

# Queensland Teachers' Understandings of Education for Climate Change

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## Abstract

Teachers approach curriculum with complex experiences, ideas, beliefs, and values that shape the way they interpret and respond to curriculum documents. In the context of national and state curriculum frameworks and policies supporting education for sustainability (EfS), it is important to examine the role and influence of teachers' beliefs about climate change and pedagogy on climate change education practices within their school classrooms. This paper examines teachers' personal and professional beliefs about climate change and climate change education. Survey data from over 300 Queensland primary and secondary teachers were first analysed to identify teachers' understandings and beliefs relating to the realities, causes, and consequences of climate change. Next, the data were analysed to illuminate how teachers conceptualise climate change education in terms of content and processes. This research is part of a larger PhD research project investigating teacher beliefs and climate change education.

**Keywords:** *Climate change education, teacher beliefs*

## Introduction

Climate change poses a significant threat to human health and wellbeing (IPCC, 2014) and as such individuals and communities need to build resilience and adapt in order to minimise risk (IPCC, 2014). It is increasingly recognised that simply raising awareness of climate change will not be enough to see a change in behaviour and choices in many individuals (Bateson, 2006). As such the focus of much climate change communication and education literature has shifted from increased knowledge and understanding to engagement through personal connection and participation (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007; Wolf & Moser, 2011). However, within the formal schooling system climate change education has tended to remain focussed on 'the science' of climate change (Kagawa & Selby, 2010) with little focus on personal connections and engagement, or the broader implications of climate change. Climate change education is more than science education alone, Kagawa and Selby (2010) argue climate change education requires a "social holistic learning process" that is flexible and embeds climate change learning with action within community contexts (p.242). Climate change education should explore both local and global mitigation and adaptation

responses (Kagawa & Selby, 2010), while acknowledging the invisible, uncertain, and temporal nature of climate change.

When considering the implementation of climate change education the role of classroom teachers' beliefs need to be addressed. Their beliefs about their ability to teach subject matter, opinions about the content matter, and political beliefs influence decisions about the inclusion of topics within their classrooms. A lack of understanding or knowledge surrounding a subject matter to be taught can lead to a topic being avoided by teachers or to be covered poorly or incorrectly (Wise, 2010). Studies investigating science teaching in primary schools, for example, have highlighted that teachers with low confidence and interest in science rarely teach science, and those that do, rely on the use of text books and worksheets or science activities that are manageable and predictable (Appleton & Kindt, 2002; Davis & Smithey, 2009; Enochs & Riggs, 1990).

Teachers also find it difficult to implement intended curriculum that does not align with values they hold (Cotton, 2006a, 2006b; Cronin Jones, 1991). A case study by Cotton (2006a) investigated how teacher beliefs impacted on the teaching of controversial environmental issues within high school classrooms. The study found that regardless of personal environmental beliefs, the teacher participants felt offering a balanced picture of the issues surrounding a topic was important. The study also found that the teachers aimed to include many different perspectives and allow students to develop their own attitudes and understandings whilst taking a neutral teacher role. However the ideal of taking a balanced and neutral approach to controversial issues was found to be problematic (Cotton, 2006b). Even with the expressed intent of taking the position of neutrality and balance, the influence of the teacher's own beliefs was greater than intended (Cotton, 2006b).

Teachers' political beliefs have also been shown to influence teaching and curriculum implementation (Cotton, 2006a, 2006b; Hess, 2005; Stevenson, 2010). Hess (2005) argues it is important for teachers to consider how political views shape our understandings of the nature of a controversial issue. Hess (2005) identified four approaches teachers use when teaching controversial issues based on how political views shape teacher thinking: denial, privileging of a particular perspective, avoidance, and balance (Hess, 2005). As the literature above highlights, teachers hold many beliefs that influence teaching. The understandings, attitudes, motivations and skills of the classroom teacher contribute significantly to the kind of curriculum practices that are enacted.

## **The Current Study**

The current study is part of a larger PhD research project that aimed to gain an insight into teachers' beliefs about climate change and climate change education and how these beliefs affect the implementation of climate change education.

The research reported here has two broad goals. First, it aims to identify teacher beliefs about the reality, causes and consequences of climate change. When considering the implementation of controversial curriculum such as climate change education, what a teacher believes about the curriculum appears to play a significant role in how the subject matter is communicated. Second, the study aims to identify what teachers understand climate change education to involve.

