

# Fostering Affective Climate Engagement Among Youth Through Digital Storytelling

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## **Abstract**

Climate education is essential in preparing youth for a future impacted by climate change. But most climate education is ineffective in engaging youth with the issue and can, in fact, seed disengagement. One key means of increasing climate engagement is by fostering a positive affect, or emotional state, towards climate change. This paper examines the effectiveness of a digital storytelling in increasing affective engagement among high school youth. Before the curriculum, youth had a strongly negative affect towards climate change, describing their feelings towards climate change with words like sad, hopeless and scared. After the curriculum, youth used words like hopeful, inspired and determined, reflecting a much more positive affect. This demonstrates the effectiveness of creative, narrative-based strategies in climate engagement and highlights the importance of giving youth the opportunity to relate to and make meaning out of climate change.

## **I. Introduction**

The last 30 years have been marked by growing public awareness of climate change. Currently, 71% of Americans believe that global warming is happening and 56% believe it is anthropogenic (Bellow et al., 2019). However, these 30 years of growing awareness have also been marked by unfettered growth in carbon emissions. As a result, global temperatures are anticipated to rise 4°C or more—an amount that is likely beyond the human capacity to adapt (Turn Down the Heat: Climate Extremes, Regional Impacts and the Case for Resilience, 2013). In even the best-case scenario of rapid emissions reductions, global temperatures will likely rise between 1.5-2°C, still leading to disastrous impacts (Fourth National Climate Assessment). They will be faced with flooding, and will be tasked with decarbonizing their lives and the

economy—something all prior generations have failed to do—while also adapting to a world wrecked by climate change (Corner et al., 2015; Feldman et al., 2010). As economic production will likely slow in the future due to ecological crisis, they will also be saddled with a crumbling economy (Fourth National Climate Assessment). What youth and future generations face is an existential crisis on a scale never before experienced. Any scenario of global temperature rise will put an enormous burden on youth of today.

If future generations are to survive (not to mention thrive), they have a monumental task ahead of them. It stands to reason that they need to be deeply knowledgeable about and engaged with the subject of climate change. Public education is an important forum through which to do this. However, research shows that most climate education is largely ineffective. Most educational efforts focus on increasing scientific understanding of climate change (Monroe, 2017). This approach, often termed climate literacy (US Global Change Research Program, 2009; Dupigny-Giroux, 2010), is based on the notion that if people better understand climate change, they will act on it. However, information alone has been shown to have little to no impact on inspiring action (Wibeck, 2014). Additionally, most educational efforts focus on teaching youth about climate science, leaving out the topics of climate mitigation and adaptation (Bofferding, 2015). This focus on climate literacy has negatively impacted how youth understand and relate to climate change. Informational approaches often fail to account for affect, or emotional states, regarding climate change (Wibeck, 2014). This is problematic, as affective qualities factors more heavily into decision-making on climate change than rational processing (Smith and Leiserowitz, 2014). And, because people tend to feel negatively regarding climate change (Smith and Leiserowitz, 2014), they are prone to avoid the subject (Moser and Dilling, 2004). This leads to pessimism, fear, apathy and ultimately disengagement with the subject

(Moser and Dilling, 2004). As a result, most youth are no more involved with climate change than adults today (Feldman et al., 2010).

If climate literacy alone is inadequate in inspiring the necessary action on climate change, what should the educational goal be then? This paper argues that the concept of climate engagement offers a viable alternative. Climate engagement is defined as “a state of personal connection that encompasses cognitive, affective and/or behavioral dimensions” (Wolf and Moser, 2011). While it addresses the need for cognitive learning about climate change, it also incorporates behavioral and affective dimensions, providing an essential pathway towards the action necessary to combat climate change. Affect, or one’s emotional state towards climate change, has a large bearing on climate engagement (Smith and Leiserowitz, 2014; Wolf and Moser 2011). Positive emotions such as hope and empowerment play an important role in building capacity among youth to take action on climate change (Ojala 2012 a, b; Buttigege and Pace, 2014; Emmons 1997). And while some emotions like anger and fear can help motivate action, an overly negative affect regarding climate change can block one’s ability to engage with the subject, especially among youth (Smith and Leiserowitz, 2014; Corner et al, 2015; Wolf and Moser 2011; Moser and Dilling 2004).

