

What are topic emotions? A comparison of children's emotional responses to climate change, climate change learning and climate change picturebooks

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Abstract

Pekrun and his colleagues highlight the significance and diversity of emotion in education. Their analysis suggests that these emotions can be categorised by their stimuli into those related to the classroom: activities, outcomes, relationships, topics and knowledge processes (epistemic). Most research in this area has focused on achievement emotions, with relatively limited research exploring topic emotions. This paper develops a framework for conceptualising topic emotions. It reports on a design-based study that captured children's expressions of emotion in response to a climate change education programme using picturebooks. The data brought together emotional responses to climate change, to learning about climate change and to climate-related picturebooks. Qualitative analysis of these responses highlights how they differ not only with regard to the emotions expressed, but also the structure of the emotional experience. Emotional responses to the broad topic of climate change were expressed as ongoing analytical judgements, where those related to learning about climate change were immersive and finite. Reading climate-related picturebooks involved exploring how emotion is communicated and evoked. This supported quasi-emotional experiences, where the reader imagines the emotions of the characters. The picturebooks are also shown to create vicarious

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emotional experiences, involving ethical-based responses to the behaviour and circumstances depicted. Based on this analysis, the paper proposes a framework for disaggregating these differing emotional experiences related to topic.

KEYWORDS

climate change education, empathy, picturebooks, topic emotion

Key insights

What is the main issue that the paper addresses?

Emotions in education have been recognised as significant for learning and categorised by their object foci. The category of 'topic emotions' is ill-defined and brings together different aspects of learning and interpretations of emotion. This has implications for climate change education, recognised as involving difficult knowledge and negative emotions.

What are the main insights that the paper provides?

This research disaggregates climate change education topic emotions into responses to climate change, learning about climate change and climate-related picturebooks. Climate change attracts negative emotions, characterised as enduring appraisals. Learning here can generate enjoyment, which is immersive and finite. Picturebooks involve the communication of emotion, evoking empathy and ethical responses.

INTRODUCTION

There is heightened focus on emotions in educational research, with increased recognition of their significance for learning (Camacho-Morles et al., 2021). Understanding emotion as a response to an object focus, Pekrun and his colleagues categorise emotions in education by the character of that object focus (Pekrun, 2006; Pekrun & Linnenbrink-Garcia, 2014). These categories include achievement emotions, which bring together those related to activities and those related to outcomes (e.g., test anxiety), social emotions (e.g., admiration), epistemic emotions related to the process of learning (e.g., curiosity) and topic emotions. The majority of research in this area focuses on achievement emotions and relatively little research exists in relation to topic emotions. Pekrun and Linnenbrink-Garcia (2014) define topic emotions as those triggered 'by the contents covered by learning materials' and provide the following as examples:

the empathetic emotions pertaining to a protagonist's fate when reading a novel, the emotions triggered by policy events dealt with in political lessons, or the emotions related to topics in science class.

(p. 4)

A small number of studies develop Pekrun and Linnenbrink-Garcia's concept of topic emotions. As will be discussed below, these studies characterise topic emotions differently, resulting in an imprecise conceptualisation. This paper explores expressions of emotion that can be categorised under Pekrun and Linnenbrink-Garcia's definition as topic emotions and provides a qualitative analysis of these expressions. It responds to research highlighting both the challenge and the importance of more precisely defining emotional experiences, including in educational contexts (Putwain, 2007; Scherer, 2005).

This paper draws on data collected as part of a design-based study. The study explores how picturebooks can support a climate change education programme in primary classrooms with children aged 10–12 years. Data analysis considers children's expressions of emotion in relation to the programme. Climate change is recognised as 'difficult knowledge' (Bryan, 2020, p. 15), which can arouse strong emotions, including in children. Picturebooks are also seen to engage readers emotionally (Arizpe, 2013; Haynes & Murris, 2012; Short, 2011). This paper finds that these expressions of emotion propose variation in topic emotions. This variation relates to different types of object foci within the categorisation of 'topic emotions', and also to different types of emotional experiences. The paper goes on to propose a framework for conceptualising different topic emotions.

LITERATURE REVIEW

While theories on emotion vary, there is broad consensus that it combines cognitive, affective, physiological and motivational processes (Linnenbrink, 2006; Scherer, 2005; Shuman & Scherer, 2014). If someone experiences anger, they may hold negative thoughts, feel rage, go red in the face, have a faster heartbeat and be distracted from a task. Emotion is distinguished from other affective phenomena. Defined as a response to a stimulus, immediate and temporary, it is differentiated from mood and trait emotions, both of which are understood as less responsive and longer lasting (Pekrun, 2006; Scherer, 2005). Emotion is recognised as distinct also from preferences and attitudes. While the three phenomena have affective and behavioural components, those of emotion are seen as more nuanced and shorter lasting. The affective components of attitudes and preferences are interpreted as binary, positive or negative, and the behavioural components as only approach or avoidance (Shuman & Scherer, 2014). The wide and nuanced spectrum of emotions can be measured in broad or narrow categories; for example, positive feeling is broader than happiness, which in turn could bring together narrower categories including joy, contentment and excitement. The extent to which this refined emotional lexicon reflects innate biological processes or is socially constructed, however, is debated (Shuman & Scherer, 2014).

Whether emotion should be understood in individualistic or social terms manifests also in educational research. Zembylas (2007) contrasts psychological perspectives that frame emotion as individually experienced with social ones in which descriptions of emotion are viewed as interpretative and culturally informed. He further proposes an interactional understanding of emotions, where both their feeling and performance, being socially generated, enables meaningful interactions, particularly in classroom contexts. Schertz (2007) too suggests the intersubjectivity of emotion. We involuntarily mimic the emotional displays of others, and in so doing accompany their feeling states to create a shared affective experience. Like Zembylas, Haynes and Murris (2012) root emotion-related language in social contexts. Drawing on Aristotle, they argue that emotions are sophisticated ethical judgements and a form of situated knowledge. They suggest that the validity and (in)acceptability of different emotions are culturally and socially specific and restrictive.