## Method

### *Survey*

This study employed an online survey hosted on SurveyMonkey. The survey consisted of 28 questions including eight demographic questions, 10 questions relating to personal beliefs and perceptions about climate change and eight questions relating to professional beliefs and perceptions about climate change education. Many of these questions included multiple related sub questions. Two further questions allowed for respondents to supply additional information they felt necessary. The survey questions on climate change were selected and taken verbatim from Reser et al.'s (2012) study which employed a survey instrument to investigate risk perceptions, understandings and responses to climate change in Australia and Great Britain. The survey items were selected from Reser et al.'s larger survey based on their relevance to the current study's overarching research questions and aims. Reser et al.'s study also provided an important data set for comparison and contrast of survey findings.

The survey was developed in consultation with experienced education researchers and was tested for reliability through a pilot phase. Initial survey was distributed to a small number of local university, primary, and high school teachers for completion and comment. The trial survey was modified based on the pilot group feedback prior to being finalised.

### *Participant Recruitment*

A notice was placed within the Queensland College of Teachers October, 2012 and August, 2013 e-newsletter [QCT e-News]. QCT e-News is an email news bulletin sent bi-monthly to all teachers for whom the QCT holds an up-to-date email address, "[t]he purpose of the e-News is to advise teachers of recent publications from the QCT and to update them on QCT activities and matters concerning their teacher registration" (Queensland College of Teachers, 2014). At the time that the survey notice was advertised, the bulletin was sent to approximately 99,000 teachers (Personal communication, 2014).

### *Data Analysis*

Survey data relating to participant demographics and participant responses to the closed answer and Likert-scale questions were analysed with qualitative data analysis software Nvivo10. The analysis was limited to frequency distribution that served to organise and summarise the data (Kalaian, 2008). Some of the raw figures were converted to percentages to offer a clearer context and more useful account of these figures. Open-ended questions were analysed primarily guided by the research questions. First the survey data were analysed to identify broad themes and general ideas to provide context for the research. Second, interview data were analysed to provide a more nuanced and in-depth exploration. Coding of the open-ended questions was completed with the aid of NVivo10.

### *Survey Respondents*

A total of 377 surveys were collected via Survey Monkey between October 2012 and December 2013. Of the 377 individual responses to the online survey 66 were discarded due to incomplete responses or other collection errors. In total, 311 teachers submitted complete and usable responses to the online survey. Of these 65% (204) identified as female, 34% (105) identified as male, and 1% (2) of respondents chose not to respond to this question. The majority of respondents were between the ages of 45 to 59 (29%) and 55 to 64 (31%) years old. Six respondents identified as less than 24 years old (2%) and 12 as over 65 years old (4%). The highest level of education attained at the time of the survey by the majority of respondents was a Bachelor's Degree (n=144), followed by a Graduate certificate (n= 69), Masters (n=55), Graduate diploma (n=20), Doctorate (n=12) Diploma of teaching (n=10),

and an Honours degree (n=1). The majority of respondents held over 15 years teaching experience (n=167) with the remaining respondents holding between zero to five years teaching experience (n=50), six to 10 years teaching experience (n=50) or 11 to 15 years (n=42).

Science teachers including general science teachers and specific disciplines such as chemistry and physics, made up the greatest number of respondents, Primary school teachers made up the second largest cohort of teachers to respond to this survey, followed by secondary mathematics and English teachers.

## **Results**

A brief summary of the results is provided below.

### *Climate Change Knowledge*

The survey employed eight sub-questions specifically addressing respondents' knowledge relating to the science of climate change as one measure of ascertaining respondents' conceptual understandings and knowledge of climate change. The results from the eight knowledge questions show some uncertainty relating to the science of climate change, however, the respondents to this survey appear more knowledgeable in certain areas than the general public.

Of the respondents 6% of teachers incorrectly believed that climate change was mainly caused by a hole in the ozone layer, compared with 20.6% of the Australian population (Reser et al., 2012) and only 7 % of respondents answered 'Don't know' to this question compared to 21.6% of the Australian population (Reser et al., 2012). However the results of this survey are generally comparable to the Australian sample in relation to correct answers. Notable differences between the two samples were the 'Don't know' responses. Respondents to the current survey were in all questions less likely to select 'Don't know' compared with the Australian sample (Reser et al., 2012).

### *Beliefs and Acceptance of Science*

Respondents were asked to select their level of agreement to the statement 'I am certain the Earth's climate is changing'. 79% of respondents either strongly (56%, n = 175) or tended to agree (23%, n=73) to this statement, 18% either strongly (n=33) or tended to disagree with this statement (n=21). When asked what natural or anthropogenic factors were the cause of climate change the majority of respondents selected 'partly natural processes, partly human activities' (n= 121), followed next by 'mainly human activities' (n=115). Less than 20% of all respondents (n=56) believed climate change was caused entirely (n=19) or mostly (n=37) by natural processes.

