Teaching of Psychology
1-10

DOI: 10.1177/00986283231177949
journals.sagepub.com/home/top

Connecting Introductory Psychology to Climate Change Can Empower Students

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Abstract

Background: Introductory psychology courses provide a unique opportunity to educate students in ways that can inform how they will address major issues of the day. **Objective:** We tested whether an integrative, last-day-of-class activity in which students applied pertinent psychological theories to climate change would empower students to address this issue. **Method:** Across multiple introductory psychology courses, pre- and post-course assessments (Study 1) and a comparison to a control classroom condition (Study 2) were used to evaluate changes in students' climate change efficacy beliefs and intentions to act. **Results:** Students who experienced the activity were more likely to (1) believe their actions could make a difference in mitigating climate change and influence others to follow suit, (2) show increased intentions to adopt sustainable behaviors and take political action to address climate change, and (3) see psychology as relevant to solving societal issues like climate change.
Conclusion: Having students connect psychology to solving climate change led students to feel more empowered to address this global challenge. **Teaching implications:** This classroom activity could readily be scaled up to thousands of introductory psychology courses around the world every year, connecting psychology to a major issue of our time and potentially mobilizing students to action.

Keywords

introduction to psychology, empowerment, climate change, social norms, intervention

Introductory psychology is taken by 1.2–1.6 million students each year (Gurung et al., 2016). The vast reach of introductory psychology, combined with its focus on human behavior and mental processes, uniquely positions it to equip students to deal with major societal problems. Recognizing this opportunity, the American Psychological Association considers enhancing students' ability to apply psychological theory to real-world problems to be a central goal for introductory psychology courses (Gurung & Neufeld, 2022; Halpern, 2010). As such, there are increasing calls to connect teaching psychology to climate change (Amel & Manning, 2022; Swim et al., 2011), and courses and textbooks designed around Sustainability Psychology specifically (e.g., Scott et al., 2021).

As students look out onto the world, however, they may wonder whether their individual actions can have an impact on major social problems. This is exemplified in a social problem like climate change, where individuals may reasonably doubt that their personal or political actions have influence given the global scale of the problem. However, learning concepts from psychology may help students overcome such concerns and recognize that their actions matter. Introductory psychology offers many concepts and findings that can help students understand important problems and develop strategies to address them. As such, the content of introductory psychology likely can help students feel empowered to effect meaningful change. In the present research, we investigated whether introductory psychology could empower students to address the large-scale societal challenge of climate change through the teaching of typical psychological topics and an integrative, last-day-of-class activity applying these topics to climate change.

Educating people about psychology has already been used in several ways to help improve societal problems and empower individuals. Educating students about the psychology of stereotype threat, for example, has been found to reduce the detrimental effects of stereotype threat on academic performance (Johns et al., 2005). Additionally, educating students about the psychology of naive realism increased the acceptance of cultural differences by reducing the assumption that one's own views were simply objective, and others are biased (López-Rodríguez et al., 2021). Notably, such efforts to address societal problems are not guaranteed to succeed: educating people about implicit bias as part of an anti-bias training, for example, may be effective

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in some cases and fall short in others (Carter et al., 2020). Thus, research is needed to understand which educational approaches are effective and in what applied domains.

The Relevance of Psychology for Addressing Climate Change

How might educating students about psychology help address a problem like climate change? Many topics in psychological research are pertinent to understanding human behavior related to climate change, such as those pertaining to attention, emotion, memory, and social influence (Constantino et al., 2021; Sparkman, Howe, & Walton, 2021). For instance, basic psychological phenomena like inattentional blindness (Mack, 2003) and habituation (Thompson & Spencer, 1966) may help students understand why climate change is given insufficient attention, and why people grow complacent despite ever-present warning signs. Concepts like diffusion of responsibility (Darley & Latané, 1968) help clarify why people struggle to act in the face of a collective action problem like climate change.

To feel empowered, students likely need to not only understand why a problem like climate change is psychologically challenging, but also have a strengthened sense that there are effective solutions at their disposal. To this end, there may be specific benefits to educating students about topics like social influence, a common topic in introductory psychology. Many problems, like climate change, cannot be solved single handedly. They require collective action, and yet people must decide as individuals whether to act. In the absence of a psychological theory of social influence, many students may view humans as independent, atomized units, each making isolated decisions. Indeed, this is the predominant cultural belief in independent cultural contexts like the US (Markus & Kitayama, 1991). In this context, individual contributions to large-scale problems may feel noble, but futile, and people are likely to conclude that their actions are too small to matter in the face of large problems. In such cases, taking action may only feel like a viable solution if one presumes "perhaps if I take action, others will too." Fortunately, teaching the psychology of social influence provides students with a framework for understanding how one individual's decision-making is connected to the actions and beliefs of others. Psychological research on norms, for instance, teaches that one's actions may spread to others through conformity (Cialdini & Trost, 1998), a process that enables humans to coordinate their behavior to solve collective challenges (Ostrom, 2000). Seeing people as part of a larger social network can enable students to reason about strategic approaches to mobilize large numbers of people, even from the perspective of an individual actor.