The ClimateSpeak curriculum was designed and piloted to serve as a case study on how climate change curriculum could be redesigned around the concept of engagement.

ClimateSpeak is an 18-hour curriculum for high-school Earth science classes. It uses media production to help students relate to and make meaning out of climate change. The goals of the curriculum are 1. To increase literacy of climate science with an emphasis on climate mitigation and adaptation, and 2. To increase student engagement with the subject. A key curricular tool for achieving this was the use of digital storytelling. Digital stories are short videos with first

person narration. This paper will answer the question: how did the curriculum shift student affect towards climate change? And what insight might this provide for creating other engaging climate change curricula?

## **II. Literature Review**

### Youth and climate engagement

Despite the eminent threat it presents, climate change consistently ranks behind other political issues, such as economics, health care or terrorism, in American's mind (Pew Research Center 2014). For far too long, policymakers, scientists and educators have assumed that this gap in public concern is due to a lack of understanding, the so-called "awareness-action gap" (Wibeck, 2014). This has engendered the notion that the public simply needs more information about climate change to foster action (Wibeck, 2014). Accordingly, education and outreach efforts have focused on climate literacy, a strategy which has been shown to be ineffective (Wibeck, 2014). However, many are realizing the ineffectiveness of this strategy and turning instead to the concept of engagement. Climate engagement is defined as "a state of connection comprising the three codependent spheres of cognition, affect, and behavior" (Lorenzoni et al. 2007). Climate engagement calls for the public to take an active role in learning about, relating to and acting on climate change.

Numerous studies have cited public engagement with climate change as vital to making the changes necessary to mitigate and adapt to climate change (Wibeck, 2014; Corner et al 2014; Wolf and Moser 2011; Featherstone et al., 2009; Ockwell et al., 2009; Lorenzoni et al., 2007). Despite decades of international agreements, there has been little demonstrated governmental leadership on climate change (Wolf and Moser, 2011). The United States is a good example of

this, where there has been substantial and lasting action on climate change, despite the fact that many governmental agencies consider it a supreme threat. Climate engagement is vital in both fostering the grassroots organizing that can lead to national policy, as well as in garnering support for legislation (Wolf and Moser, 2011). Climate engagement is also essential in compelling people to reduce their personal emissions (Wolf and Moser, 2011).

Many researchers and leaders have speculated that today's youth, having grown up in a time of public knowledge and acceptance of climate change, are more engaged with the subject. And, indeed, a visible youth-led climate movement has emerged in the past few years. However, research shows that these youth are a small minority. A nationally representative survey of American youth show that they are only slightly more knowledgeable about and engaged with the subject than adults (Feldman et al 2010). Also, while they are slightly more concerned with the issue than older generations, they simultaneously discount the risk of it more (Feldman et al., 2010).

There is an emerging body of literature investigating what shapes youth engagement with climate change. Just like adults, youth climate engagement is shaped by a variety of factors such as beliefs about climate change, political ideology, worldview and knowledge of the subject (Corner et al., 2015). One domain that is key to youth climate engagement is one's affect regarding climate change. How people feel about climate change was found to have a bigger bearing on global warming policy support than worldview and socioeconomic variables (Smith and Leiserowitz, 2014; van der Linden et al., 2015). Unfortunately, emotional distress about climate change is a well-documented phenomenon (Corner, 2015; Ojala 2012a,b, O'Neill and Nicholson-Cole, 2009). In a nationally representative study of the US, researchers found that people report feelings of worry (50%), helplessness (45%) anger (44%) sadness (43%), fear

(36%) and depression (26%) regarding climate change (Smith and Leiserowitz 2014). It is seen as a “stressor” for kids as young as 12 (Ojala 2012a), and education about global issues like climate change can trigger feelings of anxiety, hopelessness and helplessness in youth (Ojala 2012a, b). When it comes to making decisions about climate change, many have long assumed that people will use rational reasoning systems, but research suggests that they rely more on emotional and experiential processing (Smith and Leiserowitz, 2014; Tonn et al., 2006). Because climate change is a global problem, no person can individually solve it. This means that people cannot immediately address what is distressing them and, in order to cope with their negative feelings, they try to repress them, often by ignoring or discounting the problem (Moser and Dilling, 2004). The repression of negative feelings from climate change can lead to disempowerment, passivity and psychological numbing, all of which can lead to further disengagement (Moser and Dilling, 2004). This is likely even more true for youth than adults, who are still developing their rational processing systems and have limited power to make change in the world.

