Research article

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The Impact of a Climate Crisis Class on Collective Action Participation

Einfluss eines Kurses zur Klimakrise auf die Teilnahme an kollektivem Klimaaktivismus

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Abstract

We tested whether the acquisition of knowledge and beliefs in a climate crisis class related to verified collective action. We studied undergraduate participants (N = 132) in the class (intervention condition) and participants not enrolled in the class (control condition). All participants answered questions about their knowledge and beliefs about the climate crisis, as well as their biospheric values, beliefs about efficacy, and climate anxiety, at two time points separated by nine weeks. We measured collective action in the intervention condition. First, we found that a few measures of knowledge and belief as well as biospheric values and belief in collective efficacy increased significantly in the intervention group relative to the control group. Second, within the intervention group, there were no significant relationships between the changes in several types of knowledge and beliefs and verified collective action. The only significant correlate was biospheric values measured prior to intervention exposure. These results point to the need for research to explore how variables other than knowledge and beliefs, such as group dynamics, relate to collective action. Finally, the study develops new methods for measuring people's engagement in collective action in a class setting that goes beyond typical studies of intentions to act.

Keywords

collective action, climate crisis, education, interventions

Impact statement

We found that a few measures of knowledge and belief about the climate crisis as well as collective efficacy belief and biospheric values increased significantly after a course on the climate crisis, but that these changes did not relate to verified collective action. These results provide further evidence of the limitations of self-report measures in the domain of collective climate action, and the necessity to measure what people actually do rather than what they say they might do, or what they say they believe. The results also suggest that simply educating people about the climate crisis, including its socio-political dimensions, is not necessarily enough to drive action, and that other variables must be important. Educators and movement organizers might use these results to go beyond conveying knowledge and changing belief about the climate crisis to trying to understand those other key drivers of collective action.

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Zusammenfassung

Wir prüften, ob der Erwerb von Wissen und Überzeugungen in einem Universitätskurs zur Klimakrisemit tatsächlich überprüftem kollektivem Handeln zusammenhängt. Untersucht wurden Studierende (N = 132), die entweder am Kurs teilnahmen (Interventionsbedingung) oder nicht (Kontrollbedingung). Alle Teilnehmenden beantworteten zu zwei Zeitpunkten im Abstand von neun Wochen Fragen zu ihrem Wissen und ihren Überzeugungen über die Klimakrise, zu biosphärischen Werten, Wirksamkeitsüberzeugungen und Klimaangst. In der Interventionsgruppe wurde zusätzlich das reale kollektive Handeln erfasst. Einige Wissens- und Überzeugungsmaße sowie biosphärische Werte und der Glaube an kollektive Wirksamkeit nahmen in der Interventionsgruppe im Vergleich zur Kontrollgruppe signifikant zu. Innerhalb der Interventionsgruppe zeigten sich jedoch keine signifikanten Zusammenhänge zwischen Veränderungen in Wissen und Überzeugungen einerseits und dem tatsächlich nachgewiesenen kollektiven Handeln andererseits. Das einzige signifikante Korrelat kollektiven Handelns war das Ausmaß biosphärischer Werte vor Beginn der Intervention. Diese Ergebnisse deuten darauf hin, dass weitere Forschung dazu nötig ist, wie Faktoren jenseits von Wissen und Überzeugungen – etwa soziale Dynamiken oder der Einfluss von Gruppenprozessen – mit kollektivem Handeln zusammenhängen. Zudem entwickelt die Studie neue Methoden zur Erfassung realen kollektiven Handelns im Unterrichtskontext, die über typische Untersuchungen zu bloßen Handlungsabsichten hinausgehen.

Schlüsselwörter

Kollektiver Klimaaktivismus, Klimakrise, Bildung, Interventionen

Impact-Statement

Wir fanden heraus, dass einige Maße des Wissen und der Überzeugungen zur Klimakrise ebenso wie kollektive Wirksamkeitsüberzeugungen und biosphärische Werte nach einem Kurs zur Klimakrise signifikant zunahmen. Diese Veränderungen standen jedoch nicht im Zusammenhang mit kollektivem Handeln. Diese Ergebnisse belegen erneut die Grenzen von Selbstauskunftsmaßen im Bereich des kollektiven Klimaaktivismus und die Notwendigkeit, tatsächliches Handeln zu messen, anstatt Menschen fragen, was sie tun könnten oder glauben. Die Ergebnisse deuten auch darauf hin, dass die bloße Aufklärung über die Klimakrise, einschließlich ihrer soziopolitischen Dimensionen, nicht unbedingt ausreicht, um Menschen zum Handeln zu bewegen, und dass andere Variablen wichtig sein müssen. Pädagog:innen und Organisator:innen von Bewegungen könnten diese Ergebnisse nutzen, um über die Vermittlung von Wissen und die Veränderung von Überzeugungen zur Klimakrise hinauszugehen und zu versuchen, diese anderen Schlüsselfaktoren kollektiven Handelns zu verstehen.

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1 Introduction

Global heating is accelerating (Hansen et al., 2023), fossil fuel extraction and greenhouse emissions are at record levels (Kreil, 2024), and climate and ecological impacts are growing (Ripple et al., 2024) to the point of threatening the integrity of our societies in the near future (Kemp et al., 2022). The long-demonstrated incapacity of elected leaders and the wider public to act on the climate and ecological crises means that collective action is more important than ever in the struggle to leave fossil fuels in the ground and to prepare our societies to equitably adapt in the face of devastating impacts (Richardson et al., 2023; Stoddard et al., 2021).

It is important for the field of psychology to understand the factors that motivate participation in collective action in the context of the climate crisis. This has been approached in several ways including survey-based studies of people's intentions to engage in collective climate action (e.g., Agostini & van Zomeren, 2021; Bamberg et al., 2018; Dablander et al., 2024; Hornsey et al., 2006; Roser-Renouf et al., 2014; Van Zomeren et al., 2008), interview-based studies of what sustains such activities or their barriers (e.g., Bührle & Kimmerle, 2021; Fisher, 2016; Gulliver et al., 2023), and intervention studies, such as videos, that try to motivate real-world collective action (e.g., Castiglione et al., 2022). Here we took a different, intervention-based approach of trying to increase several types of knowledge and beliefs about the climate crisis for students in a class in order to test which of these might relate to their verified collective action. The rationale for this approach is that if we can discover that particular types of knowledge and beliefs *do* relate to verified collective action then this could inform both the design of class curricula as well as the approaches of climate movement organizers. By "knowledge," we refer to accumulated scientific and lived understanding of concepts such as "climate impacts" (Ford et al., 2016). By "beliefs" we refer to convictions about concepts such as "climate justice" which, amongst other things, guide our responses to the climate crisis (Schlosberg & Collins, 2014). We aimed to derive and score knowledge and beliefs from coding participants' open-ended textual responses to class prompts.

Although it might seem *prima facie* obvious that providing knowledge and beliefs about the climate crisis to people is necessary for driving them to act collectively on climate and ecological problems, there are few demonstrations of this relationship in the broader literature. For example, an over-arching review of the relationship between environmental behaviors in general and climate crisis knowledge suggested a negligible relationship (Albarracín et al., 2024), albeit this was mostly in the context of individual rather than collective behavior. One meta-analysis in that review covered dozens of studies on the relationship between climate crisis knowledge and climate crisis adaptation behaviors such as supporting environmentally friendly policies and relocating, finding an overall r value of only .14 (Van Valkengoed & Steg, 2019). Another article which reviewed the weak relationships between personal efficacy beliefs with respect to the climate crisis concluded that other factors such as social norms and group identity are probably more important (Hornsey et al., 2022). This fits with earlier critiques that the problem with climate action is not to be fixed by filling information deficits but rather through forms of information that connect with people's values and ideologies (Kahan & Braman,

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2006; Moser & Dilling, 2007). In the more specific domain of the university campus, an earlier study found that while a set of video interventions about the climate crisis and social movements was related to an increase in collective efficacy beliefs, it scarcely triggered real-world participation (Castiglione et al., 2022). A different study, run in the classroom, in which the instructor presented materials on topics such as the relationship between people and nature, waste management, and energy production, found only a very small subsequent increase in adolescent's self-reported willingness to engage in climate crisis related collective action (Balundė & Poškus, 2025).

