

# Using Social-Emotional Learning Strategies to Impact Undergraduate Students' Cognitive and Affective Engagement with Climate Change

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**Abstract:** Climate change is a defining issue of our time. As future leaders and decision-makers, undergraduate students need a solid grasp of this issue. However, traditional educational approaches in science courses often focus on climate change content but neglect the emotional engagement that can drive meaningful action. Such neglect can be particularly damaging when the topic is emotionally charged. Integrating social-emotional learning (SEL) into an undergraduate science course may offer a more compatible approach when teaching about this topic. This action research study explored how to positively impact undergraduates' cognitive and affective engagement with climate change. The action plan was to incorporate SEL into an environmental science course. The overarching research question was, 'How does incorporating SEL into a climate change module impact students' cognitive and affective engagement?'. The findings revealed that integrating SEL into climate change education did enhance the student's understanding, emotional connection, and empathy. Students reported deeper comprehension, greater personal relevance, and stronger motivation to learn about and act on climate issues. Furthermore, combining SEL strategies with academic content fostered engagement and retention. The significance of this study lies in its potential to contribute to the ongoing discourse on effective teaching practices for climate change education.

**Keywords:** Social-emotional Learning, Action Research, Cognitive Engagement, Affective Engagement.

## INTRODUCTION

The United Nations has identified climate change as the defining issue of our time (Nations, n.d.). This issue directly contributes to humanitarian disasters such as wildfires, floods, and intense storms (*Climate Change*, n.d.). As this global climate crisis intensifies, the role of higher education in equipping students with the knowledge, skills, and emotional resilience to address environmental challenges becomes increasingly crucial. As future leaders and decision-makers, undergraduate students need a solid grasp of global climate change and its impacts to take effective action (Nam & Ito, 2011). As a result, many universities continue to invest significant time and money to prepare their students to take their place in a world that must confront this environmental issue.

But there is another segment which need to think, traditional educational approaches in science courses often focus on the cognitive aspects of learning and neglect the emotional engagement that can drive meaningful action and understanding (Sinatra et al., 2014). This neglect can be particularly

damaging when learning about emotionally charged topics such as climate change. Students may need help to connect their academic studies with the pressing realities of such a scientifically based issue. Climate change can evoke many emotional responses, from anxiety and fear to apathy and denial (Linnenbrink, 2007). These emotions can significantly influence how students process information and engage with the content, making it crucial to address the emotional and cognitive aspects of learning in this context (Gregoire, 2003). Unfortunately, undergraduate courses that address climate change often do not foster such understanding or practice, and many students enter the workforce with little knowledge of the connection or their emotional engagement with the topic.

Integrating social-emotional learning (SEL) into an undergraduate science course may offer a more compatible approach when teaching about emotionally charged issues, such as climate change. SEL has multiple definitions. It is defined here as the process by which individuals acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, demonstrate empathy, establish and maintain positive relationships, and make responsible decisions (*Advancing Social and Emotional Learning - CASEL*, n.d.).

While SEL has been widely promoted in preschool through secondary school (Greenberg et al., 2003) (Zins, 2004), its application in undergraduate education remains largely unexplored, despite the unique and pressing challenges students face at this stage. Unlike K–12 education, which provides structured schedules, close supervision, and consistent SEL programming, undergraduate education shifts responsibility to the student, often without intentional SEL support. This transition demands the constant application of self-awareness, self-management, responsible decision-making, social awareness, and relationship skills. Yet, most undergraduate courses focus solely on academic content, leaving students underprepared to navigate the social-emotional complexities of academic stress, new interpersonal relationships, and increased independence. Research shows that social and emotional competencies at the undergraduate level are strongly linked to academic success, retention (Gloria & Ho, 2003), workplace readiness, interpersonal relationships, and mental well-being (Bar-On et al., 2003) (Lopes et al., 2005). Therefore, the absence of intentional SEL integration in undergraduate education represents a critical gap in the literature and practice. This intervention addresses that need by bringing SEL frameworks into undergraduate climate education, helping students develop the personal and interpersonal competencies necessary not only for academic success but also for leadership, resilience, and well-being in addressing the complex and collaborative challenges posed by climate issues.

This action research study aimed to explore how to positively impact undergraduates' cognitive and affective engagement within lessons on climate change. The action plan was to incorporate SEL within a climate change module in an inquiry-based environmental science course. A nuanced understanding of how to effectively enhance student engagement with climate change topics through SEL was uncovered by leveraging an action research framework and a convergent mixed-methods data collection and

analysis approach. The overarching research question was, 'How does incorporating SEL into a climate change module impact students' cognitive and affective engagement?' The significance of this study lies in its potential to contribute to the ongoing discourse on effective teaching practices for climate change education.