Because of this tendency, fostering a positive affect is important for youth engagement with climate change. Positive affect is associated with generally positive feelings, such as happiness, hopefulness or caring (Bradley and Lang, 1999). Many studies point to positive emotions such as hope and empowerment as central to engaging with climate change (de Vreede, 2014; Wibeck 2014; Ojala 2012 a,b; Emmons 1997). At the same time, a purely positive affect regarding climate change can be a sign of denial or psychologically downplaying the threat it poses (Ojala 2012a). Instead, a combination of both positive and negative affect are precursors to engagement with the subject (Ojala 2012a). One must first be concerned about the issue, a state that can be associated with feelings of fear, anger or sadness (Yale Center for Climate Communication,

2018). But then, one must also feel a sense of having the capacity to respond to this threat. Such capacity is often associated with emotions such as empowerment, hope and determination (Corner et al., 2015; Wibeck, 2014; Ojala 2012 a,b; Emmons 1997). These positive feelings serve to mitigate the very natural negative feelings that arise from understanding the full weight of climate change.

Changing affect around climate change can be difficult and there is little research on how to effectively do this. However, it is well-established that one-way communication campaigns are largely ineffective in doing so (Wolf and Moser, 2011). What matters more is the personal construction of meaning and the opportunity to relate to the matter at hand. As Wolf and Moser (2011) say: “Cultural narratives (stories) and the construction of meaning in social interaction tend to touch people more deeply, even if they are not deeply knowledgeable about climate change, and can better motivate interest and sustain engagement.”

### Digital Storytelling

Digital storytelling has the potential to support student engagement with climate change. Digital stories are short, multimedia videos that combine audio, images and text (StoryCenter). They are usually told with first-person narration and are intimate in nature. Since their genesis in the mid-1990’s, they have been used in different ways to enhance learning. Student production of digital stories is one strategy for this. Student production of digital stories comes with a suite of benefits. One such benefit is that digital stories operate at the nexus of cognitive and affective learning. They allow students to integrate complex material and fosters intellectual depth with educational content (Leon, 2008; Opperman, 2008). The iterative, creative process of digital storytelling helps students integrate course material into their own ‘situated knowledge’



(Benmayor, 2008). Doing so allows them to position themselves within existing discourses, do their own theorizing and forge alternative discourses (Benmayor, 2008; Opperman, 2008). This is especially beneficial for course material that offers complex realities, as climate change does (Opperman, 2008). At the same time, they also support affective learning. Their multi-step creative process also supports self-reflection and self-expression (Benmayor, 2008). This helps students develop a voice, grapple with and express complex emotions and fosters self-empowerment (Benmayor, 2008; Opperman, 2008). Lastly, the sharing of digital stories in a classroom supports community building, especially when the stories are personal in nature (Benmayor, 2008). Because of their ability to work at the affective and cognitive levels and to allow for meaning-making and self-expression, digital storytelling meets many of the pedagogical needs of engaging climate education.

### **III. Program**

The ClimateSpeak curriculum is an 18-hour environmental science curriculum for high school students. It was piloted in the fall of 2018 with 40 high school students at a boarding school in Northern California. Students ranged in age from 16-18 years old. It was developed as a response to typical climate change curricula that focus only on scientific learning about the problems and causes of climate change, leaving youth overwhelmed, depressed and unengaged with the issue. Curricular goals were 1. to increase literacy of climate science with an emphasis on climate mitigation and adaptation and 2. to engage students with climate change by fostering positive affect. The curriculum included lectures to introduce scientific knowledge—an element typical to most high school climate education. It deviated, though, by emphasizing climate mitigation and adaptation—subjects that are often not presented substantively. Topics include the

greenhouse gas effect, global and localized impacts of climate change, climate justice, mitigation strategies in various domains (for example, energy, agriculture, girls and women's right and transportation) and case studies of community adaptation projects. The curriculum also differed from standard curricula in that it used this content knowledge as a jumping off point for activities, discussions and the final project, which was the digital story production. These elements helped students relate to and make meaning out of climate change. It supported active theorizing on the part of students and helped them start to develop their own narratives about climate change.