Notwithstanding this discouraging picture of the relationship between knowledge and beliefs about the climate crisis and collective action we nevertheless set out in the current study to explore this issue further. We reasoned that many of these prior studies have not looked specifically at the relationship between knowledge and beliefs and *collective* climate action, have not provided adequate opportunities for collective action, and have not perhaps focused on the types of knowledge and beliefs that might be important. The prospect of identifying key types of knowledge and belief that *do* drive people to collectively act seems like a critical endeavor given that other ways of driving social mobilization are clearly insufficient to tackle climate, ecological, and wider social crises.

Our approach of focusing on particular types of knowledge and belief was informed both by substantial on-the-ground experience in the campus climate movement and substantial experience teaching about the climate crisis to undergraduates. Some of these measures have clear connections to established psychological theories, while others were chosen because they seemed intuitively relevant, even if less directly grounded in existing literature. In the following section, we briefly review the prior research that informed these choices and provide context for the less theoretically connected measures.

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Table 1

Types of Knowledge and Beliefs about the Climate Crisis Measured at T1 and T2

Type of Knowledge or Belief	Knowledge or Belief	Survey Question Asked	Example Participant Response
Climate Crisis Impacts	Knowledge	What will happen worldwide in the next few decades if greenhouse gas emissions continue as they are right now?	"The global average temperature will increase which is leading to more frequent and intense heatwaves. Also, there will be more extreme weather events such as hurr canes, floods, and wildfires."
Climate-Science Based Urgency	Knowledge	How much time do you think we have left to reduce those greenhouse gas emissions, and how do you feel about that?	"According to the Intergovernmental Panel on Climat Change, we have less than one decade to reduce the greenhouse gas emissions under an urgency of timeline
Climate Crisis Solutions	Knowledge	Please describe five technological and/or policy solutions that can be taken in the United States to reduce greenhouse gas emissions.	"Mass installation of solar panels. Mass installation of wind turbines. Taxing fossil fuels. Banning fossil fuels one type of institution at a time. Mass forestation."
Climate Justice Framework	Belief	What does climate justice mean to you?	"As for me, climate justice just means who does more emission should pay more response for the climate change. It should be equal to everyone as well as countries no matter poor or rich."
Barriers to Addressing Climate Crisis	Knowledge	What do you think are the main barriers in the United States preventing us from reducing greenhouse gas emissions?	"Many regions in the U.S still depend economically on industries that produce significant greenhouse gas emi sions, such as fossil fuel extraction and agriculture."
Role of Social Movements	Belief	What do you think is the role of local, social movements in reducing emissions?	"...local groups spearhead education amongst their peers...movements like Green New Deal have been suc cessful in getting institutions to change their policies...
Individual Climate Action	Belief	Please talk about what you think you could do to address the climate crisis.	"Reduce my electricity and water intake, use public transport/walk, eat plant based meals, shop second hand, recycle & reuse."
Collective Climate Action	Belief	Please talk about what you think you could do to address the climate crisis.	"I can join organizations and groups and volunteer to help promote their beliefs and programs."

1.1 Climate Crisis Impacts

Although some research suggests that laying out the predicament induces fear and doom which could be paralyzing (Feinberg & Willer, 2011), many other studies, including a meta-analysis, have found that beliefs about the severity of climate crisis impacts relates to changes in climate crisis risk perceptions, stated support for environmentalist policies, and intentions to engage in climate-related action (Hornsey et al., 2016; van der Linden, 2015; Weber, 2006). A different study found however that people who thought climate crisis impacts were unlikely to happen or would primarily affect other people in other places were less likely to be concerned (Singh, Zwickle et al., 2017). Overall, the evidence suggests that knowledge about climate crisis impacts is important in conjunction with other elements, including some we describe below, and we therefore expected that increased knowledge about impacts would relate to collective action.

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1.2 Climate-Science Based Urgency

There is some evidence that climate-science based urgency—the idea that we face a fairly imminent crisis—can increase people's stated willingness to take action, although this appears to depend on how urgency is framed. For example, prior research found that perceived urgency related to intentions to support policy, intentions to vote, and intentions to engage in personal actions (van der Linden, 2015). Other papers suggest though that expressing the urgency as carbon budget timelines and tipping points rarely leads to action unless it is framed in actionable terms (Moser, 2016) or in ways that connect with people's values, identities and sense of behavioral control (Nisbet & Scheufele, 2009). Other research suggests that urgency might backfire without combining it with messages of efficacy and hope (O'neill & Nicholson-Cole, 2009). The topic of urgency also relates to that of psychological distance (i.e., how close or far away one feels climate crisis is to one's prospects). One meta-analysis suggests that individuals tend to engage in more pro-environmental behaviors when they perceive the climate crisis as a proximal and concrete issue (Maiella et al., 2020). However, this relationship has been contested by Van Valkengoed and colleagues' (2023) meta-analysis, which found that only 9 out of 26 reviewed studies showed a positive association between psychological distance and action. Overall, the literature does support the importance of communicating urgency, and this, combined with the instructor's ability over many weeks to lay out the physical-science-basis and political-economic basis of urgency suggested to us that knowledge about urgency would relate to collective action.

1.3 Climate Crisis Solutions

We do not believe that the climate crisis can be "solved", however there are many responses that can be undertaken for both mitigation (to try to reduce the level of damage) and adaptation (to try to protect and defend ways of life). The regular Yale climate opinion surveys show that most registered voters say that they support climate friendly mitigation "solutions" such as helping farmers protect and restore the soil, funding more research into renewables, regulating carbon pollution, providing rebates for purchasing electrified devices, and transitioning the U.S. economy to clean energy (Leiserowitz et al., 2024). However that kind of research does not assay the level of knowledge about "solutions" since it uses fixed-response surveys that provide the information rather than open-response queries that ask people what they know and believe (Ojala, 2012). And sometimes, even when information about "solutions" is provided, for example concerning mitigation policies and adaptation policies (such as requiring cities to invest in flood protection, e.g., Hagen et al., 2016) the relation between people's ratings of those "solutions" and their stated willingness to act is low, as shown in a meta-analysis (Van Valkengoed & Steg, 2019). A smaller body of research has used open-ended or qualitative methods such as interviews and focus groups. For example, one study that asked open-ended questions about mitigation strategies found that individuals often suggested individual behavior as a solution and had less confidence in larger efforts involving systemic change (Becker & Sparks, 2018). Here we expected that greater knowledge about the specific policies that are needed for mitigation and adaptation would relate to collective action.

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1.4 Climate Justice Framework

Climate justice refers to a set of beliefs about the disproportionate negative impact of the climate crisis on marginalized communities who contribute the least to the problem, the disproportionate role of the affluent in contributing to climate change, and mindfulness regarding the promulgation of ineffective technical and market fixes (Aron, 2022). Such beliefs are presumably important for both generating moral outrage, a key component of the SIMCA model of collective action (Van Zomeren et al., 2008), as well as giving people a clearer sense of what needs to be done, such as not to sit by waiting and hoping for magical market or future technical fixes but involving oneself into the struggle to win policies for the technology that already exists. Research from political communication shows that framing climate action as addressing social inequalities can increase public support for environmental policies (Bain et al., 2012; Bain et al., 2016), and several studies show that creating justice frames broadens the basis of engagement (e.g., Carman et al., 2025; Ogunbode et al., 2024). We expected that beliefs about climate justice would relate to collective action.