## THEORETICAL AND EMPIRICAL UNDERPINNING

SEL has been an educational subject for several decades (Jones & Bouffard, 2012). Among the many proposed models, the framework developed by the Collaborative for Academic, Social, and Emotional Learning (CASEL) has gained the most prominence. CASEL defines SEL as the process by which individuals, both children, and adults, acquire and effectively apply the knowledge, attitudes, and skills necessary to understand and manage emotions, set and achieve positive goals, demonstrate empathy, establish and maintain positive relationships, and make responsible decisions (Swartz, 2017) (*Advancing Social and Emotional Learning - CASEL*, n.d.). This framework identifies five key interconnected competencies: self-awareness, self-management, social awareness, relationship skills, and responsible decision-making (Durlak et al., 2011).

SEL is underpinned by several theoretical perspectives that emphasize the role of emotional and cognitive processes in learning. One essential theory is Vygotsky's Social Constructivism, which posits that learning is inherently a social process and that emotions and cognitive functions are deeply interconnected (Weiner et al., 2012). SEL aligns with this theory by fostering environments where students develop social and emotional skills that support collaborative learning and cognitive engagement. Another relevant theory is the Cognitive-Affective Theory of Learning with Media (CATLM), which suggests that emotions significantly influence cognitive processes such as attention, memory, and problem-solving, which are critical for effective learning (Moreno, 2006). Therefore, integrating SEL into the curriculum allows students to manage their emotions, which provides the potential to support deeper cognitive engagement and more meaningful learning experiences.

Undergraduate education represents a critical period where students face increased academic demands, reduced external structure, and the need for greater personal responsibility, making SEL interventions particularly relevant at this stage. Research highlights that higher education students experience elevated stress, maladjustment, and mental health challenges compared to developmental norms (Stallman, 2010) (Stewart-Brown et al., 2000). The transition to college requires students to develop self-awareness, self-management, and responsible decision-making as they navigate academic pressures and newfound independence. Effective SEL skills support emotional adjustment, academic performance (Deckro et al., 2002) , and overall well-being, while poor self-management is linked to distress and academic struggles (Adlaf et al., 2001) (Kraft, 2011) (Bayram & Bilgel, 2008) (Pritchard & Wilson, 2003). Additionally, social awareness and relationship skills are crucial for forming new peer and

faculty relationships, which are key to adjustment and success (Hefner & Eisenberg, 2009) (Tao et al., 2000). Responsible decision-making influences both academic choices and behaviors such as substance use (Robbins et al., 2004). Given these challenges, undergraduate education is a logical point for SEL interventions to foster resilience, adaptation, and student success.

Thus, integrating SEL into the climate change module may support establishing a meaningful connection between students' studies and the real world, recognizing that students often struggle to perceive the practical applications of their learning beyond academic achievement. Given that global environmental challenges are closely tied to human lifestyles and preferences, environmental education is crucial in preventing issues, fostering positive attitudes, and promoting environmentally responsible behaviors (Sinatra et al., 2014). Regrettably, the persistence of unsustainable lifestyles exacerbates environmental problems daily. To counter this, students must emotionally and cognitively engage with environmental education, enabling them to make informed decisions and take necessary actions. The primary objective is to equip students with knowledge, awareness, sensitivity, and responsibility regarding the impact of human activities on the world's natural resources.

Social and emotional skills, encompassing self-awareness, self-management, and social awareness, play a crucial role in learning, influencing cognitive and behavioral domains (Main, 2018). Students with deficient social and emotional skills face a higher risk of personal and interpersonal challenges, potentially leading to disconnection within their environment. Research indicates a positive correlation between higher social and emotional skills, enhanced well-being, and improved academic performance. At the same time, lower-skill development is associated with lower self-confidence and academic shortcomings (Durlak et al., 2011). Unfortunately, social and emotional development has not received sufficient emphasis in education, with limited efforts to address the issue, particularly past the elementary level (Davis et al., 2014). Recent studies highlight the dynamic interaction between emotions and cognitive processes during learning, suggesting that emotions can implicitly impact learning, occurring automatically before students fully engage with instructional messages (Linnenbrink, 2007) (Gregoire, 2003).

Moreover, when students experience the link between practice and progress in reaching their goals, they gain a deeper appreciation for teachers who provide the tools to unlock their potential. By using brain-friendly instructional strategies, like incorporating SEL, classrooms become more supportive and welcoming environments. All students can find joy in learning, enhancing their performance, and fostering a positive learning experience (Willis, 2007) in these spaces. Socially and emotionally competent students typically feel comfortable in school and classroom settings, allowing them to concentrate more effectively on academic tasks than those who face social and emotional challenges (Welsh et al., 2001).