Activities and discussions prepared students for their final project, where they produced a short (3-5 minute) digital story about climate change from their perspective. The prompt was to produce a film that they thought would inspire others to take action on climate change. Instructors encouraged students to interpret the prompt openly and emphasized allowing students to create something that was personally meaningful. As a part of the assignment, students conducted research on a topic related to climate change and turned in a short paper. The purpose of the assignment was to help students further developing their knowledge about climate change related to a topic of personal interest. While some incorporated this information into their digital story, this was not required, and many did not. In producing the films, the instructors stressed the importance of using the narrative form of digital storytelling, as opposed to a more information-based approach. This encouraged the development of a personal connection to climate change. Once stories were complete, students shared their stories three different ways. First all students presented their films in class. Students then nominated films that they thought were particularly impactful. These were shared in other high schools with up to 400 students. Finally, all stories were catalogued on the YouTube channel ClimateSpeak. Having outlets to share their stories

beyond the walls of the school was an important element of the project, as it gave students an audience and the sense that their films could be impactful.

#### **IV. Methods**

Student engagement was measured through the development of positive affect towards climate change. To determine student affect towards climate change, students were asked to list 3-5 words that describe how they felt about climate change. They did this before and after completing the curriculum. While 40 students participated in the curriculum, only 36 filled out both evaluations. These responses were compiled and summarized by frequency. They were also sorted by positive or negative affect based on the Affective Norms for English Words schedule (Bradley and Lang 1999). This is a schedule of commonly used English words ranked for positive or negative affect. Words are given a score of 1-10, with 10 representing the highest positive affect. For the purposes of this study, words with a score of 6 or higher were considered positive, while words with a score of 4 or lower were considered negative. Words with a rank of 5 were considered neutral. The affect of individual students was then assessed pre- and post-curriculum. Affect was determined to be purely positive if students listed only positive words, and purely negative if they listed only negative words. If students listed one or more positive and one or more negative words, their affect was considered “both positive and negative”. This ambivalence reflects affective engagement, as it represents both an acceptance of the gravity of climate change via negative emotions, while also having positive emotions to buffer the negative ones.

#### **IV. Results**

Pre-curriculum assessment: students listed a total of 52 unique words. There were three instances where students wrote phrases. Those were removed because they could not be clearly assessed for affect. Words were then aggregated by synonym (i.e. sad and sadness) and summarized by frequency. The most commonly used words were sad or sadness (n=12), hopeless or not hopeful (n=9), scared (n=6) and angry (n=5). Other repeated words were hopeful (n=4), dread (n=3), determined or determination (n=3), afraid (n=2), mad (n=2) or small (n=2). There were 40 other words that were used only once (see appendix A).

Table 1. Words used more than once to describe students' feelings about climate change before the curriculum.

Word	Count
sad/sadness	12
hopeless/not hopeful	9
scared	6
angry	5
frustrated/frustrating	5
hopeful	4
determined/determination	3
dread	3
afraid	2
mad	2
small	2

The words were then grouped by positive or negative affect according to the ANEW schedule (see appendix B). Fifteen percent of total words used to describe climate change indicated a positive affect towards the issue while 81% were negative. Of the most commonly used words, all were negative except for hopeful or determined. Three percent of words were considered neutral.

Table 2. Total and percentage of words that are positive, negative and neutral used before curriculum.