1.5 Barriers to Addressing the Climate Crisis

There is substantial literature about the sociopolitical, institutional, economic, and psychological barriers to acting on the climate crisis (Brulle & Norgaard, 2019; Dablander et al., 2024; Gifford, 2011; Stoddard et al., 2021). Here we supposed that if participants did understand how progress on tackling the climate crisis has been blocked and how, then, combined with their beliefs about social movements and the collective action behaviors they could take, they might be more motivated to act collectively.

1.6 Role of Social Movements

Exposure to historical examples of social movements can increase the perceived efficacy and motivation to engage in collective climate action. For example, one study found that individuals familiar with Greta Thunberg and her messaging had stronger beliefs in collective efficacy (Sabherwal et al., 2021). Moreover, the Sunrise Movement in the United States has often used education on past justice movements (such as civil rights and labor movements) to build support (Schwartz, 2023), and recruitment to the Freedom Summer of the 1960s was helped by storytelling of earlier movements (McAdam, 1986). Over the course of the class multiple examples were given of how local social movements can be effective at driving change at the state and national level, such as the famous example of the far-ranging federal environmental legislation in the early 1970s in the U.S. (Young & Thomas-Walters, 2024). Therefore, we expected that beliefs about the efficacy of social movements would relate to collective action.

1.7 Collective Climate Action and Individual Climate Action

Some research has shown that people's perception of policy effectiveness or campaign effectiveness is a function of their collective action beliefs (Lubell, 2003; Seiferth et al., 2024). Other research, at the individual level, has shown that people sometimes prefer simple curtailment behavior such as turning off the lights over more impactful individual actions such as shifting banking and driving an electric

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vehicle (Lundberg et al., 2019). We thus predicted that participants' beliefs about the types of actions they can take, such as joining campaigns, going to protests and carpooling, would be related to their propensity to take collective action.

In addition to trying to measure people's knowledge and beliefs for all 8 elements in Table 1, our study also measured verified collective action as our main dependent variable. The participants were assigned to collective action groups and needed to act as a small group to earn class credit. Our focus on verified collective action is important because a great many studies of psychological variables and knowledge elements have focused on individual behaviors such as recycling (Miafodzyeva & Brandt, 2013; Nisa et al., 2019; Varotto & Spagnolli, 2017), and relatively few have examined collective action (some examples are: Bamberg et al., 2015; Bamberg et al., 2018; Castiglione et al., 2022; Rees & Bamberg, 2014; Sabherwal et al., 2021; Sabherwal et al., 2021). Additionally, when collective action *is* measured, it is often limited to self-reported intentions rather than actual behaviors. It is increasingly being recognized that there is a large gap between what people say they will do in self-reports and what they actually do (Dablander et al., 2025; Delcourt & Lange, 2024; Kormos & Gifford, 2014; Lange & Dewitte, 2019; Lange et al., 2023; Nielsen et al., 2022). Furthermore, much of the existing research only examines correlations, rather than testing causal relationships between psychological phenomena and climate action. Here we verified the collective action the participants engaged in, and we used a causal design to examine the intervention by including a control group.

We also measured four other variables using Likert scales: climate crisis anxiety, biospheric values and self and collective efficacy beliefs. These variables were included as covariates in our analysis to examine whether knowledge and beliefs related to verified collective action independently of these factors. It was important to include these covariates as several studies suggest that baseline levels of these variables might relate to the amount of action participants do, and that changes in these variables might occur with changes in beliefs or knowledge (see Schwartz et al., 2023 for climate crisis anxiety; see Brick & Lewis, 2016 for biospheric values, and see Bamberg et al., 2015 and Sarrasin et al., 2022 for efficacy beliefs).

2 Methods

2.1 Study Overview

We studied participants in a 10-week climate crisis class (intervention condition) and those in a control condition across the same period of time. All were asked to provide open-ended responses reflecting their knowledge and beliefs about the climate crisis, and to fill out survey items at two time points. Between the two time points, participants in the intervention were randomly assigned to a climate crisis-focused social-change organization where they worked on projects involving real-world collective action and reported on their collective actions. The level of action they needed to do to get class credit was set low and we supposed that many would go way beyond that.

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We pre-registered two primary hypotheses[1]:

Hypothesis 1: For Week 9 compared to Week 1, participants in the intervention condition will show improvement in the quality of their answers (which we now refer to as their "knowledge and beliefs") related to the climate crisis and its solutions compared to participants in the control condition.

Hypothesis 2: In the intervention condition, the (change in the) quality of answers to the climate crisis and its solutions (which we now refer to as their "knowledge and beliefs") will be positively related to the level of the participants' collective action.

We analyzed our data using SPSS and produced figures using R. In our Open Science Framework repository, we include instructions to replicate our analyses using the free statistical software JASP (see Supplementary Materials), as well as our pre-registration document and Supplemental Materials: https://osf.io/7rwne/

2.2 Participants

One-hundred and thirty-six participants who enrolled in a psychology course on the climate crisis (the intervention condition) filled out our survey at Week 1 (T1). Seventy-six participants in the control condition filled out our survey at T1 and were recruited through the UC San Diego Psychology department SONA credit system. Thirty-three participants in the intervention condition did not fill out the survey at Week 9 (T2) and 47 participants in the control condition did not fill out the survey at T2. Thus, our final sample consisted of 103 college participants who were students from the class (intervention; M_{age} = 21.10, 65 females, 30 males, 7 non-binary, 1 did not report their gender) and 29 college participants who had not taken the class (control; M_{age} = 21.21, 21 females, 7 males, 1 non-binary) who had completed the survey at both times. Based on a sensitivity analysis computed via G*Power (Faul et al., 2007), this sample size provided us with 80% power to detect small effects (d = .24 for the ANOVA with intervention and control at two time points, d = .28 for t-tests within the intervention condition when comparing T1 and T2, and f^2 = .18 for linear multiple regression in the intervention condition). The study was approved by the UC San Diego IRB #809500.

2.3 Design

We assessed each participant's knowledge and beliefs about the climate crisis in early January of 2024 (T1) and then again in early March of 2024 (T2). Figure 1 illustrates study design. The knowledge and belief items were coded by research assistants. At Week 2, participants in the intervention condition were randomly assigned to participate in one of five climate crisis-focused social-change groups. Every week, from Week 2 to Week 9, participants in the intervention condition answered questions about the actions they participated in with their group (2% of overall class credit were assigned as long as the questions were answered, not based on the quality of answers; credit was given even if a student wrote "I did no actions

[1] In our pre-registered document we used the language "quality of answers related to the climate crisis and its solutions". However, based on extensive discussions with reviewers, we now refer to "knowledge and beliefs about the climate crisis". Also, in the pre-registration, for H2, we did not specify precisely enough that our intent was to test how the *change* in knowledge and beliefs related to action.

