

Naturally enough? Children, climate anxiety and the importance of hope

Abstract: Climate change is causing considerable anxiety among young people, who may feel that they have little opportunity to respond to it, but who will bear the greatest associated burdens in their lifetimes. In this analytical review of the literature, we investigate the problem, citing recent literature and exemplars of good practice, and propose responses, framed by pedagogies of hope. We draw parallels between three elements of a pedagogy of hope (goals, pathway thinking, and agency), and outcomes-based pedagogy, with its intended outcomes, means to achieve them, and associated support, including confidence-building. As part of this support and pathways, we explore the capacity for young people to take action. We conclude with some considerations, recommendations and implications for educators seeking to engage students in climate change education. Drawing foremost on an Australian context, we invoke some of the Australian Curriculum's General capabilities. From our findings, we expand 'communities of practice' in what we term SEA (sustainability engaged and active) classrooms, to include: communities of protection and preservation, of protest and pro-activity, and of promise.

Key words: climate change; pedagogy; sustainability; hope; climate anxiety

Introduction

Climate change, which is often described in terms of crisis and chaos, is a cause of distress and anxiety for many people, and particularly for children. This distress has been variously termed climate anxiety (Eklund, 2018; Ling & Lyndon, 2019; Pihkala, 2019), eco-anxiety (Hebron, 2020; Ojala, 2018; Pihkala 2018), ecophobia (Strife, 2012) and "atmosfear" (Janković & Schultz, 2017; Kundzewicz, Matczak, Otto, & Otto, 2020), among other terms (Brian, 2020; Hebron, 2020). Definitions of the upper limit of childhood differ, as seen in the literature cited; we focus mainly in this paper on school-aged children. Researchers have found that feelings of pessimism about climate change and the future develop in late childhood and then seem to increase until the late teenage years (Kelsey & Armstrong, 2012; Ojala, 2012c; 2016). Strife (2012) conducted in-depth interviews with 50 10-12 year-olds and found that 41 (82 percent) of the children expressed fear, sadness and anger when discussing their feelings about environmental problems. A majority of the children also shared apocalyptic and pessimistic feelings about the future state of the planet. These results align with earlier studies indicating that many children are fearful and pessimistic about environmental issues (Connell, Fine, Sykes, & Yencken, 1998; Hicks & Holden, 2007; Taber & Taylor, 2009).

More recently, surveys of children and young people have also identified high levels of stress and anxiety related to climate change. A report from an online survey of 74 7-25 year-olds in Australia (Chiw & Ling, 2019) found that 96 percent considered climate change to be a serious problem and 89 percent reporting that they were worried about the effects of climate change. A survey conducted by ReachOut and Student Edge (2019) of over 1,500 Australian students aged 14-23, found that 80 percent of them indicated that they felt anxious about climate change and more than 46 percent reported associated anxiety on a weekly basis. Reviews of international research on the psychological effects of climate change on young people also found evidence that the

majority of young people harboured similar concerns (Burke, Sanson, & Van Hoorn, 2018; Sanson, Van Hoorn, & Burke, 2019).

This paper derives from an exhaustive search of recent literature, but with a focus on the Australian context, using search terms including climate anxiety, children, school and pedagogy. It will be of particular relevance to school teachers and jurisdictions. It sets forth, in the context of current literature, possible approaches to address climate anxiety in children, alongside some associated pedagogical activities. We hope to move current debates on climate anxiety forward with our extension and application of communities of practice.

Children's coping strategies

As might be expected, many children develop coping mechanisms in response to climate fears. Ojala's extensive research with Swedish children and young people has examined their emotions and coping strategies concerning climate change, as well as how these coping strategies relate to their environmental engagement and well-being (Ojala, 2012a, 2012b, 2012c, 2013, 2015, 2016). Ojala found that worry was the most common emotion related to climate change and that young people developed a range of strategies accordingly. Employing problem-focused coping involved attempting to address the source/s of the problem; emotion-focused coping involved distancing strategies to eliminate negative emotions; and meaning-focused coping involved being able to see both negative and positive trends, and placing trust in others in society to address climate change.