ANEW category	Number of instances	Percent
positive	15	15.79
negative	77	81.05
neutral	3	3.167

Lastly, individual student responses were evaluated for affect. If a student listed only negative or positive words, they were counted as being purely negative or purely positive, respectively. If a student listed at least one or more words that were negative as well as one or more that were positive, their affect was ranked as “negative and positive” (see appendix c). Of the 36 student responses, all students listed at least one negative word to describe their feelings about climate change. Seventy-two percent of students had negative affect, while none had positive affect. Twenty-seven percent of students listed both positive and negative words, indicating affective engagement.

Table 3. Affect by individual student before the curriculum.

Affect by individual student	Number of students	Percent
Purely negative	26	72%
Purely positive	0	0%
Negative and positive	10	27%

Post-curriculum assessment: After the curriculum, students listed a total of 45 unique words (see appendix C). The most commonly used words were sad and hopeful (n=13), with one-third of students listing each of these words. Other commonly used words are angry (n=10), scared (n=6), overwhelmed/overwhelming (n=5) and determined (n=4). After that, the most commonly used words were frustrated (n=4), hopeless (n=4), passionate (n=4), inspired (n=3), motivated (n=3) and depressed (n=2).

Table 4. Words used more than once to describe students’ feelings about climate change after the curriculum.

Word	Count
hopeful	13
sad	13
angry	10
scared	6
overwhelmed/overwhelming	5
determined	4
frustrated	4
hopeless	4
passionate	4
inspired	3
motivated	3
depressed	2

Of these words, 38% were positive, 56% were negative and six percent were neutral. The most commonly used words were both positive (hopeful, determined, passionate, inspired and motivated) and negative (sad, angry, scared, overwhelmed, frustrated, hopeless and motivated).

Table 5. Count and percentage of words that are positive, negative and neutral used pre-curriculum.

ANEW category	Number of instances	Percent
positive	39	37.86%
negative	58	56.31%
neutral	6	5.83%

Finally, when student's individual responses were assessed, 30 students listed at least one negative word, and some listed up to three. Six students listed only negative words. Twenty-three students listed both positive and negative words, and one student listed only positive words. One-third of students had negative affect, whereas 64% expressed both positive and negative affect.

Table 6. Affect by individual student after the curriculum.

Affect	Number of students	Percent
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Purely negative	12	33.33%
Purely positive	1	2.78%
Positive and negative	23	63.89%

**V. Discussion**

Students started the curriculum with an extremely negative affect regarding climate change. All students listed at least one negative word, 81% of all words listed were negative and 72% of students had only negative words regarding how they felt about climate change (purely negative affect). This is reflected in the frequent use of words like sad, hopeless and scared. In contrast, only 15% of words listed were positive, and only 27% of students listed both positive and negative words regarding climate change. This is not surprising, given the overwhelmingly negative narrative seeded through the media and most climate curricula (Moser and Dilling, 2004; Bofferding and Kloser, 2015). These results are congruent with national trends regarding emotions towards climate change (Smith and Leiserowitz, 2014). Although these feelings are pervasive, they present a barrier to students’ ability to engage with climate change.

After the curriculum, students developed a much more positive affect towards climate change. The number of positive words listed more than doubled, jumping from 15% to 38% percent. While some frequently used words were negative—sad, angry and scared—there were also positive words like as hopeful, inspired and determined. The number of students who were able to list at least one positive word more than doubled, moving from 27% to 64%. The increase of these positive words is essential for youth engagement with climate change. Elements like hopefulness and empowerment on their own have been found to be foundational for climate engagement (Ojala 2012 a, b; Buttigege and Pace, 2014; Emmons 1997). Because negative feelings towards climate change can breed avoidance and ultimately disengagement, the general increase in positive feelings about climate change increases engagement.

