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Research Article

Climate Adaptation and Resilience of Pro-environmental Behavior through Climate Storytelling

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ABSTRACT

The impact and threat of climate change are observed globally. It is imperative that the young generations are able to understand the importance of climate change science. The lack of research is related to modules and programs for climate change through storytelling to enhance students' climate adaptation and resilience of pro-environmental behaviors. The primary aim of this review is to understand how elements of narratives about adaptation and resilience toward climate change issues are critiqued, focusing on helping students to understand the complexity of climate issues. The positive impact of storytelling on pro-environmental behaviors is underscored. A literature search was conducted on Google Scholar, Scopus, and Web of Science platforms by entering keywords related to the topic. The data was collected for the period from June to September 2023, excluding classic literature. The titles and abstracts of the journal articles, as well as the full text were reviewed carefully prior to analyzing the corpus and reporting the emerging themes: sustainable development, adaptation, resilience, climate resilience through storytelling. These four main themes reveal crucial components to intricate climate issues which can impact human's lives. This article proposes insights on the implications of employing climate storytelling for adaptation and resilience related to climate change for educators, students, and the public.

Keywords: Climate Change, Climate Resilience, Resilience, Adaptation, Pro-Environment behavior, Climate Storytelling, SDG #13 (Climate Action)

INTRODUCTION

Nowadays, **climate change** is extensively recognized as an extreme threat confronted by humanity as it will lead to worsening the situation for health and safety with issues such as access to safe drinking water, access to clean air, food abundance, and secure shelter (1). As human activity can have a disproportionate impact on the environment (2), changes in individual behavior towards more pro-environmental behaviors (PEBs) have been suggested as a strategic solution to reduce humanity's impact (3-5). To protect the environment, there is a need to focus on children and adolescents as future champions. Educational goals need to enhance students' environmental adaptation. Storytelling is an ancient method of passing on lessons with special potential to improve learners' emotional intelligence and assist learners to become more insightful and empathic, leading to a better understanding of how to behave in the environment (6, 7). Narratives and fiction are a potent way for vulnerable groups to engage with troubling realities (8). Modules designers need to improve understanding

of how students interpret and operationalize the outcomes of climate science (9), particularly in relation to generating internally consistent and scientifically sound narratives that support peer learning. Furthermore, encouraging a proactive approach to climate adaptation necessitates a thorough knowledge of how people interpret and act on climate science findings, particularly in building narratives that appeal to a wide range of audiences and encourage peer learning programs.

The need to **adapt** is increasingly pressing due to the rapidly changing climate. This is especially relevant to developing countries that are more vulnerable to the damaging effects of climate change (10). Climate change catastrophes have been occurring with increased frequency and severity, leading to additional challenges in adaptation (11). Effective pro-environmental interventions that focus on adaptation are urgently needed to enable the building of resilience. **Resilience** is popularly understood as the degree of elasticity in a system or human behavior or its ability to rebound after experiencing some stress or shock (12). It is expected that climate change will lead to around 250,000 deaths annually between 2030 and 2050 due to malnutrition, malaria, diarrhea, and heat. By 2030, the direct costs of climate change are projected to be USD 2 - 4 billion per year (1). This estimation does not include additional costs in the agricultural, water, and sanitation sectors. As cultures cope with the urgent need to adapt to climate change, storytelling emerges as an effective tool for fostering awareness, empathy, and action in the face of environmental challenges.

Storytelling can be a creative and multifunctional tool to assist educators to deliver climate change and climate resilience information to their learners/students. Storytelling has been studied in its use in science communication. Due to storytelling's history as an innate human method for making sense of information (13, 14), stories also provide a method of education with improved learning and memory, which also has an impact on beliefs, attitudes, and behaviors (15-17). Although most research into storytelling has compared narrative and non-narrative formats, storytelling can be seen as a continuum from narrative to non-narrative, even including scientific literature. Boyd and colleagues in 2020, proposed that "factual accounts [within science] are likely less story-like but are still narratives nonetheless". (13). It is, therefore, reasonable to view scientific communication as a form of storytelling, and learn from effective storytelling methods to improve scientific communication.

The deterioration of the global environment is an increasingly serious issue with broad implications including; global warming, depletion of the ozone layer, deforestation, acidification of lakes, streams, rivers, and oceans, and rising sea levels (18-20). As anthropogenic activity is a strong factor in the environment, there have been calls for individual behavioral change (2, 5). These calls suggested that changing individuals' behavior toward more Pro-environmental Behaviors (PEBs) is a central strategy to preserve the environment (3, 4). To protect the environment, we need to train and equip our students through purposive educational curricula or packages to be sure about their cognitive, emotional, and behavioral development. Therefore, narratives may play an important role in this purpose.