Ojala (2012b) not only asked 11-12-year-old children how they coped with worry about climate change, but also how they generated hope. She found that they used the meaning-focused strategies of trust, positive reappraisal, and drawing on existential hope. Trust manifests in having confidence that science and/or governments will have the knowhow and inclination to effectively address climate change. Ojala (2012b) found that trust in science and technology was an especially common coping strategy among children. Positive reappraisal involves acknowledging the climate problem while also recognising positive trends in dealing with it. This reappraisal can precipitate positive emotions, such as hope. However, Ojala (2012b) found that the 11-12-year-olds did not use positive reappraisal as often as older youth, possibly because they had not yet developed the cognitive maturity to simultaneously consider both positive and negative trends in relation to climate change. Instead, they drew on sources of existential hope; for example, the belief that it is necessary to be hopeful concerning climate change although it is a serious problem, otherwise there is no meaning in doing anything. Ojala found that meaning-focused coping was related to more environmental engagement among young people and they were more likely to express positive feelings and life satisfaction (2012b, 2012c, 2013, 2016).

Children need support to cope with climate anxiety in a way that strengthens both their wellbeing and their ability to engage with climate change effectively (Ojala, 2012b). The Australian Psychological Society (2018b) has identified the characteristics that will be most valuable for young people to adapt successfully to the future [and present, for those who have afflicted by

‘natural’ disasters such as bushfires] in the context of climate change. These include individual characteristics such as emotional self-regulation (e.g., through meaning-focused coping), persistence, empathy, belief in social justice, adaptability and creativity. Interpersonal skills include negotiation and conflict-resolution skills, and the capacity to cooperate and work with others. Important social responses to living in a climate-altered world include volunteering and joining community groups, and engaging in active citizenship (Australian Psychological Society, 2018; Sanson et al., 2019).

The importance of hope concerning climate change

Hope is an important factor in coping with climate change concerns. A psychological theory on hope developed by Snyder (2000) has been widely used to explore agency and pathway thinking regarding environmental challenges (Li & Monroe, 2019; Ojala, 2012a; Stevenson & Peterson, 2016). Snyder’s theory proposes that hope comprises three components: goals (desired outcome); pathway thinking (the path to achieve the desired outcome); and agency thinking (the motivation to take the path). Olsson, Gericke, Sass, and Boeve-de Pauw (2020) couch these in terms of knowledge, confidence, and the will to act. They propose a 12-item *Self-Perceived Action Competence for Sustainability Questionnaire* (p. 742).

In a study exploring the psychological factors that affect hope concerning climate change, Li and Monroe (2019) found that the belief that individuals and society are able to make a difference in addressing climate change nourishes hope. According to Li and Monroe, hope has the potential to regulate worry and anxiety in the face of climate change. The stronger the sense of hope in the face of climate change among young people, the more likely the related positive outcomes because of their proactive engagement. By creating supportive learning environments with opportunities for students to learn about and take part in actions to address problems caused by climate change, teachers can nurture hope. We draw parallels in this paper between Snyder’s (2000) goals, pathways and agency, and an outcomes-based pedagogy, featuring aspirational outcomes, the means to achieve these, and learner support, e.g. Willis and Kissane (1995).

Hope appears to promote pro-environmental behaviours (Hicks, 2014; Lueck, 2007) both in terms of lifestyle choices (Stevenson & Peterson, 2016) and political engagement (Ojala, 2015); and people feeling strong hope are more frequently actively committed to mitigating climate change (Lueck, 2007; Ojala, 2012a, 2012b). Hope has the potential to facilitate proactive meaning-focused coping strategies in the face of climate change, and to lead to both individual and collective environmental engagement (Hicks, 2014; Li & Monroe, 2019; Lueck, 2007; Ojala, 2015; Stevenson & Peterson, 2016). In terms of climate change education, programs should foster hope inspired by a vision of a possible future (*goal*), awareness of pathways to reach the goal (*pathway thinking*) and belief in agency to achieve it (*agency thinking*).