The percentage of students who identified both a positive and negative word regarding climate change more than doubled, jumping from 27% to 65%. In the era of climate crisis, this is vital. While purely negative feelings towards climate change is detrimental to engagement, so are purely positive feelings. The next century will be filled with many devastating climate-induced disasters: between 70-100% of coral reefs will be severely degraded, close to 1/3 of the world's population will regularly experience extreme heat waves, hundreds of species will go extinct and sea levels will rise more than two feet, to name a few (World Wildlife Fund). In even the best-case scenario of 2°C of global temperature rise, the lives of today's youth will involve significant ecological and human devastation. If a curriculum accurately portrays climate change, and youth accurately understand it, it is unrealistic to think they would develop a purely positive affect regarding the subject. Such an emotional state could reflect either climate denial or inaccurate optimism about humanity's potential to avoid it (a form of denial in itself). Additionally, research shows that negative feelings do play a role in motivating action, as purely positive affect can lull people into complacency (Smith and Leiserowitz, 2014; Ojalla, 2012a,b). And, as the litany of bad news unfolds over the next century and beyond, it is unlikely that youth would be able to maintain their positive affect. Instead it could be replaced with the gloomy feelings that many have that ultimately block their ability to engage with the subject. Instead, when students are able to identify positive and negative emotions towards climate change, it reflects the fact that they grasp the reality of climate change via their negative emotions, but also that they have the capacity to act on it, via positive feelings, such as hope, inspiration or determination. These positive feelings represent the belief that something that can be done about climate change, while also representing youth's concern for climate change. This affective engagement may have the tandem benefit of feeding into a positive feedback loop—as students



engage with climate change, they will take action. Doing so often fosters more feelings of hope and empowerment, leading them to engage more deeply and take more action (Corner et al., 2015; Wolf and Moser, 2011).

### Digital storytelling about climate change and affect

The student production and sharing of digital stories was a multistep, iterative process. Based on the literature on youth climate engagement and digital storytelling, this process was key in creating affective engagement. The initial phase of story production involved research on an area of interest related to climate change. Students were encouraged to choose a topic that was very personal, such as how their community will be impacted by climate change or how a future career interest could contribute to climate mitigation. This research allowed students to connect personal interests to climate change, which fosters concern about the issue (Corner et al., 2015). Such concern is an initial step in facilitating engagement (Feldman et al., 2010)

After the research phase, students began writing the script for their videos. In this step, they sifted through their knowledge of climate change and decided what they considered compelling enough to inspire action. They had to make critical decisions about what information they found meaningful. This hinged on students constructing and utilizing their own theories about what motivates change and what kind of change is needed to address the climate crisis. This active theorizing built empowerment in the students by engendering the notion they could make valuable contributions towards fighting climate change. It also allowed students to grapple with the complexities of climate change and build their own narratives about it. In doing so, they constructed their own understandings of the climate crisis and how to address it. The personal nature of digital storytelling meant that students could incorporate their own ‘situated

knowledge' within this construction of meaning (Benmayor, 2008). Doing so helped them bridge the global issue of climate change with their own lives. Also, as a creative medium, digital storytelling allowed the students to grapple with and express negative emotions regarding climate change. This self-expression helped students cope with the negative emotions many of them felt towards climate change. This spurred a deep, personal construction of meaning regarding climate change. Students were quite literally writing themselves into the story of climate change, taking an overwhelming, global story and making it personal. The digital story format re-enforced this construction of meaning: students had to represent their narratives through text, images and sound, fostering depth with the subject (Leon, 2008). And, because the prompt was centered around inspiring action, their meaning-making did too: students grappled with this, engendering the belief that indeed, something can be done about climate change and they are a part of this. This sentiment is reflected in words like hopeful, inspired and determined. As students constructed their narratives, they were placing themselves within the story of climate change—taking a global story, scaling it to their own lives and casting themselves as agents of change within. This is precisely the kind of “two-way conversation” that leads to affective engagement with the subject of climate change (Wolf and Moser, 2011). It is worth noting that this is also the kind of “two-way conversation” that is often lacking in climate literacy curricula. The student’s affective engagement was reflected in the way students were able to express positive emotions towards climate change while still acknowledging the weight of climate change (Wolf and Moser, 2011). Such engagement moves beyond surface-level understanding of or concern about climate change, and instead builds a deep and lasting engagement that yields the capacity for youth to act on climate change (Wolf and Moser, 2011).

At the same time, not all students reflected affective engagement. One-third of participating students still had a purely negative affect regarding climate change. While it is unrealistic that all students would develop a more positive affect towards climate change, this is a large number of students feeling pessimistic about climate change. This is problematic because it blocks their ability to engage with climate change, decreasing the likelihood that they will take action on the issue. Additionally, it reflects an uneasy state of mental health, which can have negative impacts on overall well-being. More research should be done to understand what factors shaped this and how the curriculum can be adjusted to increase mitigated negative affect.