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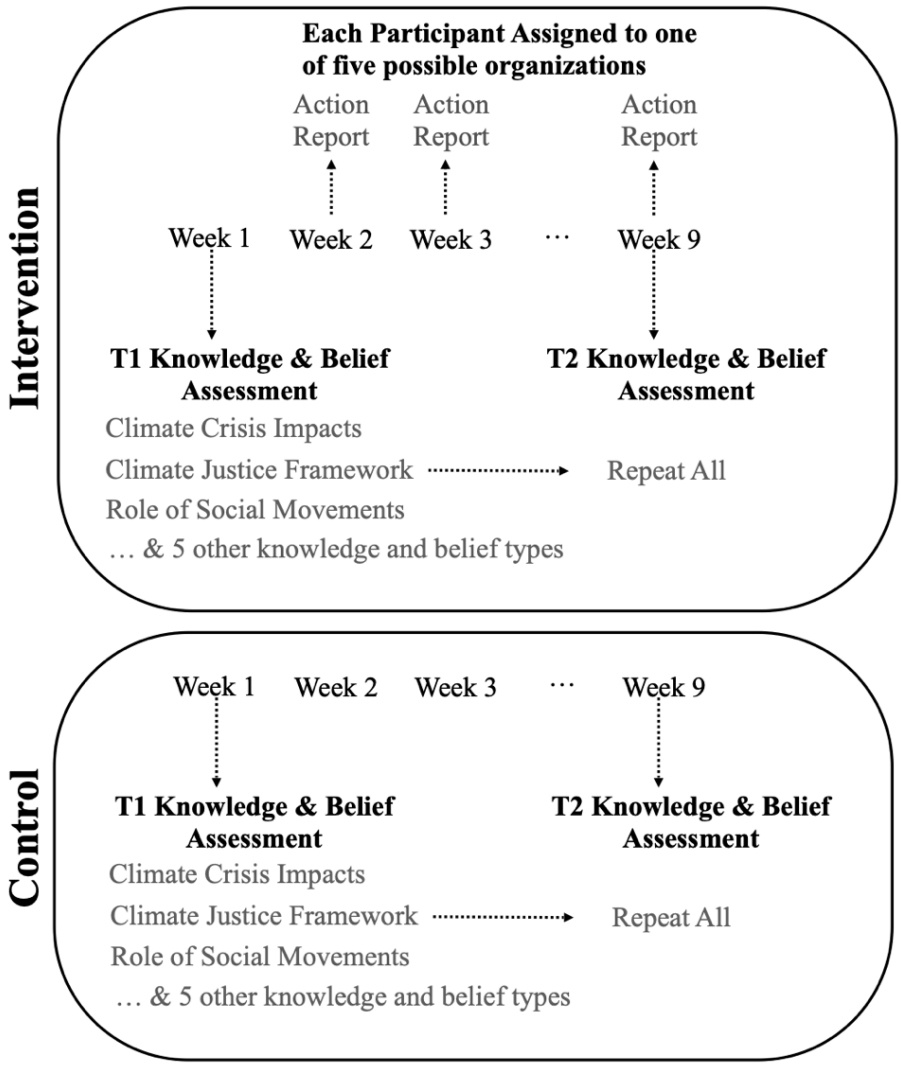
this week"). These answers were also coded by research assistants to derive a weekly quality of collective action score. In Week 10 of the class, participants made a presentation with their group on what they accomplished for class credit. For the class, a student was awarded up to 8 points for 8 hours of action with their group, 4 points for completing a group "action", and 4 points as part of the final group presentation to the class.

Figure 1

Diagram of Study Design



2.4 Procedure

2.4.1 T1 and T2 Survey and Measures

At T1 and T2, participants completed a Qualtrics survey after providing informed consent. The survey contained open-ended questions designed to assess knowledge and beliefs about the climate crisis and also four Likert-scale items for climate crisis anxiety (e.g., "I feel anxious about climate change" derived from Clayton, 2020), biospheric values (e.g., "I often feel a sense of oneness with the

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natural world around me" derived from Mayer & Frantz, 2004), self-efficacy (e.g., "I am confident in my ability to use my skills to help address the climate crisis" derived from Hamann & Reese, 2020), and collective efficacy (e.g., "I feel confident that some of the groups I'm a part of have the capability to generate collective action to address the climate crisis" derived from Salanova et al., 2003 and Roser-Renouf et al., 2014). These variables were included as covariates to examine whether knowledge and beliefs related to action independently of these factors. The scales ranged from 1 (strongly disagree) to 7 (strongly agree). Demographic information was also collected (age, gender, race, class year, first-generation student status).

2.4.2 T1 and T2 Coding of Knowledge and Beliefs about the Climate Crisis

Two research assistants independently coded the qualitative responses to the questions by assessing the 8 knowledge and belief types described above and were blinded to condition and timepoint (see Conry-Murray et al., 2024 for thematic coding methods). For example, the *climate crisis impacts* construct was scored using a rubric that awarded 1 point if no relevant consequences were mentioned, and additional points for each distinct impact mentioned, up to a maximum of 5 points. Participants received a score of 5 if they listed four or more unique impacts, such as extreme weather events, sea level rise, biodiversity loss, etc.. The internally developed rubric for scoring items can be found in the Supplemental Materials. Interrater reliability was measured using Cohen's kappa, with a target threshold of .8. Initially, research assistants independently coded samples of 20 participants and discussed disagreement and refined the rubric until they reached this reliability standard. Afterward, they independently coded 20% of the responses and a Cohen's kappa of .8 and higher was achieved for all measures. After this reliability threshold was met, each coder was responsible for coding 50% of the remaining responses.

2.4.3 The Class

Between T1 and T2, participants in the intervention condition were enrolled in a climate crisis class, PSYC 185: Psychology of the Climate Crisis, taught by Dr. Adam Aron. The undergraduate elective course focused on the causes and consequences of global heating, the barriers to collective climate action, and the necessary technical, political, and social transitions required to address the climate crisis. A central theme was the psychological factors involved in overcoming skepticism, fostering collective action, and managing climate anxiety. Students also learned about the importance of climate justice, the role of social movements, and psychological perspectives on personal and community resilience. These topics were covered in two weekly lectures over ten weeks.

In Week 2, participants in the intervention condition were assigned to participate in one of five climate crisis-crisis focused social-change groups: Bike SD (n = 16), Green New Deal Public Power (n = 19), Green New Deal Fossil Free Degree (n = 22), Sunrise Movement (n = 20), and Youth Will (n = 24). In Week 2, leaders from each organization introduced the participants to their respective group's mission and objectives. Within these organizations, participants were split into sub-teams, which focused on different goals within the organization (e.g., Bike SD had several

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different sub-teams, with one focused on making a bike plan around the University, one focused on how to build parking for bikes in new city buildings, and several others). We created sub-teams in each organization to reduce team size given research showing that optimal organizing size is about 7 (Blenko et al., 2010). In one class per week, participants were given 15 minutes to meet with their sub-team. In addition, many participants chose to hold meetings outside of class. Participants reported engaging in a variety of collective actions, such as gathering signatures for a petition, writing op-eds, researching the influence of fossil fuel funding in higher education, and designing bike-friendly city routes. Further details on the objectives and goals of each group are available in the Supplemental Materials, as are the final group presentations.

2.4.4 Collective Action Measure

As part of the course grade, every week, from Week 2 to Week 9, participants in the intervention condition reported on the collective actions they participated in within their assigned group through a Qualtrics link available on the class website. Specifically, for class credit, they needed to answer 4 questions:

1. How many hours did you spend on your project this week? [be specific about the number of hours]
2. Summarize what you had planned to do this week.
3. Summarize what specific things YOU did and what YOUR GROUP members did.
4. Reflect on what you did (or did not do): for example, how do you feel about your actions this week and why you did / did not do those actions.