Pekrun and Linnenbrink-Garcia (2014) organise emotions in education by their object foci: achievement, topic, epistemic and social. Focused on achievement emotions, Pekrun

and colleagues (Pekrun, 2006; Pekrun et al., 2007) suggest they can be categorised according to their valence (whether they are positive or negative) and activation (whether they are motivating or demotivating). Anxiety may be negative but activating, while boredom may be negative and deactivating. Enjoyment may be positive and activating but contentment positive and deactivating. A small number of studies attempt to build on Pekrun's taxonomy in relation to topic emotions, most of these by exploring the relationship between topic emotions and other aspects of learning, including conceptual change, effortful thinking and topic-related attitudes. Sinatra et al. (2014) review topic emotions in the context of science education. They highlight the difference between emotions related to a specific topic and its subject domain, recognising that a student might have positive emotions to, for example, biology but negative topic emotions towards a particular topic, for example, climate change; and also that students' emotions towards learning about a topic may differ from their emotions towards the topic itself. Broughton et al.'s (2013) study with 10–12 year olds explores the relationships between topic emotions, attitudes and conceptual change, to the reclassification of Pluto as a dwarf planet. While their findings point to the interdependence of these variables, the selection of Pluto's reclassification as the focus of the study is significant in terms of how topic emotions are presented. The authors state that they 'purposefully selected the recent reclassification of Pluto's planetary status due to its controversial and highly emotional nature' (p. 532). Pluto's reclassification is emotive because it confronts children's existing knowledge that there are nine planets, of which Pluto is one. The facet of the topic that attaches emotion isn't the topic in general, *Pluto*, but the reclassification contradicting prior understanding. Research in history education similarly identifies strong emotions attached to learning that challenges students' preconceptions about a topic (Pace, 2022; Wrenn et al., 2007). Student location, context, identity and experience here influence the topic's resonance (McCully, 2012). Perceived historical injustices also evoke heightened responses (Wrenn et al., 2007). These strong emotions are found to impinge on learners' capacity to respond critically, but also to support engagement, embodying connection with the topic (McCully et al., 2002).

Lombardi and Sinatra's (2013) study of emotions in teaching about climate change also explores the consequences of emotion for learning. Their research with teachers (pre- and in-service) looks to extend Pekrun's work by exploring the relationship between topic emotions and other teacher facets, including background climate knowledge, acceptance of scientific consensus and disposition towards effortful thinking. The results suggest that negative topic emotions, like anger, reduce the evaluative judgement needed to weigh evidence and reach scientific understandings of climate change. Their study characterises topic emotions by differentiating between those attached to human-induced climate change and those related to teaching about climate change. The quantitative aspect of the study asked respondents to indicate, using a Likert scale, the extent to which they felt each of ten emotions (including, e.g., anger and happiness) in relation to climate change, its anthropogenic causes and regulatory action, as well as to teaching about climate change. For example, respondents were asked to indicate how strongly they agreed with the statement (on a scale of 1–5): 'When I hear people say that the climate is changing, I feel angry' (p. 190). The qualitative aspects of the study involved interviews with two teachers showing strong emotionality towards climate change. The quantitative aspects of the study therefore capture self-reported emotional responses to climate change in generalised terms, without reference to what aspect of the statement the emotion attaches. This generalisation is highlighted in the qualitative aspect of the study, where the two teacher interviewees discussed the specific conceptualisations related to their emotional responses. One teacher was angry at the poor environmental regulatory framework, another at a mistake in a scientific report. Their emotions related to teaching climate change, by contrast, related to the perceived impact of the topic on

students and student engagement. The 'topics' considered in these studies therefore attach emotion for different reasons. In Broughton et al.'s study, for example, the emotions relate to the epistemic nature of the topic: the challenge of encountering information that is incongruous with pre-existing knowledge. In Lombardi and Sinatra's study, topic emotions relate to the broad topic of climate change (shown to be triggered more specifically by the experiences, understandings and political beliefs individuals attach to the broad topic) or to the social, relational and pedagogical concerns of addressing climate change in the classroom.

Lombardi and Sinatra's study of teachers' topic emotions in relation to climate change reflects wider research on emotions relating to climate change in school contexts. Jones and Whitehouse's (2021) findings, like Lombardi and Sinatra's, suggest that the emotions attached to climate change depend on how climate change is understood and conceptualised. Their study involves primary school children aged 9 and 10 years and explores emotions in climate change lessons. They found that children's feelings of worry related to understanding the issue in apocalyptic terms involving rising sea levels and endangered polar bears, and that these emotions are abated somewhat when teaching focuses on positive action. In Trott's (2022) study, also with senior primary aged children, action was again understood to abate negative climate emotions. Here, however, involvement in positive action did not so much change how children think about climate change; rather, in generating positive activity emotions, the negative topic emotions were found to be offset. The emotion and conceptualisation reciprocity of Jones and Whitehouse's study was taken further in Jones and Davidson's (2021) analysis of climate education-related emotions. Their study explores retrospectively young people's emotional responses to school climate change learning. The thematic analysis identified participants' feelings of being 'stripped of power', 'stranded by the generation gap' and 'daunted by the future'. The emotions discussed are very specific and entangled with personal experiences of climate learning and understanding. The object of these emotions isn't so much climate change generally, or even a specific issue understood to connect with climate change, but a fragmentation between the urgency of the climate crisis and normative, 'business as usual' discourses in public and private life. Hufnagel's (2015) study of pre-service teachers also highlights the connection between emotion and understanding. For example, participants express particularly strong emotions in relation to the impact of climate change on other species and in the future, as climate change is understood to have more significant consequences for animals and future generations. Hufnagel's study also attempts to differentiate the weight of different emotions as they attach to different aspects of climate change understanding. Using discourse analysis, she codes the expressions according to whether they are presented as 'true emotional expressions' (p. 1307), using the first person in the emotional expression, or more distanced, using the third person or a hybrid where the first person is used but dampened by phrases like 'kinda' or 'somewhat'. She found that emotions relating to personal lack of action, predominantly guilt, were the most deeply held.

The research here (Jones & Davison, 2021; Jones & Whitehouse, 2021) moves away from Pekrun's framework in seeking to resist classification of emotions by valence. Anger is problematised as a negative emotion, recognised—at least in the context of climate change—as a moral response to injustice and a political necessity (Jones & Whitehouse, 2021). Binary understandings of emotion as positive or negative and as individual or social are challenged. Social norms, including at school, at home and in peer groups, regarding appropriate and inappropriate emotional responses are proposed to influence how participants feel about and express themselves in relation to climate change (Jones & Whitehouse, 2021; Ogunbode et al., 2022).

Topic emotions and empathy

Pekrun and Linnenbrink-Garcia's (2014) classification of topic emotions suggests that they include responses to classroom materials like texts. While these emotions have not been explored within Pekrun's framework, heightened emotional engagement is particularly attributed to reading narrative texts (Nussbaum, 1992; Rosenblatt, 1978). As this study explores children's responses to an education programme using picturebooks, research considering the emotional experiences involved with reading literature generally, and picturebooks specifically, in classrooms supports consideration of the topic emotions expressed in the data analysed in this paper.