The capacity to face environmental threats and uncertainties, while finding positive meaning in taking action, has been termed constructive hope (2015). Ojala (2012b, 2012c, 2015), found that constructive hope motivated young people to engage in pro-environmental behaviours, while hope based on denial of the seriousness of climate change led to less environmental engagement. Young people develop constructive hope when they learn that they and others can make a positive difference by working collaboratively (Chawla, 2020b; Ojala, 2016, 2017. Kelsey

(2016) maintained that hope can be taught. She advocated a focus on creating and nurturing communities, both face to face and through online social networks, as sites of collective hope. She described examples of conservation solutions that were having a positive impact on climate change. One of the solutions that Kelsey (2016) examined was #OceanOptimism, a social media project based on advocating hope, that used Twitter to share ocean conservation successes from around the world. She cited #OceanOptimism as an example of a self-perpetuating network for collective hope. While we see considerable scope in such initiatives to inspire, educate and restore hope among young people in particular, we recognise their potential to engender 'slacktivist' or 'clicktivist' complacency. Nevertheless, such platforms offer opportunity for (young) people not only to be influenced, but to be influencers (Madison & Klang, 2020) thereby enacting agency, and being part of a movement to pivot mainstream thinking towards higher levels of sustainability. Such campaigns should complement, not displace, material contributions to environmental sustainability.

Hope and Agency

Young people feel more hopeful about climate change when armed with agency (Welsh & Cordero, 2019), that is, when they know there are actions that they can take personally to address the issue (Ojala, 2012c; Trott, 2019). To cultivate agency in the context of climate change, researchers have recommended supplementing classroom-based climate change education with action-based opportunities to mitigate students' sense of paralysis and to promote their empowerment (Chawla & Cushing, 2007; Riemer, Lynes, & Hickman, 2014) as well as engagement. According to climate change education literature, making personal connections with climate change is key to building hope, agency, and inspiring young people to engage in efforts to address climate change ((Hestness, McGinnis, & Breslyn, 2019; Littrell, Okochi, et al., 2020; Monroe, Plate, Oxarart, Bowers, & Chaves, 2019; Walsh & Tutusaki, 2014).

Children need to believe that they can make a difference both individually and as part of group (Sanson et al., 2019). To combat feelings of hopelessness and powerlessness about catastrophic climate change, Sanson et al. (2019) recommend fostering a sense of self-efficacy and collective efficacy. Collective efficacy, which encompasses emotions, knowledge and identity, is the sense that one's actions, in combination with like-minded and like-hearted others, have the capacity to make a desired impact (Allen & Crowley, 2017). Connecting classrooms of engaged students, locally or more distantly (e.g. along river catchments or wildlife corridors, or developing vegetable gardens), might serve to amplify this.

Participating and taking action on climate change can build children's confidence and self-assurance as a form of resilience-building (Sanson et al., 2019). It is important to develop children's resilience by strengthening their belief in their ability to influence environmental problems in a positive direction (Pihkala, 2017). Hart et al. (2014) argued that "taking action through playing a meaningful role in the face of adversity can offer psychological protection by helping children to feel more in control, more hopeful, and more resilient" (p. 93). Hart et al. recommended that schools become actively involved in sustainable development of the local environment as part of their coping with the impact of climate change. However, if the actions are carried out in isolation and not integrated into the community, the long-term benefits are

less assured (Treichel, 2020). Schools might like to invite, or challenge, other schools, local businesses and others to be partners or competitors in planet-sustainability initiatives.

There is broad agreement among researchers on certain practices that help young people to cope with negative emotions about climate and to encourage hope by building their sense of agency and enabling them to see that they are not alone in taking action to address challenges (Chawla, 2020a, 2020b; Hicke, 2008; Ojala, 2017; Trott, 2020). These practices include: allowing young people to share their feelings without judgement, while offering support; connecting them with experts in the field who can share their expertise, work and stories; involving young people in projects to care for the environment in their schools and local communities, e.g. citizen science projects [52]; and engaging them through experiential, inquiry-based and arts-based teaching methods (Chawla, 2020a). Agency might be further impelled by the capacity for climate change to impair agricultural productivity, and the need for farmers and consumers (all of us!) to heed this.

Climate change education

Education is central to climate change mitigation, adaptation and building the resilience critical to supporting children's emotional responses. The United Nations (n.d.) Sustainable Development Goal 13 calls for "urgent action to combat climate change and its impacts". Uninformed action may do little good, or cause harm. UNESCO and the Paris Agreement (United Nations, 2015) advocated the inclusion of climate change in primary and secondary school curricula (Australian Psychological Society, 2019; United Nations, 2015; Whitehouse & Larri, 2019). The Australian Psychological Society (2019) outlined its recommendations for educators to support young people in relation to the climate crisis. Among its recommendations were:

- To build knowledge, self-efficacy and pro-environmental attitudes and behaviours as well as capacity to be global citizens;
- To help build students' sense of collective efficacy, social responsibility and realistic hope about mitigating the severity of climate change;
- To develop empathy and global competency;
- To build the capacity of the education system to deliver the above recommendations.