2.4.5 Collective Action Measure Coding

Two research assistants independently coded the responses to the weekly collective action prompts and were blinded to condition and timepoint. The initial rubric was created by examining random sets of reported student actions and categorizing them into simple and substantial contributions. Simple contributions, such as communicating with group members or reposting content on social media, were scored as 0.5. Substantial contributions, scored between 1 and 3, were evaluated based on their complexity and impact, with higher scores reflecting actions that demonstrated creativity, leadership, or stepping outside of comfort zones (e.g., facilitating group meetings, writing op-eds, creating outreach materials, standing at a table on the main library walk, interviewing, etc.). These contributions were summed to calculate each participant's quality of collective action score for that week. This rubric was refined and expanded throughout the coding process. When coders encountered an action not previously categorized, they added it to the rubric alongside the closest matching action and discussed their decision to ensure consistency. Research assistants were also able to verify with organizations what the participants were doing. The final version of the rubric can be found in the Supplemental Materials.

To provide a concrete estimate of alignment between individual self-reports and group-level descriptions, we conducted a structured consistency check on a random subsample of participants' weekly reports. Specifically, one coder reviewed entries from four different subgroups (n = 20 participants) drawn from two time points in the course: Week 5 and Week 7. The sampled subgroups included Fossil

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Free Degree Subgroup 2 (6 participants) and Youth Will Subgroup 4 (4 participants) from Week 5, and Bike SD Subgroup 1 (5 participants) and Public Power Subgroup 2 (5 participants) from Week 7. For each participant in the subgroup, the coder compared their report of individual and group activity to the reports provided by their fellow group members for the same week. We found full consistency across all cases, such that every participant's reported actions were corroborated by at least one other group member's description, and no substantial mismatches were identified. Thus, we refer to our measure as "verified collective action".

3 Results

3.1 Hypothesis 1: knowledge and beliefs about the climate crisis will increase from T1 to T2 for participants in the intervention condition, and more than compared to the control condition

To test this pre-registered hypothesis, we conducted a series of ANOVAs with two factors: condition (between group: intervention or control) and time (within participant: T1 vs. T2). Results for the 8 knowledge and belief types are shown in Figure 2 and Table 2. All analyses were conducted in SPSS. There were significant interaction results for climate-science based urgency and collective action belief, Holm-Bonferroni corrected for 8 analyses.

For climate-science based urgency, there was a significant interaction between condition and time, $F(1, 110) = 8.59$, $p = .004$, $\eta^2 = .07$. Follow-up t-tests showed participants in the intervention viewed the climate crisis as significantly more urgent at T2 than at T1, $t(94) = 2.77$, $p = .007$, $d = 0.28$, relative to those in the control condition who viewed it as significantly less urgent at T2, $t(16) = -2.51$, $p = .023$, $d = -0.61$. For collective action beliefs, there was a significant interaction effect between condition and time, $F(1, 126) = 10.93$, $p = .001$, $\eta^2 = .08$. Participants in the intervention showed an increased belief in collective action at T2 compared to T1, $t(100) = 6.13$, $p < .001$, $d = 0.61$, while those beliefs did not significantly change at T2 in the control condition, $t(26) = -0.55$, $p = .59$, $d = -0.11$. There were no corrected significant interaction effects for the other six knowledge and belief types (see Table 2).

Next, we conducted the same ANOVA analyses on our Likert-scale belief variables (see Figure 2 and Table 3), Holm-Bonferroni corrected for 4 analyses. For collective efficacy, there was a significant interaction effect between condition and time $F(1, 128) = 13.73$, $p < .001$, $\eta^2 = .10$. Follow up t-tests showed that participants in the intervention showed significantly greater belief in the ability of groups to address the climate crisis from T1 to T2, $t(101) = 6.00$, $p < .001$, $d = 0.59$, compared to those in the control condition whose collective efficacy beliefs did not significantly change at T2, $t(27) = -1.03$, $p = .31$, $d = -0.19$. For climate anxiety, there was a significant interaction effect between condition and time $F(1, 128) = 9.90$, $p = .002$, $\eta^2 = .07$. Follow up t-tests showed that participants in the intervention were not significantly more anxious about the climate crisis at T2 than at T1 compared to those in the control condition, $t(101) = 1.12$, $p = .27$, $d = 0.11$, who became significantly more anxious at T2, $t(27) = 3.69$, $p = .001$, $d = 0.70$. For biospheric

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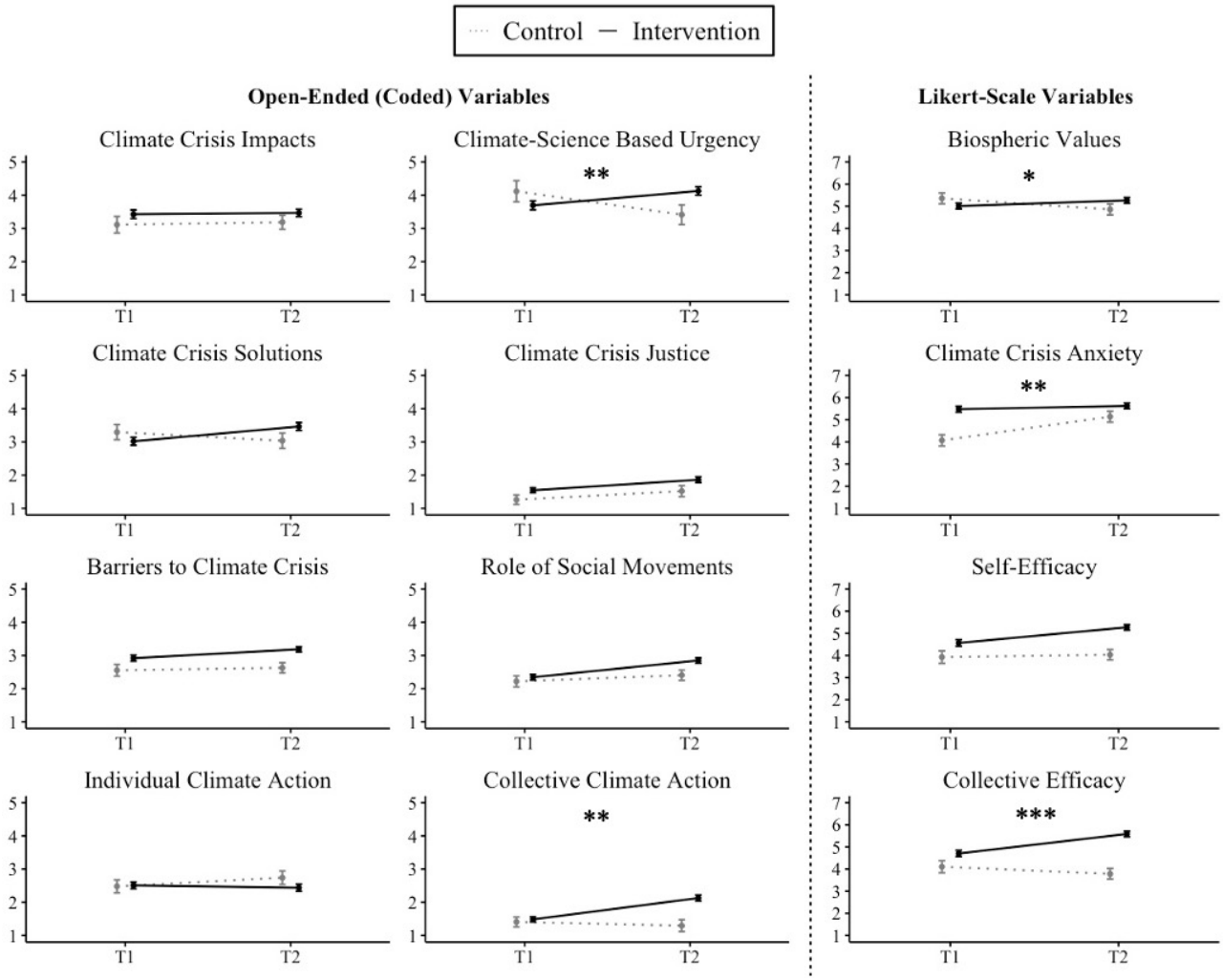
values, there was a significant interaction effect between condition and time $F(1, 128) = 7.14, p = .009, \eta^2 = .05$. Participants in the intervention showed significantly greater biospheric values at T2 than at T1 relative to those in the control condition, $t(101) = 2.28$, $p = .03$, $d = 0.23$, whose biospheric values did not significantly change at T2, $t(27) = -1.41, p = .17, d = -0.27$. For self-efficacy, there was no significant interaction effect between condition and time (see Table 3).