Limitations: while efforts were made to increase validity, there are nevertheless limitations to this study. The foremost limitation is the low trial number. In order to prove the efficacy of the curriculum in fostering affective engagement, this study would need to be repeated with a higher number of students. Also, this curriculum was piloted with students at a northern California arts boarding school. This is clearly not a representative sample on several counts. While the school proactively recruits and financially supports low income students and students of color, a disproportionate number of the students were nevertheless wealthy and white. Additionally, the application and acceptance process is academically rigorous. While the students were not necessarily more advanced in science than other high school students, they are a high achieving, engaged group of students. Also, two defining characteristics of the school—its location in northern California and the fact that it is an arts boarding school—are often associated with a higher-than-average liberal population. Although no data was collected to assess this, it is likely true that most students in attendance were moderately to extremely liberal. This is a factor that has, in many studies, been shown to be positively correlated with acceptance of and concern for climate change. Indeed, many students initially indicated concern with

climate change, and none of them ever expressed any level of climate denial. While their status as believing in and being concerned about climate change is not different than most youth (Feldman et al., 2010), they likely did so at higher rates than average youth. This should be taken into account when using similar approaches with other students. What worked with these students may not work other places. Because of this, the curriculum should be trialed in other places.

## **Conclusion**

In the age of climate crisis, educators have an important role to play in not just informing youth about climate change, but engaging them with the subject. Doing so is central to the ability of future generations to survive on a planet hotter than ever before. This research serves as a case study for the possibility of doing so via curriculum that fosters affective and cognitive learning. A key curricular goal of ClimateSpeak was to help youth foster affective engagement regarding climate change. Through the course of the curriculum, students developed much more positive feelings towards climate change, which they articulated through feelings such as hopeful, inspired and determined. A key element of this was not to try to rid students of their negative feelings, but rather to help them develop positive one as well. This engenders engagement by fostering the capacity to take action on climate change while still acknowledging the gravity of the situation.

When striving for climate engagement, educators may need to incorporate new pedagogical tools to support this. Having students produce digital stories is one such tool. The iterative, multiliteracy process of digital storytelling allows students to grapple with and make meaning out of the complexities of climate change. The personal nature of digital stories allowed

students to place themselves within the context of climate change, bridging the global issue of climate change with their own daily lives. Students were also able to cope with the negative emotions of climate change through the self-expressive aspects of digital storytelling. This process allowed students to construct and share their own narrative about climate change, casting themselves as agents of change within a large, global issue. Digital storytelling reflects the kind of “two-way conversation” that is necessary for effective and engaging climate education, but is often lacking in climate literacy curricula.

Certainly digital storytelling is not the only means through which to engage youth with climate change. Instead, it offers insight into what elements can support it. This case study demonstrates the efficacy of creative, narrative-based strategies as a means to foster affective engagement with climate change. As educators consider what tools best fit their contexts, they may want to consider pedagogies that allow for students to grapple with the complexities of and construct their own understandings of climate change. They may also want to consider creative and expressive educational practices. This often means turning the classroom into a two-way conversation, instead of a one-way flow of information. This can be difficult to do in modern classrooms but offers an important opportunity for students and teachers to engage with perhaps the most pressing global issue.

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## Appendix

Appendix A. Complete set of words that students used to describe feelings about climate change before the curriculum.

Word	Count
sad/sadness	12
hopeless/not hopeful	9
scared	7
angry	5
frustrated/frustrating	5
hopeful	4
dread	3
determined/determination	3
afraid	2
mad	2
small	2
anxious	1
apathetic	1
bummed	1
challenged	1
concerned	1
confused	1
curious	1
depressed	1
enlightened	1
exhausting	1
fear	1
guilt	1
ignorant	1
ill-informed	1
impending	1
interested	1
intimidating	1
limited	1
looming	1
lost	1
motivated	1
nervous	1
optimistic	1
overwhelming	1
passionate	1

pessimistic	1
pitiful	1
restless	1
scary	1
sorrow	1
stressed	1
stupid	1
suffering	1
terror	1
uneasy	1
unknowing	1
upset	1
urgent	1
useless	1
woke	1
worried	1
	95

Appendix B. Counts of responses from individual students by how many positive, negative or neutral words they listed before the curriculum.