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## METHODOLOGY

One of the goals of our course was to enhance our students' engagement with the topic of climate change (Herr & Anderson, 2014). This research endeavored to deepen our understanding of the impact of SEL on our efforts to achieve that goal. Action research is a method that can help educators enhance their professional practices within the classroom. It involves systematically observing and gathering data, which educators can reflect on to inform decisions and develop more effective teaching strategies (Parsons & Brown, 2002). We sought to design, implement, study, and refine our intervention through the action research process. The action plan was incorporating SEL into a climate change module. I implemented it in two sections of an environmental science course. I studied it through a mixed-methods data collection and analysis approach. The findings aimed to understand and revise our intervention.

The guiding question of this study was, 'To what extent does the SEL intervention impact students' cognitive and affective engagement with the climate change topic?'

### Action Plan

The present study explores the incorporation of SEL into a climate change module in an undergraduate science course to enhance students' cognitive and emotional engagement. Emphasizing practical foundations, boosting student participation, engagement, emotional connections, and mental connections to environmental issues are prioritized. In this study, I was both the instructor and the researcher of the class. I designed the intervention as part of the course I taught. The course is open to all undergraduate students, regardless of their major, as part of the university's curriculum. The student population was pursuing degrees in different majors because this course is for all university undergraduate students instead of only environmental or education majors. This action plan employs research-based strategies to positively influence attitudes and engagement, avoiding a simplistic additive approach (Abun et al., 2019).

## Intervention

The intervention in this study integrates SEL with climate change awareness to foster mindfulness, empathy, and actionable insights among students. In this intervention, my target was all the SEL competencies, such as self-awareness, self-management, social awareness, relationship skills, and responsible decision-making. I began with the self-awareness part, helping students become aware of their own mental and emotional states. This foundation is essential, as one cannot manage emotions or thoughts without first recognizing them. Once students developed this awareness, they were better equipped to manage themselves, absorb knowledge, and engage more meaningfully with the content. This awareness also supported their ability to be socially conscious and foster strong relationships- not only with the material but also with their peers, through attentive and mindful collaboration. Ultimately, as students engaged with the intervention, these competencies came together to promote empathy and thoughtful, responsible decision-making.

The classroom activities begin with 4–5 minutes of mindfulness to help students calm the nervous system and develop an emotional connection to the present moment. Visual tools were then used to engage students and foster an affective connection. Visual tools, including videos related to climate change, were integrated to help students connect more deeply with the content through visual storytelling. To develop understanding and build a stronger emotional connection, SEL-based videos, such as “The Story of Ubuntu”, were also introduced. These videos encouraged students to reflect on individual and collective actions they could take to address climate change. Additionally, authentic, action-oriented videos demonstrated specific steps individuals can take to make a difference. These videos resonated with students, inspiring them to believe in their ability to contribute meaningfully. By witnessing relatable examples, students found authenticity in the content and developed a sense of empowerment to take the initiative at a personal level. Each video was followed by a class discussion, encouraging students to reflect on their emotional and intellectual responses while considering practical steps for environmental responsibility. Further, a reading material was used, “The Dragons of Inaction” by (Gifford, 2011). Each student was assigned a section to read and then participate in the discussion to share their thoughts and to promote collaborative learning. By implementing mindfulness, visual tools, and critical reading, this intervention aims to enhance students’ social-emotional skills, build empathy for environmental challenges, and provide them with the tools to take meaningful actions against climate change.

## Context and Participants

The research was conducted in two sections of an undergraduate course. However, it is important to note that this course is open to all undergraduate students, regardless of their major, as part of the

university's curriculum. The intervention aimed to engage all students in meaningful exploration of climate change topics, helping them deepen their understanding and build a stronger relationship with the natural world. The total participants were 38 in pre-survey and 25 in post-survey, out of which there were 24 freshmen, eight sophomores, four juniors, and one senior. The intervention was implemented in the already existing climate change module. The lesson was structured to be conducted in six classes, each lasting 1 hour and 50 minutes. The intervention lasted a total of 3 weeks, with 2 classes conducted each week (a total of 6 classes). Each class began with a 4–5 minutes mindfulness activity to help students focus and prepare for the lesson. Throughout the intervention, seven videos were incorporated related to SEL in the context of climate change, spread across 4 different classes. Additionally, in the final class, one reading was introduced to reinforce the concepts and encourage reflection and discussion.