Respondents were asked to rank 'how serious a problem do you think climate change is right now' on a six point scale with 1 indicating 'not serious at all' and 6 indicating 'very serious'. The majority of respondents indicated climate change was a serious problem with 30% of respondents indicating 6 and 25% indicating 5 on the scale. 10% of respondents chose 'not serious at all'.

### *Climate Change Education*

Teachers were asked to express in their own words what climate change education involves. Below are a number of dominant themes that emerged from the responses.

*Balance or Both Sides of the Climate Change 'Debate'*

The idea of 'balance' and presenting students with 'both sides of the climate change argument' or a balanced perspective was most frequently identified by teachers as important in climate change education. Teachers identified that there existed a 'for and against' argument or more than one side to climate change that students should be made aware of. Not telling students what to believe but allowing them to review or be given all 'sides' of the argument so they were able to 'make up their own mind' about climate change was also considered important by teachers. A small number of teachers noted that students may not have the decision-making skills required to 'make up their own minds'. They pointed to the need to develop student decision making skills.

*Relevant Content Knowledge (Science)*

Relevant scientific content knowledge was identified as part of 'climate change education' by the respondents of the survey, second only to the idea of balance. The primary response referred to the need to explore historical climate changes, their causes and consequences. The understanding that climate change has happened in the past with various factors influencing these changes were important themes for teachers.

As well as an understanding of the causes of historical climate change, teachers stated climate change education also involves an understanding of the current causes of climate change including both anthropogenic causes and naturally occurring influences. A specific emphasis on the anthropogenic causes of current climate change were the focus of a smaller number of respondents.

*Contrarian Viewpoint*

A small number of respondents maintained a contrarian viewpoint. Respondents who commented typically viewed anthropogenic climate change as being fictitious, a politically motivated topic or biased toward a political agenda, an unsupported idea driven by media, the result of unscrupulous scientists lying for money, the un-supported popular beliefs of ignorant people, or a combination of these points.

**Discussion**

Although the teachers who responded to this survey were overall more knowledgeable and showed less uncertainty with their responses than the Australian general public (Reser, Bradley, Glendon, Ellul, & Callaghan, 2012), i.e. fewer 'Don't know' responses generally than the Australian survey, a greater number of teachers were incorrect or held false understandings of the scientific concepts than the Australian general public. This result suggests that while teachers are in general more knowledgeable and more confident in their knowledge of climate change science than the general Australian population, they are also more likely to be sure of the wrong answer rather than acknowledging they do not know.

Encouragingly, the majority of respondents to this survey did not confuse or conflate the hole in the ozone layer with the issue of climate change. Conflating the hole in the ozone layer with climate change is a common misconception among the general public, with many studies finding people often refer to the hole in the ozone layer when asked about climate change (see for example, Bostrom, Morgan, Fischhoff, & Read, 1994; Leiserowitz, Smith, & Marlon, 2010; Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007).

However, a number of teachers hold misconceptions about other aspects of climate change. Many teachers believed there are two equally valid ‘sides’ to climate change science. Although it is important for students to understand the controversy surrounding climate change and also engage with different perspectives, presenting all of these ideas to students as equally valid or legitimate view points, as if climate change science is a matter of political opinion rather than scientific observation and method, does not present a realistic picture or understanding of climate change. An important skill for students and teachers is the ability to determine the validity of an argument and ascribe weight based on reliability. If teachers are presenting the ‘science’ of an internet blogger as equal to reports published by the IPCC then this can be misleading. This both sides approach does have its place when it comes to the actions that individuals and countries can take. Students in this instance need to be able to think through various options and opinions to develop their own views on the best course of action to take.

Encouragingly there are many areas of climate change education that teachers agree on, including understanding the controversy surrounding climate change, developing critical thinking and issue analysis skills, and thinking about students own values and beliefs. A small number of teachers do not accept the science of anthropogenic climate change. While it is extremely important that individuals recognise the causes of climate change in order to mitigate and take action, it is also recognised more information will not change minds (see for example Kahan, Jenkins Smith, & Braman, 2011). Perhaps a shift in focus from convincing people of the ‘truth’ of climate change and focusing on future climate scenarios and the other skills and abilities that those living in a changing climate will need, including critical thinking skills, problem solving abilities, and knowledge of how the political system works can be the focus of climate change education for these teachers.

## Conclusion

It appears from this data that a high percentage of teachers accept that the climate is changing and that the changing climate poses a risk to the Australian people, however, teachers do not appear to have a complex or nuanced understanding of what climate change education can be. Data from this survey and follow up interviews will aim to elaborate on this, however, a narrow view of what climate change education is may lead to limiting the quality of education relating to climate change and futures. Professional development and quality reading materials and resources may help widen teacher understanding and confidence in this area.

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