Student response	# of negative words	# of positive words	# of neutral words
Sad, angry, hopeful.	2	1	
scared, hopeless, small	3		
Sad, angry, ill-informed?	3		
dread, sadness	2		
suffering	1		
pessimistic, stupid, small	3		
looming	1		
limited, sad	2		
sad, mad, worried, restless, curious	4	1	
<u>scared</u> , sad, not hopeful	3		
anxious, determined, stressed, challenged, afraid	3	1	1
hopeless, depressed, enlightened, confused, woke	3	2	
dread, hopeless, apathetic	3		
bummed, hopeless, scared, pitiful	4		
frustrated, angry, determined	2	1	
sad, scared, angry	3		
intimidating, exhausting, frustrating	3		
hopeless, sad, frustrated	3		

fear, hopeless	2		
Scary, impending, overwhelming, urgent	3		1
Uneasy, nervous, frustrated, hopeful, optimistic.	3	2	
Sad, Motivated, Scared, Ignorant, Unknowing.	4	1	
Afraid, concerned	1		1
upset, frustrated, hopeless, scared	4		
sad	1		
Angry, hopeful	1	1	
sad, hopeless, mad.	3		
Terror, dread, determination, sorrow, guilt	4	1	
Passionate, interested, sad, hopeful	1	3	
Scared. Lost. Useless	3		
	78	14	3

Appendix C. Complete set of words that students used to describe feelings about climate change post-curriculum.

Word	Count
sad	13
hopeful	13
angry	10
scared	6
overwhelmed/overwhelming	5
determined	4
frustrated	4
hopeless	4
passionate	4
inspired	3
motivated	3
depressed	2
afraid	1
ambivalent	1
annoyed	1
aware	1
big	1
challenged	1
combatable	1
cynical	1
dedicated	1
disgusted	1
eager	1

educated	1
empowered	1
frightened	1
grateful	1
growing	1
guilty	1
happy	1
illuminated	1
interested	1
intimidated	1
loud	1
nervous	1
regretful	1
saddened	1
serious	1
sick	1
spiteful	1
stressed	1
tentative	1
unappreciative	1
urgent	1
	103

Appendix D. Counts of responses from individual students by how many positive, negative or neutral words they listed after the curriculum.

Student response	# of negative words	# of positive words	# of neutral words
Scared, hopeful, determined	1	2	
Sad, scared, somewhat hopeful	2	1	
Sad, overwhelmed, hopeless	3		
Overwhelmed, stressed, hard work	2		1
ANGRY, passionate, empowered, motivated, educated	1	4	
motivated, scared, inspired	1	2	
angry, hopeless, saddened, interested, motivated	3	2	
angry, sad, cynical, hopeful	3	1	
hopeful, scared, sad	2	1	
sad, serious, growing	1	1	
sad, ambivalent, overwhelmed	2		1
angry, depressed, annoyed	3		
disgusted, illuminated, determined	1	2	

sad, hopeful, happy, spiteful	2	2	
passionate, scared, angry, sad	3	1	
frustrated, sad, hopeful, angry	3	1	
challenged, frustrated, big	1	1	1
combatable, grateful		2	
afraid, passionate, hopeless, determined, sad	3	2	
nervous, sick	2		
Sad, overwhelming, hopeful.	2	1	
hopeful, eager, frustrated	1	2	
determined, dedicated, aware, regretful	1	3	
angry, sad, guilty,	3		
angry, loud, inspired.	1	2	
Depressed, hopeful, urgent	1	1	1
scared, intimidated, passionate, hopeful	2	2	
unappreciative	1		
frustrated, tentative, hopeful	1	1	1
angry, hopeless, hopeful, overwhelmed	3	1	
Frightened, angry, sad, inspired, hopeful.	3	2	