### **Data Collection**

This action research study utilized a convergent mixed-methods approach for data collection and analysis (Creswell, 2021). According to (Creswell, 2021), mixed methods research involves "an approach to research in which the investigator gathers both quantitative and qualitative data, integrates the two, and then draws interpretations based on the combined strengths of both sets of data to understand research problems" (p. 2). By employing this convergent design, the study incorporated survey responses (quantitative) and semi-structured interview data (qualitative), allowing for a comprehensive analysis and comparison of both data types. The integration of these methods facilitated data triangulation, enabling a more robust interpretation of results and the development of new insights that contributed to the study's findings.

### **Surveys**

An anonymous quantitative online survey was conducted on a pre-and post-intervention basis. The pre-survey focused on the students' initial perspectives, and the post-survey concentrated on the impact of SEL on students' emotional and cognitive engagement. The survey was adapted from the Student Engagement Instrument - College version (SEI-C) to measure cognitive and affective engagement (Waldrop et al., 2019). The survey was based on a Likert scale, participants were given 15 minutes to complete the surveys in the class. Pre-survey questions were designed to understand participants' initial perspectives on climate. Examples of the questions include: (a) Do you have any prior knowledge of climate change? (b) How concerned are you about climate change? (c) How well do you emotionally connect with the issue of climate change? Post-survey questions sought to understand the participants' perspectives of the intervention. Examples of the questions include: (a) How has including SEL aspects changed your understanding of climate change? (b) Do you feel that SEL strategies enhanced your

critical thinking skills regarding climate change? (c) Did the SEL components enhance your ability to empathize with the challenges posed by climate change?

### **Semi-structured Interviews**

Interviews with undergraduate students took place at the end of the intervention phase only to gain insights into their impressions. The focus was on understanding whether they perceived any changes in their learning before and after the intervention. The feedback from the interviews guided the effect of SEL on students' cognitive and emotional engagement. Sample interview questions are included (a) How has your understanding of climate change changed during the course? (b) Can you share a specific moment or activity from the SEL activities that emotionally resonated with you in the context of climate change? (c) How do you think SEL could contribute to fostering a sense of community engagement and responsibility, particularly in the context of addressing global issues like climate change?

### **Reliability and Validity**

Process validity, used here as "the extent to which problems are framed and solved in a manner that permits ongoing learning of the individual or system" (Herr & Anderson, 2014), was prioritized. The research investigated the impact of incorporating SEL within a climate change module on undergraduate students' affective and cognitive engagement with the topic. The researchers worked to consensus in establishing the rating scale and interview questions through regular meetings. We discussed, revised and refined questions, ensuring they aligned with the study's goals. Final decisions were made when we agreed that the tools accurately captured affective and cognitive engagement, which enhanced the study's validity and trustworthiness. This collaborative approach was employed to ensure the credibility of the study's interpretation of findings, aligning with the concept of trustworthiness in research (Merriam & Tisdell, 2015) (Herr & Anderson, 2014).

### **Data Analysis**

The primary objective of data analysis is to transform the gathered information into reliable and trustworthy findings (Efron & Ravid, 2019). Numerical data obtained from the surveys was analyzed quantitatively and used to identify initial understandings and pre/post-change. The raw survey data was exported into SPSS software for quantitative analysis. Descriptive statistics were then run to see students' data based on individual survey questions. Descriptive statistics in the form of percentages were pulled to show the proportion of student's responses across different categories on the Likert scale. These statistics were then combined with the qualitative thematic analysis described below.

Data obtained from student interviews was used to derive meaning and identify patterns, explicitly addressing the research questions on the impact of incorporating SEL into a climate change module on



undergraduate students' emotional and cognitive engagement. A thematic analysis (Braun & Clarke, 2006) was conducted on the interview transcripts using etic and emic codes. The etic codes were those of the researchers, as identified in the research questions. The emic codes emerged through a detailed review to determine the pattern of students' responses. From this familiarization with the data, codes were developed while reading and re-reading interviews and then further converted into emerging themes by reviewing and refining the student's response patterns. For example – the student mentioned in the interview- "Well, I think, you know, seeing videos of how it's affected people or like how people are so invested in stopping the problem kind of just shows you like, on a human level, how other people care about the issue and are affected by the issue, and how it's not something distant from us. And it's something that is very like personal so we should take action. Stop it". In my codebook, I categorized this data using two key codes: awareness and responsibility.

## FINDINGS

This study employed a convergent mixed-methods approach consisting of both quantitative and qualitative data sources. The results from both data sources are presented in the following sections:

### Quantitative Results

The quantitative data consists of responses from the Student Engagement Instrument - College Version (SEI-C) questionnaire. The instrument measures the improvement in the student's cognitive and affective engagement before and after the implementation of SEL in the climate change module. By analyzing pre- and post-survey data, the research examines how SEL affects students' knowledge, critical thinking, emotional connection, engagement, and willingness to change habits regarding climate change.