EMERGING THEMES

Five themes were emerged from the data collected for this review. They are discussed in the subsequent sections: sustainable development, adaptation, resilience, climate resilience, climate resilience through storytelling.

First Theme: Sustainable Development

There is global agreement on the importance of dealing with climate change and supporting sustainable development. It is therefore, essential to maximize the effectiveness and efficiency of climate change reduction strategies using evidence-based practices. Without a thorough understanding of the problems facing, we will be unable to effectively create solutions that are socially, geographically, temporally, politically, and economically appropriate. By creating these solutions, we may not only reduce climate change risks, but also improving social resilience without undue negative consequences.

The global cooperation observed in 2015 at the Conference of Parties in Paris which led to the Paris Agreement was a major milestone in global cooperation to solve the issue of climate change. The Paris Agreement is intended to guide governments, business, and individual behavior towards creating a sustainable, fair, and prosperous future. The Paris Agreement takes the form of 17 Sustainable Development Goals (SDGs) which were adopted by the United Nations members. The SDGs serve as goals and guidelines for global progress for a sustainable, fair, and prosperous future for all people. The principle of equality is a strong theme in the SDGs, highlighting a global responsibility that all countries have to combat climate change, to ensure that countries and individuals do not suffer.

SDG #13 is Climate Action to prevent further climate change. This was echoed by the adoption of the Sendai Framework for Disaster Reduction 2015-2030 (Sendai Framework for Disaster Risk Reduction 2015-2030,

2015), which also focuses on climate change as a key cause of catastrophic disasters. The global cooperation in signing these two agreements highlights the importance of climate change as well as its impact on sustainable development to the international community. The unequal distribution of climate change impact and vulnerability is of significant concern. Coastal areas are considered the least resilient due to the impact of rising sea levels, as well as the increasing frequency and severity of storms. This is worrying because the population is disproportionately concentrated in coastal regions, leading to an increase in the economic and social impact of climate change (21).

One significant development in combatting the climate change is the development of financial institutions that aim to help countries deal with the climate change. One example is the Global Environment Facility (GEF) which acts as a finance provider to the United Nations Framework Convention on Climate Change (UNFCC) (22). The GEF works with individual countries via financing multidisciplinary large-scale projects which aim to prevent climate change. These projects span a broad range of climate change-related issues, including transportation, energy production, and energy efficiency. Climate change prevention is a multifaceted issue that includes social, psychological, physical, educational, technological, economic, and political factors. To develop sustainably, it is vital that we identify, assess, and evaluate the best and most appropriate methods for an action to make wise decisions to mitigate climate change effects.

Second Theme: Adaptation

Adaptation and resilience are important concepts in our capacity to respond to climate change. Due to their differences, it is important to understand how these two concepts relate to each other and to the problem of climate change to plan and respond to climate change-related problems more effectively. Climate adaptation is defined by the United Nations as adjustments in the ecological, social, or economic systems in response to actual or expected climatic stimuli and their impact **Reference UN**. Climate adaptation is not a new concept (11, 23). However, the increasing frequency and severity of climate-related catastrophes have created new challenges in adaptation (11). Successful climate adaptation requires a focus on raising awareness and ambition, political engagement, strengthening technical and institutional capacities, and education through sharing information and providing guidance. These factors allow for the effective use of financial and technological support and engage a wide range of stakeholders as shown in Figure 1.

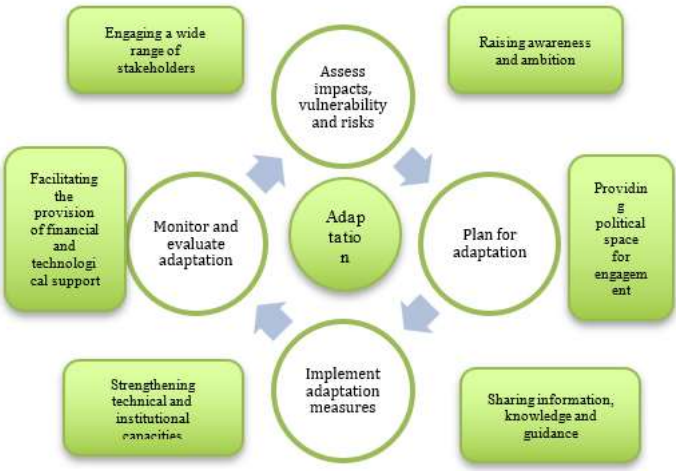

Figure 1. Adaptation and Resilience [Adopted from the United Nations Climate Change. (Paragraph 6, 2023)(24)]