In the classroom, climate change topics may raise students' anxiety levels if framed through fear and tragedy, so this subject matter should be treated with sensitivity and supported with age-appropriate material. According to the Australian Psychological Society (2018a), encouraging and supporting young people's involvement in activities to both mitigate and adapt to climate change is an important means to building young people's resilience, self-efficacy, and agency, as well as a sense of responsibility (shared with others, including the teacher and the school administration). Teaching young people about the personal relevance of climate change impacts, alongside specific actions they can take to mitigate climate change, is associated with youth having greater self-efficacy, identity, and a sense of hope about their ability to take climate action and make a difference (Corner et al., 2015; Li & Monroe, 2019; Walsh & Cordereo, 2019).

Ojala (2012c) recommended that teachers talk with young people about their emotions about climate change and the different ways they cope with their feelings about it. It is important to

provide opportunities for children to express their feelings — for instance through writing, small group talk, and the critical ‘consumption’ and production of art and drama. Through such media, important values that are related to climate change, and that can be otherwise difficult for children to articulate, can be brought to the surface and discussed in the classroom (Ojala, 2016). Being given the opportunity to share and act on their concerns about climate change can boost young people’s self-efficacy, hopefulness and resilience, whereas dismissing their feelings and denying or ignoring the climate crisis can negatively impact their wellbeing (Hart et al., 2014; Ojala 2012b; Sanson et al., 2019).

Some researchers (Chawla & Cushing, 2007; Sobel, 2008; Strife, 2012) contend that having students work on small, place-based, and cognitively accessible environmental problems at the local level is the most appropriate way to foster a young person’s sense of agency. Giving students opportunities to work for environmental change with others serves to develop their belief that collective action through joint efforts can effectively accomplish shared goals (Chawla & Cushing, 2007). As intimated above, the knowledge that other committed people are working similarly, in their own catchments or wildlife corridors, will amplify this sense of agency. Sobel (2008) suggested that schools develop a set of projects with incremental responsibilities that children undertake at each grade level, to ensure that they are actively studying and participating in, environmental tasks that are age-appropriate. Older students might play a role in apprenticing younger ones as part of this process. Strife (2012) found that children may feel more positive about the state of the environment if they were given more opportunities to engage and participate in environmental stewardship and civic responsibility. Moreover, students often find hands-on activities more engaging (Kalogiannakis, Ampartzaki, Papadakis, & Skaraki, 2018).

Stevenson and Peterson (2016) considered that climate literacy activities designed for adolescents should explicitly acknowledge feelings of despair, and build agency, by providing concrete ways for young people to engage in climate change solutions, and emphasising that collective action makes a difference. Activities highlighting environmental success stories may be particularly helpful in supporting students’ hopefulness and creating perceived agency in addressing climate change (Corner et al., 2015; Li & Monroe, 2019; Ojala, 2012b; Wibeck, 2014), particularly if these are accompanied by invitations to join such initiatives. Accounts might realistically include the uptake of renewable energy sources such as solar and wind power. Several researchers have emphasised the need to help young people overcome pessimism and increase their belief in the efficacy of their own actions through presenting stories about past issues where people (including young people) have made a difference; and examples of pro-environmental action that young people can take (Fielding & Head, 2012; Fine, Ai, Yencken, Sykes, & Treagust, 2002).

Greta Thunberg (https://en.wikipedia.org/wiki/Greta_Thunberg) is one example of a young person who initiated a worldwide youth movement to combat climate change. The school strikes for climate action that have recently spread across the globe signal that individual children are not alone in their concerns or efforts. Another positive example of effective youth action was a nine-year-old German boy, Felix Finkbeiner (https://en.wikipedia.org/wiki/Felix_Finkbeiner), who established a global organization called Plant-for-the-Planet, with the aim of children planting a million trees in every country on earth to offset CO₂ emissions. That has now become a global movement with administrators between eight and 21 years old (Straume, 2020).