### Pre-survey

Descriptive statistics on students' prior knowledge of climate change revealed that out of 38 respondents (N=38), a significant majority, 84.2%, responded "Yes" to having prior knowledge, while 15.8% indicated "No," signifying they lacked prior exposure to climate change concepts. Student's concern toward climate change data revealed that out of 38 respondents (N=38), a combined 76.3% of students expressed varying degrees of concern, ranging from "slightly concerned" to "most concerned," while 23.7% remained neutral on the issue. Specifically, 71% of students reported feeling "slightly connected," "moderately connected," or "most connected," while 29% remained neutral or no connection.

## Post-survey

Comparing the above pre-survey with the post-survey data on the impact of SEL on students' understanding of climate change. Descriptive statistics showed that there were 25 responses (N=25) in the post-survey after the integration of SEL in the climate change module. The responses were distributed as follows: 28% of students felt that SEL "significantly broadened their perspective," 24% reported that it "enhanced their empathy toward the impact on communities," 28% indicated it "helped them connect emotionally to the issue," and 20% observed "no noticeable impact" on their perception of climate change. Collectively, these results suggest that SEL integration led to a positive shift in understanding for 80% of the students.

In the post-survey, descriptive statistics on whether SEL strategies enhanced students' critical thinking skills regarding climate change. The data indicated that 80% of students felt that their critical thinking was "slightly enhanced," "moderately enhanced," or "most enhanced," while the remaining 20% reported either "not enhanced" or "neutral" responses.

In the post-survey, descriptive statistics on whether SEL components enhanced students' ability to empathize with the challenges posed by climate change showed an overall mean score of 3.40 (SD = 1.080). The data indicated that 76% of students experienced an increase in emotional connection, ranging from "slightly enhanced" to "most enhanced," due to SEL strategies. Meanwhile, 24% of students reported either a neutral or no enhancement in their ability to empathize with climate change challenges.

## Qualitative Results

The qualitative data consists of interview responses from 6 study participants after they have completed the SEL. Through the data analysis of the 6 semi-structured interviews, the following two overarching themes were identified.

### **I. Cultivating empathy, awareness, and a sense of community through emotional and social understanding**

The interview data revealed that students demonstrate understanding toward climate change topics when SEL is integrated in the science classroom. This is evident in the way the students describe how their understanding gets deeper about climate change with the integration of SEL. Student 1 (S1) described that "Definitely, I think it can help students at any age feel more connected to their content and understand why they're learning it. That will help them learn it better and develop social-emotional skills". When describing the severity of the climate change problem, student 2 (S2) stated that "I knew it was an issue, taking this course and learning more about it. I've seen that it's probably a bigger issue than I would have thought it was". The other four students' responses also indicated that SEL not only deepens their comprehension of the subject but also fosters a stronger connection to the content.

On the student's awareness toward climate issues, S1 described "I think the activity will stay with me because I learned more about how climate change affects the animals that live near the glaciers and it's affecting the sea level". Next, videos related to climate change according to the SEL perspective helped to know students' thinking on the climate change problem. For example, S2 shared, "Well, I think seeing videos of how it affects people, how other people care about the issue and are affected by the issue, and how it's not something distant from us. It's something that is very personal, so we should take action". Further, students believe that integrating social and emotional aspects should be a standard component in other academic disciplines as their attitude toward the subject has changed. Student 3 (S3) said "Yes, it helped me learn more about the subject, and I think it can help others or myself learn about other different subjects". Additionally, students expressed greater empathy toward the climate change module when SEL was integrated. For example, student 4 (S4) noted, "I think building empathy helps you understand that climate change is affecting you personally, even if the impacts aren't immediately visible."

Mindfulness, a key SEL skill, helps to calm the nervous system and fosters emotional connection to the present moment, including issues like climate change. The data indicates that these exercises improved students' cognitive engagement in the class to focus on their studies. For instance, student 5 (S5) shared, "When I come into class, I'm often distracted, but those exercises helped me be more present and realize, okay, it's time to learn." Another student 6 (S6) stated that "check-ins at the beginning like the grounding I think that's super, super helpful for focus. So, I think it's definitely something that should be integrated and integrated into other areas of study too". A sense of community is another crucial factor in fostering an emotional and cognitive connection with the topic of climate change. One student observed, "If more people learned this way, they'd understand the personal effects, which would lead to more conversations about climate change and how to help the world. It could create a sense of community around it."