Third Theme: Resilience and Climate Resilience

The concept of resilience is understood to be defined by a system or behavior's elasticity (12). This is commonly observed as a system's ability to 'rebound' after experiencing a disruption, and quickly return to its original state. Successful resilience is determined by the continuance of essential functions despite disruption to the system. This concept is fundamentally different from adaptation which involves changing systems from their original state to one that can better handle new stressors. Resilience is an important concept in understanding disaster risk, and it has been suggested that the concept of resilience allows for more systemic approaches to reducing climate change risks (25). Sudmeier-Rieux (2014) based this suggestion on research conducted in Nepal between 2008 and 2011. This researcher observed communities that were affected by landslides and mapped local understanding of their resilience. Based on these observations, Sudmeier-Rieux identified a pattern in which marginalized communities living in poverty have greater resilience, despite living without food security and in difficult social, economic, and environmental conditions.

Marginalized and underprivileged communities are also the first to be affected in the case of a climate event though they may be the first to bounce back to their normal state. Simpler standards of living mean that these communities can rebuild more quickly after a disastrous event. However, Sudmeier-Rieux (2014) explained that caution as focusing only on short-term resilience and recovery can detract from fixing the causes of vulnerability and risks faced by the marginalized communities such as economic and social inequality, land tenure issues, and government corruption (25). Focusing on "resilience as recovery" runs the risk of producing a band-aid approach of quickly recovering from disasters, rather than focusing on the underlying causes and therefore potentially preventing these disasters in the first place (26). As there are still questions regarding whether resilience is a benefit or danger for disaster and climate risks among the affected communities, therefore, Sudmeier-Rieux (2014) suggested that resilience to disasters, climate change adaptation, and humanitarian research must be assessed critically (25). Researchers and practitioners are encouraged to provide examples of how to operationalize resilience at different scales and contexts to fill the research-policy gap. This is important to clearly define the scope of resilience and identify what needs to be considered to avoid potential dangers emerging in resilience paradigms. The Paris Agreement (2015) took a step in the right direction by creating a framework designed to limit global warming to below 2°C, hence limiting the effects of dangerous climate change (27). The Paris Agreement (2015) has been working to improve countries' capacity to handle the impact of climate change-induced events.

Climate resilience is a term that encompasses the positive aspects of both adaptation and resilience in the climate context. Building on the general considerations stated above, climate resilience can be defined as the ability of social-ecological systems to handle and recover from climatic shocks and stresses, and thus, positively adapting their structures in the face of long-term climatic change. Hence, climate resilience is a combination of absorptive, adaptive, and transformative capacities which are delineated according to the responses to climatic shocks and stresses they cause. One of the core components of climate resilience is absorptive capacity, which is the ability to prepare for, mitigate, or recover from the impact of climate change disasters using planned responses to protect or reinstitute essential features and functions (e.g. human life, housing, productive assets) (28, 29). These components can focus on early warning systems, savings, weather insurance schemes, trained disaster risk reduction teams, and dyke systems in flood-prone areas (climate hazard-specific). Another core component is adaptive capacity. Adaptive capacity is an ability of a system to alter, transform, or adjust its features and functions to better respond to existing and anticipated future climatic shocks and stresses, and to take advantage of opportunities (28, 30). Adjusted planting behavior, climate change-related information and education events, improved natural resource management, and diversification of early warning systems are some examples that can be seen in adaptive capacity to reach a broader network of actors. Adaptive capacity is also one of the core components of resilience which is the ability of a system to fundamentally alter its features when the existing conditions become untenable in the face of climatic shocks and stresses (28, 31). For instance, livelihood transformation (e.g. from rice farmer to shrimp farmer), migration from rural to urban areas, and change from fossil energy systems to renewable energies can be seen in the process of adaptive capacity. Although differentiating the three capacities is useful for analytical purposes, they fall along a continuum and jointly facilitate different types of responses that range from low to high degrees of structural change (see Figure 1). Climate resilience depends on the combination of these capacities as climatic shocks and stresses of diverse types and intensities require different responses. Resilience is applied very differently to various disciplines. From a climate change perspective, an integrated social-ecological understanding of resilience is the most appropriate. Following this line of thought, our environment is constituted by social-ecological systems (SES) which encompass five main dimensions: social, ecological, economic, physical, and institutional dimensions. The concept of resilience considers systems at various levels (e.g. households, communities, countries) as well as the interdependencies between these systems. Moreover, it regards risk, uncertainty, and change as normal features of every SES (32).