Knowing about organisations that work to improve the future for the planet, including those started by children, could be both empowering and comforting for children (Straume, 2019). Felix's story is included in the Young Voices for the Planet (<https://www.youngvoicesfortheplanet.com/youth-climate-videos>) collection of short films that feature young people speaking out, creating solutions, and seeking to change society as they reduce the carbon footprint of their homes, schools and communities. We note that neither organisation is without controversy e.g. Knuth and Fischer (2020); nevertheless each also sets forth a blueprint for possible emulation or adaptation.

In recent years children and young people have directly advocated the protection of their futures and future generations' futures by filing lawsuits against governments. In 2015 twenty-one young people between the ages of 8 to 19 filed a constitutional climate change lawsuit against the US government, claiming that, in spite of knowing of the danger posed by carbon pollution, the government exacerbated the danger through fossil fuel extraction, production, and consumption, and that a nation-wide transition away from fossil fuels was needed to protect plaintiffs' constitutional rights (Field, 2017). In Australia in 2020 a group of young people between 13 and 17 launched a class action seeking an injunction to stop the Australian Government approving an extension to a coal mine, arguing it will harm young people by exacerbating climate change (ABC News, 2020). Other stories of young eco-warriors include Sydney's Daniel and William Clarke, authors of *Tears in the Jungle* (Clarke & Clarke, 2011), outlining ways to protect orangutan habitat. In New Zealand, the Whanganui River has been conferred the rights of a human [69], enabling legal action to be taken on its behalf over environmental harm.

Competence, concern, commitment: Education programs that foster student hope and agency

It is important to build hope through presenting past and present examples of people making a difference and working on solutions to climate problems (Australian Psychological Society, 2018a). Brook (2010) reported on the Youth Environment Forum program, aimed at supporting students in Years 4 to 10 to build a sense of optimism and hope for the future by guiding young people through a process to identify local issues of concern, and to plan and take action. Among other positive outcomes of the program, Brook found that students came to realise that there were other students in their local area who were concerned about environmental issues, and they were able to connect to local citizens and organisations that were working to protect the environment. The students realised that their voices were valued by adults and that they could use them to make a difference. By promoting student agency, the program helped to counter any possible sense of hopelessness students may have felt when faced with environmental threats and predictions about climate change (Brook, 2010). Older students might be introduced to the reverse side of this coin, that is, human-induced environmental disasters. This environmental history study might prompt them to investigate ways in which the disaster might have been avoided, mitigated or otherwise addressed (Buchanan, 2021).

It is important for teachers to be mindful of their students' emotions and coping strategies concerning climate change (Ojala, 2012b, 2016). Ojala considered it important with 11-12-year-olds to encourage problem-focused coping strategies, despite their association with negative affect; such strategies appear to promote environmental engagement. Ojala (2012b, 2016) recommended that teachers emphasise positive thinking, trust in society, and optimism about

climate change, since these factors seem to shield children who use problem-focused coping from negative emotions; these factors also have a positive association with pro-environmental behaviour and environmental efficacy. When children adopt coping strategies where they de-emphasize the seriousness of climate change, it is important for teachers to encourage them to put their thoughts into words, so that they can be discussed critically in a supportive classroom environment. Otherwise, it may be difficult to engage these children with factual or ethical arguments (Ojala, 2012b, 2016). The research suggests that it is important to acknowledge children's emotions and to give them the opportunity to express climate-related feelings such as worry, fear and anger in order to promote constructive learning processes, engagement, and hope (Kelwey & Armstrong, 2012; Ojala, 2016).

To address negative feelings about climate change, it is necessary to create empowering learning environments that support children's awareness, while inspiring their sustained interest and engagement (Li & Monroe, 2019; Trott, 2019, 2020) and commitment. According to Li and Monroe (2019), if educational programs increase students' competence as well as their level of concern, their level of hopefulness about climate change will also increase. As seen in several threads of this paper, acting locally is pivotal for accomplishing realistic outcomes. Ojala (2016) recommended place-based education with an action component, where children worked with the community to address a local issue. Field (2016, 2017) emphasised the importance of students having agency to imagine and shape their future; her research showed that participatory, place-based approaches to learning were more likely to be responsive to young people's needs. The importance of learning on, and from, place, or Country, is gaining recognition (Jackson-Barrett & Lee-Hammond, 2018). It is one of several indigenous practices that might inform sustainability education. Familiarity, indeed, intimacy, with one's Place, is likely to engender an ownership of responsibility to it.