## **II. Building cognitive skills, Confidence, and Responsibility Through Engaging Interpersonal Connections**

Building cognitive skills, confidence and responsibility through engaging interpersonal connections emerged as the second major theme from the data analysis. This theme highlights the impact of SEL skills on students in fostering cognitive skills, confidence, and responsibility toward climate change. The data suggests that when SEL principles are incorporated into climate change education, students not only acquire knowledge but also develop essential interpersonal skills that empower them to communicate more effectively about this critical issue. S1 reflected on how this approach made it easier to engage in discussions about climate change "It's easier to communicate about climate change, having a very recent class on it about emotional aspects of climate change". Another student S2 described how

this integration has influenced their approach to discussing climate change: "Way I will explain maybe a little different because I have gained knowledge and has incorporated into my personal life with recycling and doing other things to kind of help out".

Four other students have the similar view, indicating that their perspective on climate change has evolved due to the interpersonal skills they gained through SEL. These students now feel more confident and responsible when discussing climate issues, suggesting that SEL has equipped them with the tools necessary to advocate for climate action effectively.

The emotional connection fostered through SEL has played a key role in this process, as it has heightened their commitment to spreading knowledge and advocating for action on climate change. S3 stated that "Seeing videos of how climate change affects people and how much they care about the issue made me realize that it's not something distant; it's very personal, so we should act." This response reflects the sense of responsibility that the student has developed toward addressing climate change. Similarly, S2 expressed, "I would talk to people about the risks posed by climate change," indicating the confidence gained after acquiring a deeper understanding of the issue. Additionally, two other students highlighted the increased confidence and sense of responsibility they have developed toward climate change because of this class.

The integration of SEL into the climate change module has significantly enhanced students' emotional engagement and connection with the topic, leading to a deeper understanding and increased motivation to learn. For example, student S1 shared that "those modules that we did really gave me a deeper understanding of what scientific inquiry is through engagement with the topic," while another S2 noted, "Once you have the emotional connection, I think it makes it easier to learn about the topic and be more engaged in because you care more about it now." Similarly, several other students highlighted how mindfulness and grounding activities helped them focus and emotionally comprehend the magnitude of the climate crisis and the importance of taking action.

Students expressed a strong sense of enjoyment in the way the climate change module was organized and delivered in class, which further enhanced their learning experience. One student noted, "I really enjoy the way the teaching has been organized," highlighting the effectiveness of the instructional approach. Another student emphasized the impact of emotional connection on learning, stating, "Once you've established a connection and care about it, it makes you want to learn and makes it easier to retain information". These reflections suggest that the thoughtful structuring of the module combined with SEL strategies that foster emotional engagement, not only made the learning process more enjoyable but also contributed to better retention and a deeper understanding of the material.

## COMPARISON AND INTEGRATION (DISCUSSION OF FINDINGS)

This study sought to examine the extent to which SEL interventions impact students' cognitive and affective engagement with the topic of climate change. The findings from both quantitative and qualitative data provide compelling evidence that integrating SEL into climate change education fosters deeper cognitive understanding, enhances critical thinking skills, and strengthens emotional engagement with the subject matter. By synthesizing these findings, this section interprets the significance of SEL in shaping students' comprehension, emotional connection, and overall engagement with climate change education.

### Enhancing Cognitive Engagement and Critical Thinking

The quantitative data from the Student Engagement Instrument - College Version (SEI-C) survey revealed a positive shift in students' cognitive engagement following SEL intervention. The post-survey results indicated that 80% of students reported an enhancement in critical thinking skills, with varying degrees of improvement. This suggests that SEL-based instructional strategies provide students with a structured and reflective framework to analyze climate change issues more deeply. The qualitative data corroborate this finding, as students explicitly described how SEL activities facilitated a more profound comprehension of climate change. For instance, students emphasized that videos and discussions incorporating SEL elements helped them grasp not only the scientific dimensions of climate change but also the broader socio-environmental implications. These findings align with previous research indicating that SEL interventions can improve metacognitive skills and analytical thinking, which are essential for engaging with complex global issues.

Moreover, the development of cognitive skills was reflected in students' increased confidence in discussing climate change. The qualitative findings suggest that SEL enabled students to articulate their knowledge more effectively, fostering a sense of responsibility and advocacy. The integration of interpersonal SEL skills, such as communication and perspective-taking, contributed to students' ability to explain climate issues with greater clarity and conviction. The connection between SEL and enhanced communication skills is critical, as it empowers students not only to understand climate change but also to engage in informed discussions and potentially influence others' perceptions and behaviors.