Potter (2019) discussed climate resilience in urban planning (urban resilience) in Australia (33). In this article, Potter (2019) claimed that the relationship between urban place-making and power should be considered when discussing urban resilience. For instance, their case study on the homeless population of Australian cities demonstrates a critical issue surrounding vulnerable populations. Potter (2019) argued that in Australia, one of the most vulnerable groups is Indigenous Australians (Aboriginal and Torres Strait Islanders) as they were disadvantaged through systemic, financial, and ecological processes (33). In other words, the levels of urban resilience that vulnerable communities such as the homeless or Indigenous people in Australia possess will depend on the socio-economic inequality and political disenfranchisement in urban spaces. Such factors might hinder their recovery from climatic stress and culture shock caused by urbanization. Consequently, it be concluded that urban resilience is directly linked to climate resilience within urban spaces and populations.

Potter (2019) has also reported that many places that manifest stories of Indigenous ontology have been erased through colonization as the history of the Indigenous people's experience do not conform to desired imagery and values held by the colonial state (33). The effect brought by colonization is claimed agential by Potter (2019) as it can cause an ongoing impact on the Indigenous people. One of the examples is the development of

Port Adelaide, an old industrial waterfront suburb. The area was important to the Kaurna of the Port Adelaide area as a source of food due to the mangroves that were there prior to the colonization in Adelaide. The area is also significant as it is linked to Tjilbruke, a Kaurna ancestor who played a part in a constellation site as well as a key figure in the Indigenous stories along the Fleurieu Peninsula. Nevertheless, Potter (2019) stated that the importance of the area to Indigenous people is juxtaposed with the emphasis on waterfront developments at New Port, Port Adelaide, causing the degradation of the coastal region and the loss of the mangroves and the water network that buffers Port Adelaide from the sea beyond (33).

To conclude, it is the narrative focus of a people that influences the development of a community. The shift of narratives from Indigenous to colonizer's perspectives has allowed for the degradation of the Port Adelaide mangrove forest which directly protects the community from climate change-related disasters such as hurricanes by providing a natural buffer. By carefully selecting the narratives that are focused on climatic-related shocks and stresses such as drought or rising sea-level and discussing their impact on younger generations, communities can develop to be more climate resilient.

Fourth Theme: Climate Resilience through Climate Storytelling

Storytelling is a precious method of teaching which can foster emotional intelligence and assist learners to gain behavioral insight and social empathy (6, 7). Moreover, storytelling can promote language learning by improving students' vocabulary, language structure, and cultural acquisition (34-36). Oral tradition, which involves storytelling from memory rather than reading aloud, is one of the humanities' oldest art forms. Storytelling involves two elements – selection and delivery (37). Storytelling is a fundamental part of being human and has played a crucial role in early civilization as a method to teach social norms as well as enhance social cooperation in various populations and cultures. Stories allow us to share information and experiences in a way that creates an emotional connection. They also help us to gain insight into ourselves and the environment and help to encode the information in our long-term memory. Because stories create an emotional connection, we can gain a deeper understanding of other people's experiences. Storytelling can express the physical (verbal and body language, intonation, and voice), cognitive (intellectual, problem-solving, reasoning, making a decision, judgment, etc.), and emotional aspects of an individual in the context of his past or present experiences, which empower a more complete understanding of the person.

Stories are effective tools for sharing experiences and knowledge, fostering emotional connections, and improving memory encoding (38-45). They can shift viewpoints and increase self-awareness (41), modify emotional experiences (40), and improve lesson comprehension and application (38). The use of rhythm and rhyme in tales can improve memorability (42), while sharing pleasant stories can boost interpersonal connection (45). Stories are also important in education, community development, and intergenerational discourse (44). They are essential for meaning and sense-making, creating our identities and the world around us (39). Empathic resonance in personal tales can promote human connection and empathy (43).

A variety of research support the notion that storytelling can improve our understanding of and behavior towards the environment. Studies emphasize the power of storytelling, particularly extended reality and folktales, to foster pro-environmental attitudes and behaviors (46, 47). Besides, some studies showed how environmental storytelling in diverse mediums, such as cinema and action-based storytelling, may elicit agency and intention to participate in pro-environmental behaviors (48, 49). Furthermore, studies emphasize the transformational potential of place-based digital storytelling and scientific storytelling for conveying environmental concerns and complicated human-environment systems (50, 51). Finally, some researchers highlighted the importance of digital storytelling and narrative lenses in developing language skills, environmental awareness, and a knowledge of social-ecological systems (52, 53).