Reading literature is partly valued for the emotion it engenders, engagement that is both pleasurable and extends readers' experiences. Nussbaum (1992) suggests that novels broaden and deepen human insight, providing empathetic engagement with diverse others as well as deeper reflections on the self. She understands emotion as a discriminating resource informing ethical consciousness. In the immersive experience, provided through reading novels, we can encounter and walk through 'ethical alternatives' (p. 27). She identifies authorial consciousness in texts as distinct from the perspective of the narrator or of a character. This stance may encourage the reader to empathise with or otherwise have feelings distinct from a character or the narrative voice. Nanay (2018) similarly distinguishes between different types of emotional response to literature. He differentiates between *quasi-emotion*, where you imagine how a character is feeling 'from the inside' (p. 1375) and *vicarious emotion*, where your feelings are *for* the character. He gives the example of observing a neighbour being attacked from behind by a bear. The neighbour has no fear, being unaware of what is about to befall them. The viewer, therefore, feels vicarious fear, a different emotion to that experienced by the neighbour though in relation to them. Quasi-emotion in respect of the neighbour in these circumstances will be whatever the neighbour happens to be feeling at the time, but will not be fear of the bear. Where Nanay suggests both these emotion types are 'other' orientated, Boler (1997) argues that empathy is a self-centred emotion, being fear that what has befallen the other will happen to the self. While emotional responses to literature are often described, as by Pekrun and Linnenbrink-Garcia (2014), in empathetic terms, as Nussbaum (1992), Boler (1997) and Nanay (2018) highlight, these responses are more complex than identification with the fictional other.

Haynes and Murris (2012) apply Nussbaum's contentions regarding emotion and literature to picturebooks. They explore how children, in engaging with picturebooks, draw on their experiences, beliefs and imagination fusing cognitive and affective elements. Picturebooks are recognised as multimodal artefacts (Nikolajeva & Scott, 2013; Salisbury & Styles, 2020) inspiring responses through multiple media of communication (Kress, 2003), including images, text, colour, fonts and other design features. The dynamic between these media, which can include for example tension and contradiction between the text and images (Nikolajeva & Scott, 2013), requires readers to actively interpret, imagine and construct meaning. The images in picturebooks can convey emotion (Arizpe et al., 2014; Haynes & Murris, 2012; Nodelman, 1988), including through colour and image-based devices (Nikolajeva & Scott, 2013; Nodelman, 1988). Images are believed to evoke emotional memories more strongly than words; the emotional side of the brain understood to respond to visual stimuli more quickly than verbal (Nikolajeva, 2012). Arizpe et al.'s (2014) international study of children's responses to the wordless picturebook about migration *The arrival* (Tan, 2006), for example, highlights the extent to which children draw on memories and experiences to make sense of the story. The book's ambiguity encouraged children to dramatise the characters' thoughts and feelings and to hypothesise about alternative and varied interpretations. The visual nature of the text engaged the children emotionally, drawing on and extending their own experiences.

The study, however, also suggested the limitations of empathy, with participating children of migrant background questioning the capacity of others, without such experience, to properly imagine the characters' situation and feelings. Boler's (1997) critique also challenges the authenticity of empathy, arguing that fundamental distinctions between people prevent genuine engagement with another's perspective. Accepting these constraints, picturebooks are shown to solicit empathy in children, which deepens connection with others' perspectives and builds pro-social attitudes (Burke & Stagg Peterson, 2007; Findlay et al., 2006; Hope, 2018; Short & Kauffman, 2004).

METHODOLOGY

This paper draws on data generated in design-based research (Anderson & Shattuck, 2012; Barab & Squire, 2004), exploring the use of picturebooks in climate change education in primary schools. Like much design-based research, this study is informed by pragmatism, which is values-based and outcome-focused (Morgan, 2014), recognising knowledge to be rooted in experience, always partial but beneficial for improvements to practice (Biesta, 2014; Dewey, 1908; Johnson & Onwuegbuzie, 2004). As design-based research, the study was centred on developing new approaches with data analysed to support the 'progressive refinement' (Collins et al., 2004, p. 18) of an education programme and to contribute to wider theory. It involved three iterations, each consisting of 11–12 lessons, in classrooms with children aged between 10 and 12 years. Each iteration involved a focus group with eight participating children and a teacher interview, prior to and on completion of the programme. Characteristically (Anderson & Shattuck, 2012), the programme was designed and taught by the researcher in collaboration with the class teachers. The study was subject to ethical considerations, with university approval granted and key practices including the voluntary nature of participation, anonymisation, minimalisation of risk and ensuring participation was beneficial to participants. Consent was sought and obtained from school principals, class teachers, parents and children using statements outlining details of the research in plain and appropriate language.

The participants

One class in each of three schools in County Dublin, Ireland, participated in the research. Participation was by convenience, the teachers of the classes being known to the researcher. In the first school the researcher worked with eight children from the class, randomly selected to participate. The second and third iterations involved the whole class and class teacher, with eight children in each iteration participating in the focus groups. The children in the first iteration were in fourth class, aged 10 years. Those in the second and third iteration were in fifth class, aged 10–12 years. Visual signifiers and collected data indicates focus group participants included 11 girls and 13 boys, of whom eight were of second-generation migrant backgrounds,¹ of African and European heritage. Owing to Covid-19 restrictions for the conclusion of the second and all of the third iteration, the researcher facilitated the lessons through Zoom with the teacher in the classroom. All the schools were co-educational, multi-denominational and English-medium schools. The first school was a newly designated disadvantaged suburban school,² the second an inner-city school with a high level of climate awareness and the third an established suburban school with some previous engagement with climate activism. Both the second and third schools were located in higher socio-economic catchments.

The programme and picturebooks

The programme used picturebooks to support class inquiries into different aspects of climate change learning. It took a critical approach aiming to explore systemic, social and justice perspectives, as well as scientific and geographical (Oberman & Sainz, 2021). The picturebooks used were predominantly fictional, with themes including environmental exploitation and action, with some involving unresolved narratives. Philosophy for children (Khosronejad & Shokrollahzadeh, 2020), inquiry-based science and global justice inquiry approaches (Dewey, 1910; Levy et al., 2013; Oberman, 2023; Short, 2012) were drawn on in lesson planning. For each iteration, the lessons were delivered once or twice a week, taking between two and three months in total.

The programme developed within and between iterations in response to the data collected. More substantial revisions were made between iterations one and two, the second and third iteration remaining similar. The first iteration began with a focus on the greenhouse effect, with the intention of progressing to ethical and social aspects of climate change, including consumerism, global justice, ecosystems and collective action. Developing this foundational knowledge, however, required an extended focus, which impinged on the intended critical aspects of climate change learning. These were only latterly addressed, using picturebooks in philosophical inquiries (Haynes & Murris, 2012; Khosronejad & Shokrollahzadeh, 2020) and broader discussion.

For the second and third iterations it was decided to integrate scientific, geographical, social and ethical areas of climate change learning around three inquiries. This integration of learning drew on Dewey's (1910) concept of inquiry, involving the process of disciplinary knowledge generation and the application of knowledge with social and ethical considerations. It enabled scientific and geographical learning to be explored and applied for a purpose. The first inquiry used *The promise* (Davies & Carlin, 2014), about a girl transforming a city through tree planting, to examine the concept of 'change'. The book instigated writing, image-based and discussion activities looking at the causes and effects of social change. The second inquiry used *The Lorax* (Seuss, 2017), a celebrated rhyming story of eco-destruction caused by the manufacture of textile products called 'thneeds' (Figure 1). Children considered the environmental impact of 'thneeds' with learning on product lifecycle and the greenhouse effect. They designed alternative sustainable thneeds through investigation and experimentation with different fabrics, examining the implications of their production, use and disposal. The third inquiry focused on climate global justice. It was initiated through the book *The boy who harnessed the wind* (Kamkwamba et al., 2012), a true story of the construction of windmills from recycled materials during famine in Malawi. It considered the causes of the famine and adaptation possibilities. Table 1 outlines the programme's three inquiries in the second and third iterations.