Although the control group was substantially smaller than the intervention group ($N = 29$ vs. 103), post hoc power analyses confirmed that the significant interaction effects were adequately powered (> 80%), given their medium effect sizes ($\eta^2 = .05$-$.08$). Nevertheless, we note that conclusions involving the control group should be interpreted with some caution due to the group size imbalance.

Figure 2

Condition and Time Interaction Results for each Knowledge and Belief type



Note. Error bars represent standard errors of the mean.

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Table 2

Condition and Time Interaction Results for each Knowledge and Belief Type

Knowledge and Belief Type	*p*	Error *df*	*F*	η^2	90% *CI* η^2 *[LL, UL]*	Intervention Condition T1 *M* (*SD*)	Intervention Condition T2 *M* (*SD*)	Control Condition T1 *M* (*SD*)	Control Condition T2 *M* (*SD*)
Climate Crisis Impacts	.90	126	0.02	.00	[.00, .00]	3.43 (1.32)	3.47 (1.08)	3.11 (1.22)	3.19 (1.18)
Climate-Science Based Urgency	.004	110	8.59	.07	[.01, .16]	3.69 (1.32)	4.13 (1.21)	4.12 (1.22)	3.41 (1.28)
Climate Crisis Solutions	.02	126	5.51	.04	[.00, .11]	3.02 (1.24)	3.47 (1.14)	3.30 (.95)	3.04 (1.43)
Climate Crisis Justice	.74	126	0.12	.00	[.00, .03]	1.54 (.81)	1.86 (.91)	1.26 (.45)	1.52 (.64)
Barriers to Addressing Climate Crisis	.39	126	0.74	.01	[.00, .05]	2.92 (.94)	3.19 (.80)	2.56 (.85)	2.63 (.79)
Role of Social Movements	.13	126	2.34	.02	[.00, .07]	2.35 (.90)	2.85 (.78)	2.22 (.70)	2.41 (.89)
Individual Climate Action	.29	125	1.14	.01	[.00, .05]	2.51 (1.01)	2.44 (1.08)	2.48 (1.01)	2.74 (1.02)
Collective Climate Action	.001	126	10.93	.08	[.02, .16]	1.49 (.76)	2.13 (.97)	1.41 (.80)	1.30 (.72)

Table 3

Condition and Time Interaction Results for each Covariate Variable

Covariate	*p*	Error *df*	*F*	η^2	90% *CI* η^2 *[UL, LL]*	Intervention Condition T1 *M* (*SD*)	Intervention Condition T2 *M* (*SD*)	Control Condition T1 *M* (*SD*)	Control Condition T2 *M* (*SD*)
Collective Efficacy	<.001	128	13.73	.10	[.03, .18]	4.71 (1.46)	5.59 (1.25)	4.11 (1.45)	3.79 (1.32)
Self-Efficacy	.06	128	3.68	.03	[.00, .09]	4.57 (1.51)	5.27 (1.23)	3.93 (1.39)	4.04 (1.29)
Climate Crisis Anxiety	.002	128	9.90	.07	[.02, .15]	5.48 (1.34)	5.63 (1.28)	4.07 (1.33)	5.14 (1.38)
Biospheric Values	.01	128	7.14	.05	[.01, .13]	5.01 (1.28)	5.26 (1.24)	5.36 (1.37)	4.86 (1.56)

3.2 Hypothesis 2: for participants in the intervention, the change in knowledge and beliefs about the climate crisis from T1 to T2 will be associated with greater engagement in verified collective action

To test this pre-registered hypothesis, we first conducted a series of paired-sample t-tests within the intervention condition alone to identify which of the 8 knowledge and belief variables increased from T1 to T2 (using Holm–Bonferroni

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p-values corrected for 8 comparisons). Then we entered the significant variables into a multiple regression with level of verified collective action as the dependent variable.

For the first step, six knowledge and belief variables increased significantly in the intervention condition from T1 to T2. These were: climate-science based urgency $t(94) = 2.77$, $p = .007$, $d = 0.28$, climate crisis solutions $t(100) = 3.16$, $p = .002$, $d = 0.31$, climate justice $t(100) = 3.76$, $p < .001$, $d = 0.37$, barriers to addressing the climate crisis $t(100) = 2.59$, $p = .011$, $d = 0.26$, role of social movements $t(100) = 5.50$, $p < .001$, $d = 0.54$, and collective action belief $t(100) = 6.13$, $p < .001$, $d = 0.61$. The only knowledge and belief variables that did not increase significantly were individual action belief $t(99) = -0.47$, $p = .64$, $d = -0.05$, and climate crisis impacts $t(100) = 0.33$, $p = .74$, $d = 0.03$.

Following these analyses, we focused on the 6 measures that showed a significant change in the intervention from T1 to T2. We created difference scores for each of these. These variables were then standardized and included in a multiple regression model as *independent* variables where the *dependent* variable was the sum of the quality of verified collective actions participants reported. We did not pre-register this analysis at the level of detail reported here (e.g., restricting predictors to significant T2-T1 difference scores within the intervention condition and standardizing variables prior to regression).

To remind the reader, from Week 2 to Week 9, participants in the intervention wrote about the collective actions they participated in for that week, and we coded these for action quality on a 0-3 scale and then summed them for each participant. The mean summed quality of action score was 11.78 (see Figure 3). For context, a score of 12 could mean that within the weeks, a participant attended three different tabling sessions (2 points each), created social media content (2 points), and attended four group meetings (1 point each). For the multiple regression analysis, we also included the covariates from T1 of climate crisis anxiety, biospheric values, self-efficacy, and collective efficacy (on the view that we needed to try to control for differences in baseline beliefs and values in our participants).

Contrary to our pre-registered prediction (H2), none of the T2-T1 changes in knowledge or belief variables in the model was significantly related to verified collective action for the intervention condition over the nine weeks (Table 4 and see Supplemental Materials for correlation tables). The only variable that significant related to the quality of collective action was our T1 biospheric values covariate ($\beta = .33$, $SE = .11$, $t = 2.78$, $p = .007$). To further explore the null results, we ran a Bayesian linear regression model from which we could derive Bayes Factors (not pre-registered). For all variables except biospheric values, Bayes Factors were smaller than 1, which means there is evidence favoring the null hypothesis. In several cases, the values were close to 0.1, making the null hypothesis ten times more likely given the data (see Supplemental Materials). For biospheric values at T1, the Bayes Factor was above 24, which is strong evidence for the alternative hypothesis.