### Fostering Affective Engagement and Emotional Connection

A key finding of this study was the role of SEL in strengthening students' emotional engagement with climate change. The pre-survey results showed that while a majority of students expressed concern about climate change, their emotional connection to the issue was relatively moderate. However, the post-survey data demonstrated that after SEL integration, 76% of students reported an increased emotional connection to climate change, with many acknowledging that SEL strategies helped them empathize with the impacts of climate change on communities and ecosystems. This suggests that SEL

provided a framework for students to process and internalize the emotional weight of climate issues, fostering a more personal and engaged perspective.

The qualitative findings further support this conclusion. Students described how SEL-based instructional approaches, including mindfulness exercises, reflective discussions, and emotional storytelling through videos, allowed them to connect more deeply with climate change topics. They highlighted that engaging in activities designed to cultivate empathy and perspective-taking made climate change feel more immediate and personally relevant. The development of emotional connection is significant, as research suggests that affective engagement is a crucial predictor of pro-environmental behavior. When students experience an emotional investment in climate issues, they are more likely to be motivated to act, reinforcing the importance of SEL in climate education.

### **Building a Sense of Community and Responsibility**

Another crucial aspect of SEL's impact was fostering of a sense of community and shared responsibility among students. The qualitative data revealed that SEL interventions created an inclusive and supportive learning environment where students felt more connected to their peers and to the broader implications of climate change. Several students emphasized that discussing climate change within an SEL-integrated framework helped them see the issue as a collective concern, rather than an abstract, distant problem. This sense of shared responsibility was evident in students' expressions of willingness to take action, such as making lifestyle changes, advocating for sustainable practices, or educating others about climate change.

Furthermore, mindfulness practices played a pivotal role in enhancing students' cognitive focus and emotional regulation, allowing them to engage more deeply with the subject matter. Students reported that these exercises helped them become more present and attentive in class, which in turn facilitated better learning outcomes. By creating a structured space for students to reflect on their emotions and thoughts, SEL contributed to a more holistic learning experience that integrated both cognitive and affective dimensions. The findings of this study provide robust evidence that SEL interventions significantly impact students' cognitive and affective engagement with climate change education. The integration of SEL strategies led to notable improvements in critical thinking, emotional connection, and interpersonal communication, all of which are essential components of meaningful engagement with climate issues. The study highlights that SEL not only deepens students' academic understanding of climate change but also fosters a greater sense of personal investment and responsibility toward addressing environmental challenges. Given these findings, incorporating SEL into climate education curricula can be a valuable approach for cultivating informed, engaged, and proactive global citizens.

## IMPLICATIONS

The findings of this study offer several significant implications for the integration of SEL into climate change education. The positive impact of SEL on both cognitive and affective engagement among students provides compelling evidence for its potential to enhance academic performance and personal and social growth in the context of global challenges like climate change.

### 1. Enhancing Cognitive Engagement Through SEL

The study demonstrates that mindfulness activities and emotional check-ins significantly enhance students' cognitive engagement with complex topics such as climate change. SEL cultivates a deeper understanding of the subject by promoting critical thinking and enabling students to connect academic content to real-world experiences. This approach fosters active learning, as evidenced by the increased ability of students to apply their learning strategies in their personal lives and make informed decisions about climate change.

#### *Implication*

Educators should consider incorporating SEL strategies, such as mindfulness exercises and reflective check-ins, into their curricula to improve students' focus, comprehension, and ability to engage with complex issues. This approach has the potential to transform how students relate to academic content, making learning more meaningful and empowering.

### 2. Fostering Emotional Connection and Empathy

SEL's role in fostering emotional connection and empathy toward climate change is another key finding. While there was a slight increase in students' emotional connection to the topic after the intervention, the results highlight the potential for SEL to deepen empathy and inspire action. Mindfulness practices and activities like videos and personal reflections helped students grasp the personal and global significance of climate change, shifting their perspective from theoretical knowledge to emotional resonance.

#### *Implication*

Integrating SEL components into environmental education encourages students to develop a personal sense of responsibility and a deeper emotional commitment to global issues. This emotional connection not only enhances academic learning but also empowers students to advocate for climate action. Therefore, incorporating more activities that facilitate emotional engagement—such as storytelling, experiential learning, and group discussions—can further deepen students' empathy and commitment to addressing climate challenges.

### 3. Promoting Broader Educational Practices

The positive outcomes observed in this study suggest that SEL could be effectively implemented across various academic disciplines. Students expressed a belief that the strategies learned through SEL could be applied to other subjects, indicating the broader potential of this approach. This integration could promote the development of well-rounded individuals who are not only academically proficient but also socially and emotionally aware of global issues.