All three iterations also involved creative picturebook writing and illustrating (Gannon, 2017; Oberman, 2023). In the first iteration, children wrote their own picturebooks. In the second and third iterations, these were written as a class, with each child individually illustrating one of the pages.

Data and data analysis

A range of data were collected, including recordings of whole-class discussion during the lessons, children's work and focus group, and teacher interview audio recordings. An interview and focus group were conducted just prior to the delivery of the first lesson and a post-programme interview and focus group were conducted within a week of the delivery of the final lesson for each iteration of the programme. The focus groups and interviews were each

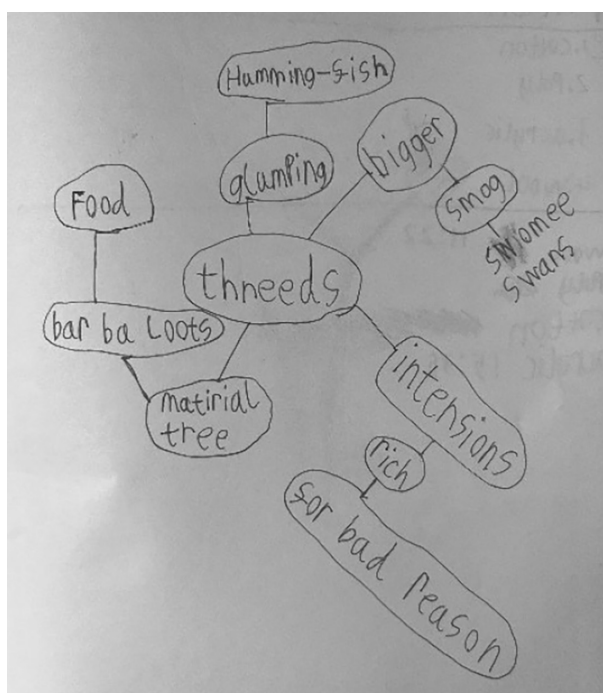


FIGURE 1 Example concept map on the problem with thneeds, by Clive, iteration 2.

around 25 min long and used semi-structured schedules to enable open discussion. They took place in empty classrooms and corridor spaces, with those in the third iteration using Zoom. Pre- and post-programme focus groups asked children about their conceptions, feelings and learning pertaining to climate change and picturebooks. The post-programme questions asked also for their responses to the programme.

All audio recordings were transcribed orthographically, and pseudonyms applied. Nvivo was used to analyse audio transcripts thematically (Braun & Clarke, 2021). Unlike much of the research on emotions in education, the focus on topic emotions here was emergent rather than an initial orientation of the study. It arose from thematic analysis without research instruments designed specifically for the purpose. All data analysis and coding were done by the author. The data were coded openly, informed by the theoretical framework of the study, then coded to support systematic analysis of the emotions expressed in relation to the programme. This involved the same data being coded by the emotions (e.g., happiness and anxiety), the object foci of the emotions (parent codes included, e.g., topic and epistemic) and the subject purported to experience the emotion (including, e.g., 'I' or 'they'). For example, Owen's comment (see below) '*So I really enjoyed making the book*' was coded first by the emotion, 'joy', then by the object focus of the emotion, parent code 'activity', child code 'picturebook creation' and then by the subject, 'I'. This process of analysis enabled consideration of the relationships between different emotions, categories of object foci and subjects attributed with the emotions. It drew on the categorisation of emotion in education (Pekrun & Linnenbrink-Garcia, 2014) and the climate emotion discourse analysis differentiating strong and weak emotions (Hufnagel, 2015).

From analysis of these codes, themes emerged relating to the characterisation of emotional experiences. In the main, the data considered here involve self-reported emotions although observed emotions, either through recorded emotional behaviour (e.g., laughing) or emotive language are also included (Pekrun & Bühner, 2014; Reisenzein et al., 2014).

TABLE 1 Outline of the picturebook-based inquiries in the second and third iterations of the programme.

Key learning goals	The picturebook stimulus	Key inquiry activities
Explore the concept of 'change', including identifying changes, their cause and personal responses.	<i>The promise</i> by Nicola Davies and Laura Carlin. A celebrated prophetic tale in which a city is transformed by a girl's planting of stolen acorns.	• Philosophical inquiry with <i>The promise</i> as stimulus. • Creative writing tasks including alternative versions of <i>The promise</i>. • Individual body X-rays on and discussion of change theme.
Explore the greenhouse effect, product lifecycle and environmental impact of different fabrics through inquiry into sustainable 'thneeds'.	<i>The Lorax</i> by Dr Seuss (2017). One of the most successful environmental books. A rhythmic rhyme in which a fallen entrepreneur narrates his destruction of an ecosystem to expand his business manufacturing the multipurpose textile product, thneeds.	• Discussion of <i>The Lorax</i> and the environmental impact of thneed manufacturing. • Exploration of fossil fuels, greenhouse effect, climate change and product lifecycle using images from the book. • Investigation and experiments on alternative fabrics. • Design sustainable thneed.
Explore the implications of climate change for vulnerable communities, recognising the intersection of issues and considering alternative adaptation strategies.	<i>The boy who harnessed the wind</i> by William Kamkwamba, Bryan Mealer and Elizabeth Zunon. A true story, told with collage-style illustrations, narrating William's construction of windmills from waste products during famine in Malawi. Also written as a novel version.	• Card activity exploring the multiple causes of the famine in Malawi (the subject of the book). • Role-play activity exploring possible adaptation strategies for William's village in Malawi.

The emotions analysed are predominantly retrospective, expressed in the focus groups in relation to the completed programme, although concurrent expressions are also included. The subjectivity involved in expressing and interpreting state of mind, including reflectively, is acknowledged as an inevitable consideration in this research, which anyway recognises the significant influence of language in how we understand and define emotion (Pekrun & Bühner, 2014; Zembylas, 2007). Being situated in the context of a picturebook-based climate change education programme and in more general discussion of this programme, the expressions of emotion in the data go some way to capturing the complex social dynamic in which they are evoked (Turner & Trucano, 2014). They enable a highly qualitative analysis of the experiences indicated by the emotional expressions.