The rhetorician Walter Fisher (1984) claimed that some stories are perceived as more reasonable than others and that audiences adopt stories critically depending on their perspective (14). How well a story is adopted by an audience varies depending on the story's rationality and external fidelity. Rationality within a story is defined by its coherence (whether the story's elements are congruent). Fidelity is understood by how well a story resonates with the audience's lives. Improving fidelity in climate change stories may help these topics appear less "abstract and intangible" as they have been related to the audience's lives (54). Rationality and fidelity depend on a story being clear, coherent, and relevant to the audience. By focusing on improving rationality and fidelity, climate change narratives can engage audiences more effectively.

The Narrative Policy Framework has been used to describe four core story elements found in stories: characters, settings, plot, and morals (55). These elements have also been identified by another research as core elements that impact audience engagement (13). Complicated issues such as climate change can be hard to digest, especially for young learners such as children and adolescents. The use of the four core story elements serves to synthesize complicated concepts and thereby better gain the attention of the young generation and spark their interest in pursuing knowledge related to climate change. For example, a study conducted by Daniel (2018) who reported that by using digital storytelling as a teaching method in education, students learning was

enhanced and their perception towards climate change was vastly different (56). The use of digital storytelling in the study was conducted two times, once in 2013 and once in 2014 under the project "*Living with climate change – a digital story*". Among 46 students that participated in the module (56), 26 students (13 studying in Germany while another 13 in Tunisia) joined the module in 2013; while 20 students (ten from each country) participated in the course in 2014. Some of the participants also originated from Algeria, Morocco, and Lebanon as the virtual university of Tunisia has students from all over the Maghreb region. Qualitative analysis methods such as evaluation, encompassing reflection reports, and participatory observations were interpreted and analyzed in the study to assess the potential of using digital storytelling for climate change in the education system. The digital storytelling was shown to students in the form of a 3-5 minute video, presenting the effects of climate change in their home countries from the natural science perspective.

Daniel (2017) found that most of the students demonstrated an understanding of the concept of climate change although some criticized it as too theoretically driven and abstract in the core message based on Daniel's (2017) evaluations (56). However, almost all students were reported to be capable of operationalizing their lived experiences about climate change into a digital story despite their criticism. To conclude, the use of digital storytelling in Daniel's (2017) study demonstrated that storytelling can help to broaden students' knowledge base and trigger critical reflection on their self-perception on the topic of climate change. As stories also create an emotional connection, young learners experience feelings of sympathy and empathy for the perspective of the storytellers who have experienced, researched, and understood the issues of climate change.

Harris (2019) explained that three lessons can help climate science communicators to tell better stories, namely, by paying attention to the story's context and connection to the audience, by better-using ambiguity, and by focusing on the importance of listening when speaking to their targeted audiences (57). Drawn from extensive interviews and fieldwork, the three lessons were identified from the responses of storytellers from Appalachia and Alaska on how they would advise scientists that struggle with communicating about their research with their audiences. According to the research, the importance of a story's context and connection to the audience, by stating that the storyteller should find ways to connect the message of their story to the listener's context. The context of the story does not necessarily have to be personalized. The context and the connection with the community are important as when done well, the story using contextualization can make the listener to be more receptive to and engaged in the messages in stories in a similar context.

Harris (2019) additionally discussed *ambiguity* as a useful tool to help scientists to better communicate about their research (57). The ambiguity of the story allows listeners to have their own understanding of the story. This can be challenging; scientists are trained to clearly communicate what is known and unknown. Clear communication of themes and ideas do not have to be packaged as fact, and that rephrasing might help scientists to overcome this challenge. Although ambiguities in delivering climate change stories are potentially uncomfortable, it is suggested that being a good listener is as important as having a good story. As storytelling works like a conversation, listening to the audience and engaging with them by responding to them accordingly can inspire better storytelling. When scientists are engaged in complicated stories with their audiences, *trust* is built and better stories that resonate with the audiences can be incorporated after *listening* to their audience's cues through their body language and facial expressions. To conclude, Harris (2019) stated that the three lessons (ambiguity, listening, and trust) work concordantly, each lesson working to help climate change scientists communicate their research to those who most need to hear it (57).