Many schools and community groups provide programs that actively engage children in projects that develop environmentally sustainable practices or promote renewable energy, but few include a research or evaluation component (Sanson et al., 2019). One recent exception is a student-centred, problem- and project-based program in Australia, aimed at enabling school students to identify ways of reducing their schools' electricity consumption and costs. Students identified opportunities for energy-saving at school, costed these, and wrote proposals requesting funds from NSW Department of Education. An investigation of this project indicated that the project provided an effective, enabling and engaging tool to help students to identify ways to reduce electricity consumption and to evaluate their effectiveness (Buchanan, Schuck, & Aubusson, 2016). Another research project involved place-based stewardship programs (Flanagan, Gallay, Pykett, & Smallwood, 2019). Through local environmental projects, the students developed a greater awareness and appreciation of the natural world and the value of collective action. The researchers found that knowledge of the issues and motivation to do something must be balanced with collective actions in communities where young people can gain both a sense of agency and the reassurance that they do not have to solve the problems alone (Flanagan et al., 2019).

Climate change education and the arts

According to Lee et al. (2020), it is important that climate change education leverages techniques already found to be effective in strategic messaging in education, such as focusing on the personally relevant, and using active and engaging teaching methods (Monroe et al., 2019) or using art-based approaches (Ojala & Lakew, 2017). Numerous researchers have advocated the inclusion of the arts in climate change education to provide an affective component, involving emotions and values Bentz & O'Brien, 2019; Bofferding & Kloser, 2015; Doyle, 2020; Publicover, Wright, Baur, & Duinker, 2018; Siegner & Stapert, 2020; Stratford & Low, 2015; Trott, 2019). Publicover et al. (2018) found that music was able to motivate, engage, entertain and create a sense of community in relation to pro-environmental behaviour. According to Bentz and O'Brien (2019) the results of a project employing a transformative learning approach engaging students with art, showed that the approach supported critical thinking and climate change awareness, and led to new perspectives and a sense of empowerment. Trott (2019, 2020; Trott, Even, & Frame, 2020) described an after-school program for 10- to 12-year-olds, designed to strengthen their climate change awareness and sense of agency. The program combined hands-on climate change educational activities with digital photography, culminating in student-led action projects focused on individual and community change. Survey and focus group analyses showed that the children were inspired and motivated by their growing climate change awareness and felt empowered and eager to learn more and take action to minimize harm, while developing communication skills and digital knowhow. Doyle (2020) reported on an interdisciplinary creative project that used speculative fiction and participatory play to enable a group of 14- to 15-year-olds to produce their own climate messages. Evaluations of the project indicated that the creative and participatory approaches employed encouraged sociocultural and emotional engagement with climate change, increasing the young people's feelings of efficacy. Siegner and Stapert (2020) analysed and evaluated a middle-school climate change curriculum implemented through an integrated social studies and language arts framework, engaging students through narrative, storytelling, and local community projects. Students read fiction and non-fiction texts featuring climate change, how it affects people around the world, and how different people respond to it. Siegner and Stapert found that the students demonstrated high levels of climate literacy and overall engagement with the topic.

In Finland, climate educator Anna Lehtonen has adapted the methods of participatory drama to process climate anxiety (Lehtonen, 2015; Lehtonen, Österlind, & Viirrett, 2020). Drama methods enable a quick transition into examining deeper themes, because assuming a role offers a sense of anonymity (Pihkala, 2019) and associated liberty, distance or licence. Drama also affords the opportunity to deal with and diffuse difficult emotions via humour.