FINDINGS

Emotions on climate change: Ethical judgements

In the focus groups, participants were asked about their feelings in relation to climate change. Students' emotional responses to climate change are also evident in the transcripts of whole-class discussion during the programme lessons. Applying Pekrun and Linnenbrink-Garcia's (2014) categorisation, these can be termed topic emotions, as they relate to the topic of study in the programme: climate change. Consistent with other studies, students here express a range of, predominantly negative, emotions to the topic in general terms, or in relation to specific aspects of their climate change understanding. These expressions

of emotion include anxiety, anger, sadness and guilt. Some participants also communicate defensiveness, feeling obligated to act but incapacitated. These emotions are particularly evident in the second iteration, with high climate awareness, proposing the significance of context to emotional response (Wrenn et al., 2007). The references below are indicative of these findings.

It's like you feel anger as well because you're like 'Why are you doing that' but you can't do anything because they're so far away.

(Cara, focus group pre-programme, iteration 2)

Like sad and scared.

(Tim, focus group post-programme, iteration 3)

Sympathetic. Or is that not even a word? ... I'm thinking of the animals.

(Hazel, focus group post-programme, iteration 3)

I also feel guilty because I like chocolate, but I understand that dark chocolate is better and I don't like dark chocolate so every time I eat a chocolate bar, I feel so bad.

(Victor, focus group pre-programme, iteration 2)

What is interesting about these responses is not only the emotions felt and their object foci, but what they suggest about the structure of experience. Emotion is expressed as a reflective assessment of the climate situation as understood by the children. Their feelings related to climate change are in the present tense and ongoing, 'I feel angry'. Victor's comment highlights his general feeling of 'guilt' connected to more intense 'bad' feelings at moments when he perceives he is doing wrong, when he eats chocolate. Victor's predominant topic emotion, like others, is consistent. There is little evidence in the data of children's climate change emotions changing, despite learning from the programme. In their form of expression there is also limited evidence of the physiological or motivational aspects of the emotion. Where anger, for example, is understood to involve increased pulse and a flushed face, Cara demonstrates neither of these—though she articulates her anger. Notably she expresses her emotion in the second person, a characteristic Hufnagel (2015) interprets as distancing the emotion, and which suggests a reflective rather than an immersive relationship to these feelings. In fact, some of the emotional expressions suggest children's high levels of analysis in identifying their emotional responses to the topic. Emma's discussion here is particularly demonstrative of this reflective emotion identification:

Yeh I actually I know I shouldn't feel guilty but I feel a lot of guilt because urm we don't realise how much we actually cause it like and it's hard to make changes because in my house my dad makes a lot of meat because we are half Spanish and most of my food and I feel guilty but I know I should stop but I think the most important thing is at least people are still being educated. Because I know a lot of people don't bother to learn and they look at videos and just ignore it which I think is wrong.

(Emma, focus group post-programme, iteration 2)

Emma here both acknowledges and queries her feelings of guilt. In her analysis of the emotion, she considers the circumstances that both make her culpable and exonerate her. On the one hand, she contributes to climate change through meat consumption; on the other hand,

she recognises cultural factors, her high level of engagement and the positive significance of climate change education as being causes to abate her guilt. Her feelings of guilt therefore are interlaced with her cognitive engagement with the question of responsibility for climate change. Few participants articulate the reasons for their topic emotions as Emma does here. However, they do express their climate change emotions reflectively, suggesting feelings associated with a rational appraisal of the climate situation as they understand it. As Theresa, the teacher in the second iteration, states: *'of course there is going to be anxiety but it is not unfounded'*. Emotion, in these expressions, is conveyed as an ongoing judgement attached to the issue, reflecting Nussbaum's (1992) conception of emotion as ethical appraisal.

As well as the self-reported emotions described above, participant climate emotions are also observable in the emotive responses with which they described environmental issues. The references below are indicative of these.

You can even see the pollution outside your school, it is crazy. Isn't it? You can see pollution outside your house and your school and everywhere. You can see it everywhere.

(Frank, lesson transcript, iteration 1)

It is melting. Over, you know, throwing our trash and our wrappers and our pictures all around, and now they are all melting.

(Fergal, lesson transcript, iteration 1)

Frank and Fergal here do not use explicit emotional language, such as stating anger, but their indignation is suggested in their emphatic expression, repetition and, in Frank's case, rhetorical question. Observable rather than self-reported, this emotion involves interpretation. Nonetheless, their phraseology conveys their emotion, like the references above, as evaluative responses to the environmental situation as they understand it.

The enduring and evaluative nature of the children's emotions here brings into question their distinction from attitudes. Where both attitudes and emotions have affective constituents, attitudes are regarded as longer in duration than emotions and as attaching to a belief, understood as less secure than the object foci of emotions (the belief can be wrong). Attitudes are also seen to have simpler valence (positive and negative) and behaviour components (avoidance and approach) (Shuman & Scherer, 2014). Children's responses to climate change are expressed using the language of emotion (anger, anxiety and sadness) rather than attitude (like, dislike). They indicate more complexity and nuance in terms of valence and behaviour. However, like attitudes, they are shown here to be ongoing responses built on conceptualisations of the topic. Despite learning about the topic, these emotions significantly endure, highlighting a blurred distinction between attitudes and emotions.

Children's discussion of their feelings towards climate change also proposes the varied width of the 'topic' to which children attach emotion. Just as Shuman and Scherer (2014) suggest that measurement of emotions can be broader or narrower (e.g., happiness is broader than elation), this data highlights how the 'topic' to which emotion attaches can also be of varied breadth. Some children, for example, attach their emotion to the general topic of climate change. For others, it relates to a specific idea that is significant in their conceptualisation (e.g., leaders' inaction). The two references below are indicative of this variation: in the first the topic is climate change broadly; in the second it is the specific idea of inaction.

Anxiousness just because kind of yes, climate.

(Xander, focus group pre-programme, iteration 3)

Like angry at the people who are in charge of our world that they let it happen.
(Hazel, focus group pre-programme, iteration 3)

This varied breadth of topic, evoking the emotion, raises further questions regarding the impact of learning on topic emotions. The emotions attached to wider topics are shown here, as elsewhere (Lombardi & Sinatra, 2013), to depend on how these wider topics are understood and which narrower facets of the topic dominate the conceptualisation. Hazel, for example, is asked how she feels about climate change but her emotion attaches to a particular dominating idea, in this case the inaction of powerful people. Through participation in this programme, students' broad climate-related emotions do not alter significantly. The programme incorporated exploration of positive social change, including successful climate adaptation and mitigation. As the teacher in the third iteration, Dave, describes: the lessons '*took the proactive side of it ... there was no fearmongering*'. The data show evidence of learning in this regard, with increased social and political climate change awareness. The dominant conceptualisation of climate change, however, attracts the same emotional responses. Further research might explore the relationship between emotions attaching to narrower and wider related topics. Which narrow topics dominate broader topic emotions? It would be valuable to further examine how teaching narrower topics attracting positive emotions can influence wider topic emotions on climate change.