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Table 4

Linear Regression Results of Changes in Knowledge and Belief (Timepoint 2 minus Timepoint 1) on Verified Collective Action Participation, Controlling for Covariate Variables at Timepoint 1

Variable	β	*p*	95% *CI* [*LL, UL*]
Δ Climate Science Based Urgency	.014	.887	[-.185, .214]
Δ Climate Crisis Solutions	-.021	.840	[-.223, .182]
Δ Climate Justice Framework	.028	.778	[-.170, .226]
Δ Barriers to Addressing Climate Crisis	-.111	.252	[-.303, 081]
Δ Role of Social Movements	.109	.266	[-.085, .303]
Δ Collective Action	.024	.812	[-.172, .219]
T1 Biospheric Values	.312	.007	[.089, .536]
T1 Climate Crisis Anxiety	.030	.782	[-.183, .242]
T1 Self-Efficacy	.075	.509	[-.150, .300]
T1 Collective-Efficacy	.022	.826	[-.180, .225]

3.3 Post-hoc (non-pre-registered) analysis of how verified collective action differed by group and analysis of high vs. low actors

We were curious about possible differences in the summed quality of collective action scores between the 5 groups. Figure 3 indeed shows that Green New Deal Public Power Group performed about 50% higher quality collective action than the other groups, and this showed up in a significant ANOVA with 5 groups, $F(5, 97) = 3.57$, $p = .005$, $\eta^2 = .16$. Pairwise comparisons showed that the quality of actions were greater for the Green New Deal Public Power Group than compared to Bike SD (d = 1.14, 95% *CI* [0.43, 1.88]), Sunrise Movement (d = 1.21, 95% *CI* [0.54, 1.92]), Green New Deal Fossil Free Degree (d = 0.73, 95% *CI* [0.10, 1.37]), and Youth Will (d = 1.14, 95% *CI* [0.51, 1.81]). One reason that might explain why there was more action for this one group is that the actions needed were on-campus, and regular, and so perhaps easier for participants to engage in.

We were also interested to discern reasons for acting in those participants who acted a lot versus a little. Rather than a full-blown coding approach we informally derive insights by comparing the reasons given across the last four weeks by the top 10 actors vs. the lowest 10 actors (see Supplemental Materials). For the top 10 actors, these included the following: a high sense of personal satisfaction, a high sense of personal responsibility, a high sense of personal and group satisfaction, excitement about actions, concrete goals, consistent communication within their organization, high confidence in their group, feeling appreciated during actions, feeling as if actions mattered, and feeling grateful for a group member. For the 10 participants performing the lowest level of collective actions, reasons given included a

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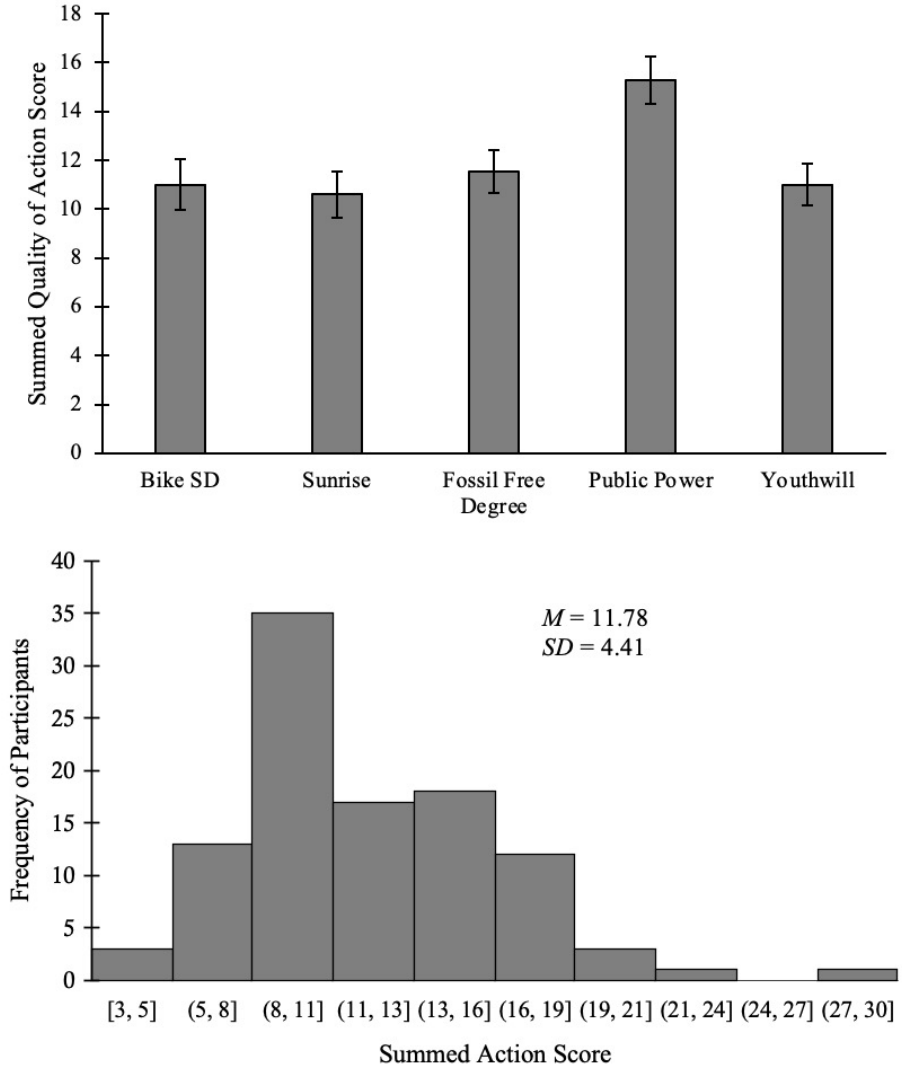
lack of communication with their group, unclear instructions from their organization, a lack of motivation, a lack of time, and dealing with illnesses.

Figure 3

Weeks 2-9 Summed Quality of Collective Action Scores by Organization and Distribution of Summed Collective Action Scores



Note. For a participant, summed quality of collective action refers to the sum across 8 weeks of the actions done in each week, where each weekly action, of which there might be several, was scored from 0-3. Error bars represent standard errors of the mean.

4 Discussion

We sought to answer a key question—which types of knowledge and belief about the climate crisis and which efficacy beliefs and values relate to verified collective action? Our results were as follows: First, we found significant interactions for the knowledge type of climate science-based urgency and collective action belief; that is, these types of knowledge and beliefs increased significantly from Weeks 1 to 9 in the intervention condition compared to the control condition. Follow up *t*-tests

showed that the increase for each of these was significant in the intervention condition itself. Second, we found significant interactions for biospheric values, climate crisis anxiety and collective efficacy. However, follow up *t*-tests showed that the increase was significant in the intervention condition only for biospheric values and collective efficacy, not for climate crisis anxiety. Third, we developed a methodology for coding verified collective action as part of the class activity, and, in a post-hoc analysis we found that one of the groups, the Green New Deal Public Power Group, undertook about 50% higher quality collective action than the other groups, which was a significant difference. Fourth, for our analysis of which knowledge and belief elements related to verified collective action in the intervention condition, there were no significant results for any of the knowledge or belief variables (correlation tables showed no relationship at all, suggesting we were not simply under-powered). Only biospheric values measured prior to the intervention were significantly related to verified collective action.

We discuss the significance of the main result of a null relationship between types of knowledge and belief about the climate crisis and collective action below at length. It could reflect measurement and statistical issues, or it could reflect a psychologically interesting insight into the limits of knowledge and beliefs about the climate crisis to drive collective action. A secondary result was for collective efficacy and biospheric values: we showed that they increased significantly in the intervention condition vs. control, but then in the intervention condition alone, only T1 biospheric values related to verified collective action. This adds to other evidence of the limitations of self-report measures in the domain of collective climate action, and the necessity to measure what people actually do rather than what they say they might do, or what they say they believe. We now discuss these results in turn.