Research suggests that engaging students in their own storytelling around climate change through filmmaking and other digital media can impact their development of an identity that includes greater interest and confidence in taking action to mitigate climate change in their own communities (Littrell, Okochi, et al., 2020; Littrell, Tayne, et al., 2020; MacDonald Ford, Willcox, & Mitchell, 2015; Walsh & Cordero, 2019). Littrell et al. (2020) described an informal, place-based science program designed to engage middle and high school students in learning and communicating about impacts of climate change on their communities. They found that making personally meaningful connections with climate change inspired a sense of responsibility and agency among students. Walsh and Cordero (2019) found that creating a film about climate action improved middle school students' environmental identities (i.e. recognising their capacity

to address climate change). Such an activity also presents an all-too-rare opportunity for young people to command the attention of their elders on an important global issue. Another case study involving students in Years 7 to 12 found that learning to make a film focusing on the local community was associated with greater capacity for adaptation in the face of climate change (MacDonald et al., 2015).

The use of 'solutions stories', climate change stories that exemplified successful conclusions, are advocated by Coren and Safer (2020). Resourceful people collaborating to solve sustainability issues, as a means of fostering agency, courage, and hope, while providing real-life examples feature in such optimistic stories (Coren & Safer, 2020). This is in contrast to many climate change stories that concern the problems created by the impact of climate change, and emphasise inevitability, disaster, and loss (Schneider-Mayerson, 2018). The optimistic solutions stories promoted collaboration, social resilience, and sustainable habits, while the narratives focused on how to succeed at desired climate tasks. Coren and Safer (2020) considered that, by enacting solutions through engaging in "do-able" behaviours, the solutions stories had the potential to reduce the mental health impacts of extreme weather events caused by climate change, while better preparing communities to respond to them when they did occur. New technologies might enable communication between school students and such group members. We highlight three sustainability initiatives here: Clean up the World (n.d.) (<https://www.cleanuptheworld.org/>), Earth Hour (2021), (<https://www.earthhour.org.au/>), and the War on Waste (ABC, n.d.) (<https://iview.abc.net.au/show/war-on-waste>). We have unashamedly chosen undertakings with a Sydney focus here; we invite other communities to collaborate or compete. There are many other examples, such as local museums, libraries, environmental education centres and the like.

Citizen science in climate change education

Citizen science offers a number of attractive features in tackling climate change. It puts young people in contact with experts, and with like-minded peers. In her study of Swedish 11-12-year-olds, Ojala (2012b) found that children who used problem-focused coping had a tendency to experience anxious and depressive feelings in their everyday life. However, these children tended to focus on individual efforts to tackle the cause of climate change, which would seem impossible to achieve alone, and they seldom reported collective engagement. The children who used emotion-focused coping distanced themselves from negative emotions like powerlessness by avoiding engagement with thinking or acting on climate change.

Emerging technologies allow environmentalists not just to connect, but to collaborate. Researchers have maintained that connecting with nature and acting to protect nature can be mutually reinforcing (Chawla, 2020a; Sobel, 2008) and have suggested that it is important to increase children's access to, and direct experience of, nature. Citizen science projects have the potential to capitalise on numerous recognised best practices in climate change education, communication and engagement (Groulx, Brisbois, Lemieux, Winegardner, & Fishback, 2017), as well as technologies to amplify outcomes (Buchanan, Pressick-Kilborn, & Maher, 2018). Paige, Hattam, and Daniels (2015) found that connecting young students to the natural world through a citizen science project provided a meaningful context for learning about relevant science topics and helped students to develop positive attitudes towards the environment. Paige, Hattam, and

Daniels (2015) described two different models used to develop scientific citizenship in middle schools in South Australia. The first involved being engaged with one of the many large public citizen science programs in which students gathered scientific data in their local area, e.g. collecting scientific data about specific iconic species, such as possums, magpies, blue tongue lizards or spiders. The second model involved teachers selecting a citizen science topic that connected to their students' world and working in partnership with academics. This educational practice is supported by research by Ojala (2012c), who discerned that young people who used the meaning-focused strategies of trust and positive reappraisal found hope by putting trust in actions of researchers as well as faith in their own and their community's ability to effect change. The results of a study by Ratinen and Uusiautti (2020) supported these findings that children and young people were able to build more hope when they also trusted and believed that society and others had the ability and willingness to take action on climate change. Trust, and trustworthiness, emerge as important here (Buchanan, 2021).