Pekrun and Linnenbrink-Garcia (2014) categorise 'emotions related to topics in science class' as topic emotions (p. 4). As can be seen, however, while the topic and corresponding emotions may surface in the classroom, the issue is real-world and the related emotions therefore expressed as ongoing attached responses. These emotional responses are highly cognitive and reflective of the children's conceptualisation of the issue. As will be discussed below, the character of the emotion expressed contrasts with the emotional experiences attached to *learning about* climate change and *reading picturebooks* with climate change content, though all fall under the category of topic emotions. While the emotions expressed in relation to climate change are analytical, the emotions related to learning about climate change are expressed in more physiological and immersive terms. The expressions of emotion aroused in response to reading the picturebooks are also analysed and point to an interactional experience, with emotion communicated and evoked in others. Table 2 presents a framework for approaching the

TABLE 2 A framework for topic emotions.

Topic emotional characterisation:	Emotion as ethical judgement	Emotion as immersive experience	Emotion as communication of feeling
Hybrid:	Quasi-emotions (empathy)		
	Vicarious emotions		
Examples from data:	<i>It's like you feel anger as well because you're like 'Why are you doing that' but you can't do anything because they're so far away</i>	<i>I felt happy when we were doing the story</i>	<i>The first thing I figured out when we started reading The Lorax was the problem because the page was all dark and ugly</i>
Features of emotion characterisation:	Cognitive, residual and attitudinal	Affective, physiological and immediate	Created through a nexus of imagination, memory, analysis and communication
Proximate educational emotion phenomena:	Attitudes and preferences	Activity and epistemic emotions	

different emotional experiences encompassed in topic emotions. It sets out the different characterisations of emotion found in the data: emotion as ethical judgement, emotion as immersive experience and emotion as communication of feeling. Emotional responses to climate change picturebooks, drawing on Nanay (2018), are differentiated into quasi- and vicarious emotions, which are understood as hybrid across emotion characterisations. The table provides examples from the data of the different characterisations of topic emotions, features of the characterisations and other emotional phenomena to which each closely relates. Below, the emotions related to learning about climate change and reading climate-related picturebooks are discussed.

Emotions on learning about climate change: Immersive experiences

Pekrun and Linnenbrink-Garcia's (2014) suggested topic emotions are distinct from other categories of emotion in education, like activity emotions, because of their object foci: a topic or activity, respectively. The climate change emotions explored above, however, propose quite different experiences to those related to activities. Children's 'emotions' to climate change and the programme tasks were not equivalent. When children were asked about their emotions during the lessons, they predominantly described their responses to engaging in the activities, what Pekrun (2006) has called 'activity emotions'. These were mostly positive, principally enjoyment.

Yes I really enjoyed that lesson as well because it was really hands on I guess so you kind of got to experience it.

(Cara, focus group post-programme, iteration 2)

So I really enjoyed making the book. It was fun to draw and it was nice making up a story.

(Owen, focus group post-programme, iteration 2)

I've two that I don't know which I enjoyed more. So, the first one is the one where we were making the story and maybe it's because it's only that the entire class got to do together and it's something different that we haven't been doing the past other weeks and the second one is definitely drawing and writing the book ... I think that was lots of fun.

(Tess, focus group post-programme, iteration 3)

In contrast to the present tense used to discuss their emotions on climate change, in the focus groups children describe their emotions during the lessons in the past tense: '*I enjoyed*'. The tense distinction highlights the finite duration of tasks and the attached emotions, as against enduring emotions attached to a topic like climate change. In their description of their feelings during the activities, the children highlight the immersive character of these emotions. Cara describes the activity as '*hands-on*' and one you '*experience*'. Owen and Tess, in attaching the emotion to the task rather than themselves—'*it was fun*', '*it was nice*' and '*that was lots of fun*'—and in drawing attention to the collaborative context of the task as contributing to the resulting enjoyment, suggest the experiential character of the emotion. The enjoyment is claimed consistently in the first person here, where many of the expressions of emotion related to climate change are more distanced. The significance Zembylas (2007) attaches to the interpretation of emotion finds evidence here. The contrast suggests that Pekrun and Linnenbrink-Garcia's (2014) differentiation between categories of emotion not only relates to

their object foci but to the character of their experience. Certain emotional experiences being more cognitive, evaluative and enduring and others more a sensation of finite duration.

Topic emotions, however, as we have seen above (Broughton et al., 2013; Lombardi & Sinatra, 2013) include not only emotions related to the topic itself but those related to teaching and learning about the topic. In these circumstances, the stimuli and therefore the related emotions are more finite. The emotions experienced by students in learning about climate change, as the data indicate, can be very different from those aroused by climate change. It is not simply that emotion may attach to the activity, as distinct from the subject of that activity (Harley et al., 2019), but also to the attainment of new learning. Una's reference below is indicative of these learning-related expressions of emotion.

When we were learning about the materials I was really surprised by how bad the materials were, like even cotton which is supposed to be good takes a lot of water and like acrylic when it is wasted a lot of plastic goes into the water as well and I didn't know that.

(Una, focus group post-programme, iteration 2)

Una here articulates her surprise in learning about the environmental impacts of fabric production. Her emotional response and retention of key information weeks after the activity demonstrate that although her emotions on climate change are negative, learning about climate change arouses interest and surprise. In fact, Una's emphasis on the adversity of material production and the concurrent appreciation of this learning suggests the inverse correlation of positive emotions linked to learning and negative emotions associated with climate change. As Wrenn et al. (2007) and McCully (2012) propose, strong emotions towards a topic of study can increase investment in learning. Dave, the teacher in the third iteration, also identifies the positive emotions attached to new climate change learning through the fabric inquiry associated with *The Lorax*.

The whole process is something that they really valued and got a lot out of from taking it from not really knowing a huge amount about the topic material in the first place or not as much as they thought they did, to then having in depth discussions on it and reading about it and then experimenting with their own materials and then I suppose coming up with their own finished product at the end ... Yeah, [it] was obviously huge for them and dealing with the materials and experimenting with them I think they found hugely interesting.

(Dave, teacher interview post-programme, iteration 3)

The focus on emotion related to new learning brings into question the distinction between epistemic and topic emotions. In fact, Pekrun and Linnenbrink-Garcia (2014) suggest that topic emotions might include epistemic emotions. While epistemic emotions are defined as those related to the process of learning, they tend to be identified by the character of the emotion (curiosity, surprise and confusion) rather than the object foci (Muis et al., 2015). They are understood as the emotion pertaining to the incongruity between new and pre-existing knowledge and proposed to correlate with learners' level of interest in the subject of learning (Broughton et al., 2013; Lombardi & Sinatra, 2013; Markey & Loewenstein, 2014). As can be seen here, epistemic and topic emotions—where these topic emotions relate to the content of new learning—are intertwined. The learning on the environmental impact of fabric appears to cause Una surprise, both as it is incongruous with her previous perception but also because she has positive emotions towards learning this information specifically, and about climate change

generally. As the reference indicates, since the emotion is positioned in the moment of learning, these experiences are finite and immersive.

It is similarly difficult to disaggregate these emotions related to topic content from those related to the activities in which the content is explored. The teachers, in describing children's engagement with the lessons, show the interconnection of emotions linked to tasks and topic, as the reference below indicates.

