- Pascua, L., & Chang, C.-H. (2015). Using intervention-oriented evaluation to diagnose and correct students' persistent climate change misconceptions: A Singapore case study. *Evaluation and Program Planning*, 52, 70–77. <https://doi.org/10.1016/j.evalprogplan.2015.04.001>
- Public Universities Australia. (2023, August). *What is an Education?* THE VOICES of Australia's UNIVERSITIES – the Peak Body for Australian Higher Education. <https://puau.org/2023/08/06/what-is-an-education/>
- Queensland College of Teachers. (n.d.). *Code of Ethics for Teachers in Queensland*. <https://www.qct.edu.au/standards-and-conduct/code-of-ethics>
- Ranney, M. A., & Clark, D. (2016). Climate change conceptual change: Scientific information can transform attitudes. *Topics in Cognitive Science*, 8(1), 49–75. <https://doi.org/10.1111/tops.12187>
- Rawling, C. (2023, August 9). Climate change disasters engulf northern hemisphere as global air and ocean temperatures set new records in July. *ABC News*, <https://www.abc.net.au/news/2023-08-09/explainer-climate-change-disasters-northern-hemisphere/102707278> .
- Rennie, L. J. (2015). Making science beyond the classroom accessible to students. In D. Corrigan, C. Bunting, J. Dillon, A. Jones, & R. Gunstone (Eds.), *The future in learning science: What's in it for the learner?* (pp. 151–173). Springer Publishing Company.
- Rest, J. R. (1986). *Moral development: Advances in research and theory*. Praeger.
- Rittel, H., & Webber, M. (1973). Dilemmas in a general theory of planning. *Policy Sciences*, 4(2), 155–169. <https://doi.org/10.1007/BF01405730>
- Scager, K., Akkerman, S. F., Pilot, A., & Wubbels, T. (2017). Teacher dilemmas in challenging students in higher education. *Teaching in Higher Education*, 22(3), 318–335. <https://doi.org/10.1080/13562517.2016.1248392>
- Seow, T., & Ho, L. (2016). Singapore teachers' beliefs about the purpose of climate change education and student readiness to handle controversy. *International Research in*

- Geographical & Environmental Education*, 25(4), 358–371. <https://doi.org/10.1080/10382046.2016.1207993>
- Shapira-Lishchinsky, O. (2019). The implicit meaning of TIMSS: Exploring ethics in teachers' practice. *Teaching and Teacher Education*, 79, 188–197. <https://doi.org/10.1016/j.tate.2018.12.013>
- Trott, C. D. (2022). Climate change education for transformation: Exploring the affective and attitudinal dimensions of children's learning and action. *Environmental Education Research*, 28(7), 1023–1042. <https://doi.org/10.1080/13504622.2021.2007223>
- Tzaberis, N., Xenitidou, S., & Mogias, A. (2014, March). The contribution of education for sustainable development in addressing ethical issues of climate change. In *ADAPTtoCLIMATE Conference*, Nicosia, Cyprus.
- UNESCO. (2019). *Country progress on climate change education, training and public-awareness: An analysis of country submissions under the United Nations framework convention on climate change*.
- Wong-Parodi, G., & Feygina, I. (2021). Engaging people on climate change: The role of emotional responses. *Environmental Communication*, 15(5), 571–593. <https://doi.org/10.1080/17524032.2020.1871051>