Results of a study by Stevenson and Peterson (2016) aligned with earlier research (Ojala, 2012b, 2013, 2015) in suggesting that climate literacy programs for school students should include activities that build agency by providing avenues for students to engage in climate change solutions, and emphasising that collective action does make a difference. Citizen science projects have the potential to build agency accordingly. Sanson and Burke (2020) suggested that schools offer students opportunities to engage with climate change mitigation by developing programs that emphasise active citizenship and help students to develop adaptive coping strategies for the future. When students engage in citizen science projects they are engaging in active citizenship and teachers, as they set, and set out to meet, their educational outcomes, have the opportunity to tailor the projects to the concerns of their students (Paige et al., 2015; Paige et al., 2018).

Curriculum – and the Australian Curriculum as an illustrative example

A curriculum that resonates with climate change understandings is a necessary precondition for effective action on the part of students. Fuertes et al. (2019) propose a climate change competency, “una competencia en Cambio Climático” (p. 1). Such a framework could serve to assess the extent to which and ways in which an existing curriculum assists with, or how it might be deployed to achieve climate change-related competencies in students. Dunlap and van Liere (2008) assert that deeper, socio-cultural changes.

We now look briefly at the Australian Curriculum (AC) as an example of entry points for sustainability education. Similar opportunities no doubt inhere to curriculum documents elsewhere. The AC's General capabilities (ACARA, n.d.a) lend themselves to cross-curricular study of sustainability. Apart from the 'two R' capabilities of literacy and numeracy, as well as ICT, sustainability has implications for Critical and creative thinking, Ethical understanding, Personal and social responsibility, and, probably, Intercultural education. While most sustainability-related outcomes occur in the Geography Syllabus (ACARA, n.d.b), nevertheless, as indicated above, other subject areas, such as history, English/literature, science and the arts also lend themselves to studies of sustainability. The AC's Cross-curriculum priorities (ACARA, n.d.c) also lend themselves to environmental studies. Apart from Sustainability, the other two comprise: Aboriginal and Torres Strait Islander histories and cultures, and Asia and Australia's engagement with Asia. We note the curious absence of the Pacific from the last of these priorities; Australia's

contribution to carbon outputs will be proportionally greatest for many Pacific island nations. We note, too, the similarities between Snyder's (2000, 2002) pedagogies of hope, and outcomes-based pedagogy. In both, the teacher (or the Syllabus) sets out a goal, and devises a pathway to get there, perhaps in collaboration with the students, and provides support along the way, towards autonomy to act independently of the teacher. We also offer a word of caution here. High-stakes examinations, teacher accountability and associated busy work might sap teachers' and students' energy and courage to boldly pursue sustainability goals. Might such assessment and accountability regimes be (dare we say it?) a smokescreen to prevent young people from confronting us with discomfiting truths?

Conclusions and recommendations: what might a sustainably engaged and active (SEA) classroom look like and aspire to?

We tie together here three major inferences we have synthesised from the literature and from our own experience/s. We summarise the kind of classroom we have in mind as a sustainability engaged and active (SEA) classroom. Drawing on the notion of a community of practice (Wenger, 2010), we extend this in three ways: a community of protection and preservation; of protest and pro-activity; and of promise. Our definition of 'community' here refers to the classroom and/or beyond; the classroom walls might melt away in such a definition.

Recommendation 1: That a classroom concerned with sustainability should preserve and protect – not just the environment, but also the students who are charged with attempting to nurture and sustain it. Young people might need considerable support in this matter. Returning to UN SDG 13, a response to climate change requires *action*.

Recommendation 2: That members of such a class should be encouraged to protest - to speak up, to speak out, and to be proactive, individually and collectively, and to locate others speaking and acting similarly. Again, the teacher will be central in providing leadership, guidance and encouragement here. This, we concede, is risky teacher behaviour; an employee of the state challenges the status quo. Yet, all education, if it is not to be a waste of public funds, should be a catalyst for change, of individuals and societies.

Recommendation 3: Perhaps most fundamentally, that such a classroom should constitute a community of promise – of realistic hope and trust that effective results can, should, indeed, must, be found. As with the above two 'communities', teachers – who may, in turn, seek support and help from colleagues the school executive and others, including field experts – will be vital in taking initiatives here.

In each of the above, but particularly in the third, the community of promise, hope and trust must not simply be set before young people; it must be also be invested in them. Older generations need to entrust the promise and capacity of young people to act with a long-term view to extending the shelf-life of their planet. Older generations should also remain mindful that young people cannot be expected to do this alone.

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