While adopting methods of telling meaningful stories to targeted audiences is important, the narrative elements in the story are also essential to influence audiences. Bloomfield and Manktelow (2021) argued that two categories could narratively restructure or strengthen narratives to increase the understanding of climate science information (54). The categories are evaluated in the Assessment Reports and Summaries for Policymakers that cover the key results of climate science's impact on non-specialist audiences. One of the narrative opportunities is to communicate clearer characters (such as people and government), settings (by using local examples), and morals (by communicating specific aims) to the audiences. This is similar to what Jones and Peterson (2017) has described as four structural elements of stories that can be shared, namely, the plot, setting, characters, and morals (55).

Another important element of narratives is the headline statement. As headline statements are read narratively by design and can be related to events and experiences, the presence of explicit characters is important to strengthen the narrative elements of the storytelling. For example, taken from the Intergovernmental Panel on Climate Change (IPCC) (2014a:2) where a headline reads as "Adaptation and mitigation are complementary strategies for reducing and managing the risks of climate change" can be rephrased with additional explicit characters that could be read as "Global governments and leaders can enact both adaptation and mitigation as complementary strategies for reducing and managing the risks of climate change" to strengthen the narrative elements for the storytelling (54).

Other than headline statements, Bloomfield and Manktelow (2021) explained that placing more emphasis on a story's characters can better communicate the elements present in climate change risk (54). For example, more moral framing which is used to distinguish between good and evil could be included in the Intergovernmental Panel on Climate Change (IPCC) reports that aggregate climate change research to provide details on the persons that have been affected and are vulnerable to the impact of climate change. It was also explained that specificity should be added to clarify the moral of the story and the story character's goals. Instead of simply explaining it to the audience, the topic should be expanded to clarify the story character's goals and morals. For example, expanding topics such as how climate change is worsening food security could strengthen the narrative, as opposed to using general statements about sustainability that are not as appealing as goals that resonate and engage more with people's experiences.

Besides the importance of communicating clearer settings, story characters, and morals to the audiences, another narrative element that was discussed by Bloomfield and Manktelow (2021) is the use of comparisons and analogies (54). Due to the narrative structure being present in climate change scenarios, it is easier to present it in narratives than in a list of facts. This allows policymakers to better assess the outcomes of each scenario. When the outcomes of each scenario can be easily assessed, solutions such as new policy construction for climate change are more likely. Analogies can also be incorporated to increase audiences' understanding of concepts and actions in response to climate change (54). For example, running a faucet and filling up a tub can be used as an analogy for the sources of carbon to increase understanding of CO2 accumulation. To explain how to slow down the accumulation of carbon, the tub analogy is used where the faucet (sources of carbon) must be slowed down or the drain must be widened to prevent overflowing (accumulation of carbon).
Research showed that using analogies leads to better improvement of understanding of CO2 accumulation among the *non-experts* audiences, and it increased positive opinion for climate change action among the audiences (54). To conclude, it is crucial for climate change researchers to hone their craft in effective communication by incorporating narrative elements into their storytelling to increase the audience's appreciation and understanding of climate change to boost support for climate action.

CONCLUSION

In summary, the complexity of climate change problems should be discussed and integrated into education, especially among the younger generation and students. This review discussed the impact of storytelling as a method for climate education and increasing Pro-Environmental Behaviors (PEBs). We also discussed the importance of focusing on climate resilience when raising awareness as this allows for improved communication and learning, technical improvements, boosting institutions' abilities, improving the landscape for financial and technical support, as well as engaging stakeholders to stimulate the impact or effect that can help to overcome the climate change issues. Climate resilience was identified as a promising area for narrative focus. The elements of climate resilience, including the components of adaptation and resilience were reviewed and the relative importance of climate resilience was covered. We further reviewed how cultural narratives can impact on climate resilience through the case of Australian aboriginal communities. Finally, methods, techniques, and systems of storytelling were reviewed in order to provide a framework for the improvement of climate change communication and scientific storytelling in general. Techniques including the use of rationality, fidelity, ambiguity, the narrative policy framework, clear characters and settings, and analogies were reviewed in the context of climate change narratives.

This review demonstrated that narrative storytelling is a valuable tool in climate change education, and to provide a synthesis of practical advice for science communicators to improve their narratives. It is clear that narrative storytelling is an effective method for communicating climate science information, and thus more effort should be made to incorporate effective storytelling elements into future science communication. More research needs to be conducted on the specifics of climate change narratives to identify the most effective methods for communicating and educating the younger generations about climate change and boost PEBs.

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