I think giving them a forum for discussing [climate change] and listening to each other's opinions and kind of being yeah, just the opportunity to, I suppose further explore how they feel about it and doing it in a way that you know is interesting to them because it involved picturebooks and somebody else's story. I thought that was really nicely done.

(Theresa, teacher interview post-programme, iteration 2)

Theresa here suggests children's enjoyment in the lessons related to its focus on climate change and the pedagogical approach, with the two aspects being conjoined. The children also indicate the inseparability of task and topic emotions. The three references below are indicative of this.

I liked the ones that were more practical and you could kind of see it for yourself and sometimes if you kind of do something physically you remember it better and it kind of sticks with you.

(Una, focus group post-programme, iteration 2)

When we had our inquiries I thought that was good because you get to choose what you would like to learn about and then you can go in and then you present it and you gave us some good materials as well to work with so I enjoyed that.

(Cara, focus group post-programme, iteration 2)

I am the same as Cara—I think it is more fun if you just do everything yourself and you have to match them up because you have to read through them and think more and I found it quite enjoyable and I would say another class would enjoy that as well.

(Ciara, focus group post-programme, iteration 2)

While Cara, Una and Ciara here don't articulate their learning in the lesson, they all indicate their enjoyment in their learning, which related to climate change. Una likes the activity as it means she remembers the content '*better*'. Cara enjoyed the inquiries because you choose '*what you would like to learn about*' and Ciara '*because you have to read through [the information] and think more*' (Figure 2). The difficulty of disaggregating activity and topic emotions is evident here, with the emotional expressions explicitly connected to the activities but implicitly connected also to climate-related learning. Like epistemic and activity emotions, however, these emotions attach to a learning experience which is of finite duration. At times it is similarly expressed, as an attribute of the task: '*it was fun*' suggesting

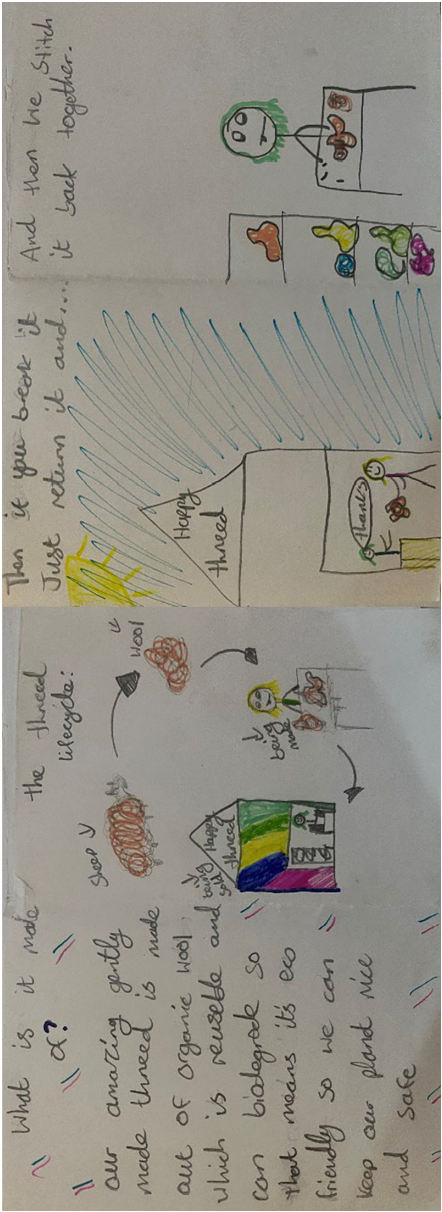


FIGURE 2 Double page spreads from Ciara's little book on the lifecycle of a sustainable thread, iteration 2. [Colour figure can be viewed at wileyonlinelibrary.com]

again its immersive quality. The distinction between attitude and emotion is here again by degree with the language of '*liking*', associated with attitude, appearing synonymous with that of emotion '*enjoyed*'.

Emotions on climate change picturebooks: Communicated feelings and hybrid experiences

Pekrun and Linnenbrink-Garcia (2014) state that emotional responses to artistic media, like novels, are also included in the category of topic emotions. This study explores children's responses to an education programme using picturebooks, with many of the expressions of emotion in the data being responses to these books. This section considers the character of the emotional responses to the picturebooks as against the emotions related to climate change and to learning about climate change, explored above. In doing so, it evaluates empathetic emotions against these other expressions of topic emotions.

Many of the children's expressions of emotion related to the picturebooks. Reflecting previous research (Arizpe et al., 2014), in discussing the picturebooks, children inferred affective states from the picturebook composition.

I find it interesting that the idea of planting stuff caught on so quickly and that everyone started to do it and that it made such a huge difference because everyone is happy and surrounded by colour and all things and plants.

(Cara, lesson transcript, iteration 2)

So, the first thing I figured out when we started reading The Lorax was the problem because the page was all dark and ugly.

(Ursula, lesson transcript, iteration 1)

The city is lonely and sad.

(Danny, lesson transcript, iteration1)

The references here suggest the children's identification of emotion through the multimodal features of the picturebooks. Colour, in particular, is seen to engage children in the affective ambiance of the books, with other features—including text—contributing. Danny, for example, is drawing directly on the text of *The promise* in his articulation of the city's sadness. While these expressions of emotion attach to the book's chorus (*everyone, the problem, the city*) or mood, elsewhere children identified the feelings of individual characters, stating for example that the character is sad. The emotions expressed are those identified as being communicated by the picturebooks rather than those being experienced by the learners. However, as discussed below, in engaging with the emotion communicated through the picturebook, children express their own emotional experiences, which are both immersive and evaluative.

Quasi- and vicarious emotions as hybrid emotional experiences

As well as identifying emotions communicated in the book, the children—like in other studies (Martinez-Roldan & Newcomer, 2011)—dramatise characters' feelings and thinking, constructing an imagined emotional experience. The reference below is indicative of these responses. Luke, in discussing *The giving tree*, identifies with the character of the Boy who, in the story, exploits and rejects the ongoing care of the Tree.

I mean the other guy is being so mean to the tree. He was like, 'Tree, I don't care about you anymore and just because I am thirty-two doesn't mean I am too old to play, and I need to pay taxes and bills'. So, he just left the tree abandoned, all alone, poor tree is sad. That is it.