4.1 Some types of knowledge and belief about the climate crisis, collective efficacy, and biospheric values increased compared to the control

As expected for a climate crisis class, some types of knowledge and belief about the climate crisis did increase more in the intervention condition than control; these were climate science-based urgency and collective climate action belief. However, other types of knowledge and belief did not increase significantly relative to the control group. We can think of two reasons why. First, as Figure 2 shows, for some elements, such as barriers to climate crisis action and climate justice, the participants in the intervention were already at an elevated level relative to control even at timepoint 1. This could reflect a selection bias in that participants who chose to take this class as an elective already had some knowledge or beliefs of these types, and therefore the impact of the 9 weeks was less than it might have been if they were randomly allocated to the class. Second, owing to attrition in the SONA recruitment system through the Psychology Department, there were only 29 participants in the control condition, making the data in that group more 'noisy' than it would be with a much larger sample and perhaps hindering the detection of underlying true interaction effects. Even then, it was intriguing that the increase in knowledge and belief about the climate crisis was so little for many of the types

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(e.g., climate justice). One possible explanation is that we measured follow-up these variables in Week 9 before the final exam, at a point when many students had not studied, and many might have missed one or several classes. Another possible explanation is that our coding of knowledge and belief under-estimated the true abilities that participants developed. This is possible even though inter-rater reliability was high, in the sense that the raters had to limit themselves to the rubrics they agreed on, and were good at that in particular.

Another interesting result was that, for collective efficacy, participants in the intervention showed an increase across time relative to control participants. This is quite notable given the well-documented difficulty in improving efficacy beliefs in the context of the climate crisis (as discussed by Hornsey et al., 2021; though Castiglione et al., 2022 showed an increase of collective efficacy with an intervention but not relative to a control group). Moreover Hornsey et al. (2021; 2022) argued that knowledge or reasoning is often insufficient to persuade people to act socially, even hypothetically; instead other kinds of variables such as social identity, social norms and threat-levels are more important (also see Angill-Williams & Davis, 2022 and Whitmarsh et al., 2021). Here we *did* see an increase in both self and collective efficacy beliefs, although this was significant relative to the control group only for collective efficacy. Perhaps collective efficacy is different from self-efficacy in being more sensitive to acquisition of knowledge and belief about the climate crisis, or perhaps our class-based intervention was more effective than other research interventions, or perhaps the increase was not due to the acquisition of knowledge and belief about the climate crisis but instead the other experiences the participants gained by acting collectively which we did not explicitly measure. For biospheric values, participants in the intervention also showed an increase across time relative to control participants, although this increase was small. This finding is notable given that biospheric values were not a direct target of the class, suggesting that the ecological framing of the content may have shifted participants' relationship with, or understanding of, nature. Alternatively, this effect may reflect priming of environmental concepts or a demand characteristic.

In the intervention condition, the increase of knowledge and belief about the climate crisis did not relate to verified collective action. That is, even though many participants did perform substantial levels of verified collective action, there was no relationship at all between the quality of collective action and the 6 knowledge and belief types that showed an increase across time (see correlational tables in the Supplemental Materials). This non-relationship could relate to several things. First, given our modest sample and several variables in the general linear model, it is entirely possible that smaller—but still meaningful—effects went undetected. Our power analysis indicated we had sufficient sensitivity to detect medium-sized effects, but not smaller ones, and the Bayes Factor results provided evidence for the null hypothesis given the data. Thus, we encourage readers to interpret the null findings with caution. Second, and relatedly, it might reflect one of several statistical issues that are well-known in individual differences research (Hedge et al., 2018). It could relate, for example, to too little variability between participants in their change in pre-post knowledge and belief types (which is likely here given how little change there was on average), and it could relate to unreliability in the knowledge and belief measurements. As noted above, the change in knowledge and beliefs about the climate crisis was quite small which might have related to our

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coding rubrics missing key parts of knowledge, and likewise our way of coding quality of collective action might have missed or exaggerated actions done.

Such a result is also, however, consistent with a growing recognition that there is a big gap between what people indicate in surveys and what they do in the real world (Dablander et al., 2025). Moreover, the generalizability of these findings may be limited by cultural and contextual factors. Our sample reflects a WEIRD population (Henrich et al., 2010), and as such, the relationships between knowledge and beliefs about the climate crisis and verified collective action could differ across societies. Given the study's context—one class at one university—these findings should be interpreted as preliminary. We strongly encourage replication and extension in more diverse contexts and with larger, more balanced samples to test the robustness and generalizability of these relationships. Future studies would also benefit from including an active control condition, such as a comparable class without climate content, to more rigorously isolate the effects of such interventions.

4.2 We developed new methods for class-based intervention research

We developed a methodology for coding verified collective action as part of the class activity: participants answered questions for class credit every week from weeks 2 to 9, and these were scored by two raters. Because participants were assigned to a sub-team of about 7 other participants, we could verify the accuracy of what they wrote for their action each week, and we could also compare this with the final presentation. Notably, they understood that credit was given for their reporting each week irrespective of what they reported doing, only that they reported what they did or did not do. One of the groups, the Green New Deal Public Power group engaged in nearly 50% higher quality collective action than other groups. This might have related to the relative ease of performing actions for that group (there was a regular on-campus need) relative to other groups, where some of those groups required off-campus activity or activity only on Zoom with less frequency. At the practical level this has an implication for the mission of encouraging people to join collective action—make the actions easy-to-join, accessible, and local.

We did ask participants each week their reasons for and against acting, and although we did not formally code this, inspection of the answers from the top 10 action scorers revealed answers such as a high sense of personal satisfaction, a high sense of personal responsibility, excitement about actions, concrete goals, consistent communication within the organization, feeling appreciated during actions, feeling as if actions mattered, and feeling grateful for a group member. In future research we intend to measure these and related variables more carefully, predicting that, as Hornsey et al. (2021; 2022) argued, these kinds of variables might relate more strongly to whether people not only believe that they can make a difference but actually *try* to make a difference. This would be consistent with broader literature on variables that relate to action such as a group's ability to resolve conflict (Behfar et al., 2008), group cohesiveness (Beal et al., 2003) intragroup trust (Simons & Petersen, 2000), leadership (Jung & Sosik, 2002), and social identification (Ellemers et al., 2004). It will also be important, in the future

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to not allocate participants to groups at random, but to let them choose, according to their interests. Social identity around the nature of the work to be done might be paramount.

Indeed, one such variable that related to collective action was biospheric values. In our multiple regression model, biospheric values measured at T1—prior to the intervention and included as a covariate—significantly related to verified collective action engagement. It is quite interesting that biospheric values at baseline was the only variable that related to collective action during the class: this is an insight that fits observations in the wider climate movement and academic research (Brick & Lewis, 2016)—those with high biospheric values or a nature-oriented personality are more likely to act.

4.3 Conclusion

Social movements have long been a driving force for sociopolitical and economic change, and more collective action is clearly needed to meet our current ecological predicament. This research developed a new program that leveraged the university classroom for collective action. We demonstrated that climate crisis education increased beliefs about the role of collective action, knowledge of the urgency of climate change, beliefs in collective efficacy, and biospheric values. However, only pre-existing biospheric values were related to verified engagement in collective action. This raises important questions about what kinds of information people might need to act, and how to design a climate crisis curriculum and measure its efficacy. Our approach also provides a useful basis for future class-based interventions to engage students with praxis in the real world.

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5 Open science statement

All data and analysis outputs can be downloaded at https://osf.io/7rwne/. Stimulus materials and questionnaire items can be found in the supplemental materials of this article. The study was pre-registered (https://osf.io/mzgaw) on January 9th, 2024, prior to data acquisition, and was conducted in accordance with this preregistration. We confirm that our paper includes all studies that we have conducted on this research question and that, for all studies reported, we have reported all measures, conditions and data exclusions, as well as the rationale behind our sample size.

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