#### *Implication*

Educational systems should consider expanding the use of SEL beyond climate change education. By embedding SEL into other subjects, schools, and universities can cultivate a generation of students who are not only academically equipped but also emotionally intelligent and socially responsible. Furthermore, this holistic approach can improve student engagement and retention across disciplines, fostering lifelong learning and social responsibility.

#### **Potential Drawbacks and Areas for Improvement**

While the findings of this study highlight the positive impact of SEL on students' cognitive and emotional engagement with climate change education, several limitations and areas for improvement must be acknowledged. One key limitation of this study is the relatively small sample size, particularly in the post-survey responses (N=25). The reduced response rate could have influenced the generalizability of the findings, as a larger and more diverse sample might yield different insights into the effectiveness of SEL strategies. Previous research has emphasized that studies with larger and more representative samples provide stronger empirical evidence for the impact of SEL on student learning outcomes (Durlak et al., 2011) (Taylor et al., 2017). Future research could benefit from expanding the sample size to enhance the robustness and generalizability of the results. Additionally, self-reported measures were the primary method used to assess changes in student engagement, emotional connection, and cognitive understanding. While self-reported data offer valuable personal insights, they are subject to biases such as social desirability and retrospective self-perception errors (Podsakoff et al., 2003). To strengthen the validity of these findings, future studies could incorporate additional assessment methods, such as classroom observations, teacher evaluations, or performance-based tasks, to triangulate the impact of SEL on student learning.

Another potential area for improvement is the duration of SEL implementation within the climate change module. Research indicates that sustained and repeated exposure to SEL strategies leads to more substantial cognitive and emotional development (Zins, 2004). The relatively short timeframe of SEL integration in this study may have limited its long-term effects on student engagement and behavior change. Longitudinal studies tracking students over an extended period would provide deeper insights into the lasting influence of SEL on climate change education.



Furthermore, while this study suggests that SEL fosters critical thinking and emotional connection to climate change, it does not directly measure whether this engagement translates into sustained behavior change. The Theory of Planned Behavior (Ajzen, 1991) suggests that increased awareness and emotional connection do not always result in actionable change unless coupled with self-efficacy and perceived behavioral control. Future research could explore whether students who experience SEL-based climate education demonstrate measurable behavioral shifts, such as adopting more sustainable practices over time.

Lastly, cultural and contextual factors should be considered in the broader application of SEL in climate change education. Some studies suggest that the effectiveness of SEL interventions varies across different educational settings, depending on students' prior experiences, cultural backgrounds, and institutional support for SEL integration (Jennings & Greenberg, 2009). Future research should examine how these factors influence the effectiveness of SEL strategies in climate education across diverse populations.

Despite these limitations, the findings of this study align with existing literature, which supports the role of SEL in enhancing student engagement and fostering deeper emotional and cognitive connections to learning (Brackett et al., 2011). Addressing these areas for improvement in future studies will further substantiate the impact of SEL on climate change education and contribute to the development of more effective instructional strategies.

## CONCLUSION

This research study demonstrates the positive impact of integrating SEL into climate change education, highlighting significant improvements in both students' cognitive and affective engagement. Through the incorporation of mindfulness exercises, emotional check-ins, and other SEL strategies, students showed enhanced critical thinking skills, a deeper understanding of climate change, and increased confidence in discussing and advocating for climate action. The integration of SEL not only fostered intellectual growth but also cultivated a stronger emotional connection to the topic, empowering students to connect their academic learning to real-world experiences. These findings underscore the importance of SEL in creating a more holistic learning environment that supports both cognitive development and emotional well-being, particularly in addressing global challenges like climate change. However, while the study's results are promising, there are areas for refinement to improve the effectiveness of SEL interventions further. Despite a positive trend in emotional engagement, the increase in students' emotional connection was modest, suggesting the need for more targeted and interactive strategies to deepen empathy and foster personal investment in climate issues. Additionally, the variation in responses among students, with 20% showing no significant change, points to the necessity of tailoring interventions to meet diverse learning needs. Future interventions should

also focus on providing more practical, real-world applications of SEL principles to enhance student engagement and ensure that the impact of the intervention is more widely felt. By addressing these challenges, educators can further harness the potential of SEL to create a more inclusive, engaging, and impactful approach to climate change education.

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**Please Cite:** Saroya, T. & Buck, G. A. (2025). Using Social-Emotional Learning Strategies to Impact Undergraduate Students' Cognitive and Affective Engagement with Climate Change. *Journal of Research in Didactical Sciences, 4*(1), 21-41. doi: <https://doi.org/10.51853/jorids/16253>

Received: 07.12.2024 ▪ Accepted: 29.03.2025