(Luke, lesson transcript, iteration 1)

Luke here imagines the character 'from the inside' (Nanay, 2018, p. 1375), interpreting his motivations. This empathic engagement is profoundly imaginative. Luke draws on his experiences, emotional memories and creativity to embody the character and construct a rationale for his rejection of the Tree. This empathy, described by Nanay as quasi-emotion, derives from that communicated by the picturebook, through the narrative, text and images, but is also enacted and immersive. Interestingly, Luke here dramatises the motivations of the antihero, though he goes on to show empathy also with the victim, describing the Tree as '*abandoned, all alone and sad*'. Furthermore, his repetition of the Tree's isolation suggests not only identification with the Tree, but his own indignation at its mistreatment, an emotion not *with* the characters but *at* their situation, what Nanay terms *vicarious* emotion. The emotion here then is not that perceived to be experienced by the characters, but is an emotion *for* the characters, aroused by viewing their circumstances and behaviour. This emotion, as can be seen from Luke's comment, involves ethical evaluative judgement. Luke views the Boy's behaviour towards the Tree as wrong. As Nussbaum (1992) suggests of novels, the emotion is connected to the ethical stance of the book, distinct from any particular character. The references below are further examples of these vicarious other-centred emotions, here all related to the book *The boy who harnessed the wind*.

For The boy who harnessed the wind, I mostly felt relieved that he had built the windmill and those people would be okay now.

(Jonny, focus group post-programme, iteration 3)

He took his time to build one windmill so he can get food. That is genius.

(Ursula, lesson transcript, iteration 1)

I feel like originally when they saw him just trying to build it, they were like ... 'Oh, what are you doing strange person'. But then when they saw what he was actually doing. He was like 'Oh, we can use this for our own personal gain'. So they're like 'ah amazing now'. If that was me I would be like, two minutes ago, you were saying I was crazy.

(Maria, lesson transcript, iteration 2)

The references demonstrate children's vicarious emotional responses to the narrative. Jonny is relieved for the characters facing famine, Ursula is inspired by William's ingenuity and Maria is indignant at the villagers' hypocrisy. The emotions here appear immersive and transient, being aroused by the aesthetic reading experience; however, they are also evaluative judgements. Maria's comment, in particular, appears ethically responsive to the villagers' mistreatment of William as she sees it, and reflects the emotion associated with injustices (Wrenn et al., 2007). Each of the teachers identified the ethical nature of children's responses to the picturebooks.

Dave, for example, identifies this emotive weight—for the children—of the injustice and resilience proffered in the narrative.

Being able to see their own, see themselves how this person has made an impact and even though he started off and everyone kind of said he was crazy and everyone kind of dismissed his opinions and whatever else and the fact that he has created such positive change for his community and his environment, was I think, just huge for them.

(Dave, teacher interview, post-programme, iteration 2)

This analysis points to varied emotional experiences involved in responding to texts, in this case picturebooks. The data here draws attention to the complex social and psychological processes involved in empathising with and understanding character motivations. The children, in engaging with characters, draw on their imaginations and past experiences as well as the narrative and compositional picturebook features to connect with but also analyse and be separate from them. At one level, the narrative and composition design features support children's identification and recollection of emotions. Emotion here is communicated, suggested for example in colour or facial expression, and identified and attached to an imagined emotional lexicon by the children. It is also communicated through the narrative by children imagining and putting themselves in the position of the characters. This quasi-emotion is shown as a hybrid emotion type, being a communicated feeling that generates an immersive emotional experience. Vicarious emotion, evoked through the aesthetic of the picturebook narrative, engenders an ethical response to perceived injustice or its resolution.

CONCLUSION

Emotion is increasingly recognised as significant in learning, including emotions relating to the topic of study. How that emotion is understood, however, had not been considered and the concept of 'topic emotions' had been adopted to include responses to a variety of stimuli including broad issues, specific scientific advancements and artistic works. Pekrun and Linnenbrink-Garcia (2014), in categorising emotions by their object foci, suggest that these emotional experiences are equivalent. This paper draws on empirical data to examine learners' experiences of topic emotions as they relate to climate change, learning about climate change and climate-related picturebooks. The data find that how emotion, in these contexts, is structured needs greater consideration, with some experiences being more cognitive and attitudinal and others being more physiological and immersive. This paper, in examining emotional engagement with fiction—in this case picturebooks, as a subcategory of topic emotions, explores this aesthetic and imaginative process. Drawing on Nanay (2018), it suggests that empathy can involve both identification with characters, where the aesthetic enables the reader to envision their inner world, but also an affective response to the characters' behaviour and situation, what Nussbaum suggests is the product of text's ethical stance.

These findings have implications for instruction as they differentiate the enduring character of emotions linked to broad issues, like climate change, as against those aroused by specific learning content with immediate consequences for task engagement and knowledge retention. Emotions linked to climate change are shown to withstand instructional efforts to explore hopeful climate action, problematising proposals to foreground learner agency as an antidote to climate anxiety and grief. The relationship between narrower and wider aspects of a topic is informative here. While positive climate stories, a narrower topic, might attract optimism,

the wider climate change topic remains connected with negative emotions. Given the scale of the planetary crisis, negative emotions seem both inevitable and appropriate. While hopeful action messages play a motivational role, this research suggests that teachers attend to other aspects of climate change learning evoking emotional responses. Positive emotions can attach to learning about climate change, despite its negative content. Ensuring the salience of learning and interest in tasks supports student enjoyment. The use of picturebooks is shown to evoke distinct emotional responses, with implications for classroom practice. Building on Haynes and Murris (2012) and Nussbaum (1992), this study suggests that picturebooks can solicit affective ethical responses to contextualised climate issues, which can be expanded upon to support children's philosophical consideration of the systemic challenges.

As with all research, this study has limitations. As emotional expression is influenced by social, cultural and linguistic factors and personal attributes (Zembylas, 2007), what is expressed only partially reflects what is felt, with the interpretation of those expressions involving further subjectivity. Furthermore, drawing particularly on focus group data, the analysis involves retrospective accounts of emotion rather than concurrent. Data were transcribed orthographically with audio dimensions, like pauses, recorded but not emphasis. Aspects of expression, such as facial and intonational, were not therefore captured. The interventionist nature of the research—integrating the designer, researcher and teacher roles—also has implications both for the objectivity of analysis and the generalisability of findings. Nonetheless, the study provides systematic analysis, which foregrounds the voice of children, capturing their expressions of emotion in naturalistic and situated contexts.

In providing this analysis, this study furthers understanding of topic emotions as experienced by children in classrooms, enabling the disaggregation of these experiences. In highlighting the interactional and ethical influences on children's expressions of emotion, these findings suggest that Pekrun et al.'s (2007) taxonomy of achievement emotions, which categorises by valence and activation, does not easily extend to topic emotions. As Jones and Davison (2021) and Jones and Whitehouse (2021) suggest, the emotions arising from these different aspects of topic are not easily designated as positive or negative. The framework proposed here, differentiating emotion as an immersive experience, as an ethical judgement or otherwise as a communication of feelings, should encourage educational researchers in this area to discriminate between different classes of topic emotions.

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ENDNOTES

¹ See Machowska-Kosiack and Barry (2022) for a discussion on and definitions of 'second-generation' migrant background and of visual signifiers.

² Under the Department of Education and Skills' Delivering Equality of Opportunity in Schools – Action Plan 2017, schools with high numbers of students at risk of educational disadvantage are identified to participate in a schools' support programme.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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