Social influence research can provide a strong foundation for beliefs that people can come together as a group to solve collective challenges, and that one's own actions are contagious, and thus matter in that process. For instance, social influence has been shown to shape cooperation in social dilemmas: people are more likely to contribute to the group when others do, too (Hackel et al., 2020). Social norms also shape cooperation outside the laboratory. Decades of field studies demonstrate that people engage in pro-environmental action when they believe others do as well (Cialdini, 2003; Farrow et al., 2017). For instance, the odds of someone buying solar panels for their roof go up for each home in the neighborhood that already has them (Bollinger & Gillingham, 2012). And, important to the domain of climate change, research finds that even a (growing) minority of individuals can influence others' behaviors, as demonstrated by recent research on dynamic norms. For instance, when café patrons learned that 30 percent of Americans had recently changed their behavior by eating less meat; these patrons were twice as likely to order a meatless lunch compared with a control group (Sparkman & Walton, 2017). Those learning about such theories may feel emboldened by knowing that such approaches can have scalable and long-lasting effects (Sparkman et al., 2020; Sparkman, Macdonald, et al., 2021). Thus, we expect educating students about social influence will lead them to feel empowered to address large collective action problems that may otherwise breed doubt in one's own ability to have a broader impact.

Beyond harnessing conformity, students may feel more empowered to address climate change by simply having a broader repertoire of relevant influence techniques at their disposal. For instance, teaching students about compliance techniques, like the foot-in-the-door approach (Freedman & Fraser, 1966) or becoming aware of how slight changes can nudge people in better directions (Thaler & Sunstein, 2008) may lead students to feel they are able to shift the actions of others, and therefore have an impact.

Goals of the Present Study

Although the psychology concepts described above, including those related to social influence, are typically taught in an introductory psychology class, there is no guarantee that students taught these concepts will know how to apply them to climate change without specific guidance. Thus, in the present research, we bring together the content goals related to teaching psychological phenomena like the above, with the broader pedagogical goal of applying psychology to a real-world problem like climate change in the context of an introductory psychology course. These included teaching about concepts that may be describe as psychological barriers to action regarding climate change (inattentional blindness, habituation, and diffusion of responsibility) and the social influence concepts described above that offer psychological solutions for mitigating climate change. Then, at the end of the term, we encouraged an explicit application of these topics to climate change by reviewing the relevant concepts and asking students to imagine how they might apply them to try to address climate change in a short classroom activity.

In Study 1, we used a pre-post analysis on college students from four different classes and two campuses to assess whether this learning activity led introductory psychology students to feel more empowered to address climate change. We

assessed empowerment in several ways, including changes in students' beliefs about whether their actions could help address climate change and influence others to follow suit. We also examined changes in students' intentions to adopt climate mitigation behaviors (e.g., to conserve energy) and take political or other social action to address climate change. We examined whether the learning activity's effects were specific to climate change beliefs and behaviors by also measuring potential change in students' feelings of empowerment regarding an unrelated domain of personal finances. In Study 2, we assessed the effectiveness of this approach again, but in a quasi-experimental design contrasting the pre-post effects of two different introductory psychology courses, one given the climate change learning task and the other given a control learning task focused on a different applied problem of increasing health and happiness on campus.

Study 1: Pre-Post Analysis of Student Attitudes and Self-Reported Actions

Hypotheses

By applying psychology to better understand the barriers to climate action and ways to intervene on those barriers, we expected students to be more empowered and motivated to take climate action. Specifically, we hypothesized that students would report increases in five dependent measures when comparing pre- and post-activity ratings, including beliefs about their personal climate impact and ability to influence others, proenvironmental behavioral intentions, proenvironmental political/social intentions, and belief that psychology is helpful. We did not predict this would occur for items used to assess specificity (financial efficacy and financial intentions). We also assessed information-seeking behavior about climate activism groups as an exploratory outcome to observe the percent of students that would sign up for political action.

Method

All study materials, including measures, materials used to lead the in-class activity, and relevant data are available through the Open Science Framework (Sparkman et al., 2023).

Participants. Participants were students in four introductory psychology courses (total $N = 686$ students who completed both pre- and post-surveys) taught at two universities during the Fall of 2018 ($n = 199$), Winter of 2019 ($n = 131$), Spring of 2019 ($n = 108$), and Fall of 2019 ($n = 248$). The Fall 2018 through Spring 2019 courses were at a 4-year university in the Western United States (University A), whereas the Fall 2019 course was at a 4-year university in the Eastern United States (University B). Given the wide range of students who enroll in an introductory to psychology course, participants included those from a variety of majors and years in college (for full demographic information for each study, see supplemental Table 1 on OSF (Sparkman et al., 2023).

Students at University A were included in analyses unless they opted out of having their data used for research purposes (none chose to opt-out). Students at University B were included in the analysis only if they opted into allowing their class data to be used for research purposes (approximately 98% chose to do so). Some students only completed the pre-survey and were not

Table 1. Means of Outcome Measures Pre- and Post-Class Activity.

	School and Term											
	University A Fall '18 ($n = 199$)			University A Winter '19 ($n = 131$)			University A Spring '19 ($n = 109$)			University B Fall '19 ($n = 248$)		
Outcome Measure	Pre	Post	t (d)	Pre	Post	t (d)	Pre	Post	t (d)	Pre	Post	t (d)
Personal climate impact	3.49 (0.82)	3.78 (0.85)	5.53*** (0.35)	3.31 (0.85)	3.64 (0.83)	4.38*** (0.39)	2.94 (0.94)	3.42 (1.01)	5.45*** (0.49)	2.95 (0.92)	3.42 (1.03)	7.94*** (0.49)
Social impact	2.72 (0.90)	3.35 (1.00)	9.67*** (0.66)	2.95 (0.93)	3.53 (0.84)	7.65*** (0.65)	2.61 (0.86)	3.14 (0.91)	6.58*** (0.60)	2.51 (0.82)	3.14 (1.01)	10.28*** (0.69)
Behavioral intentions	4.08 (1.12)	4.47 (1.31)	4.65*** (0.31)	3.97 (1.21)	4.92 (1.15)	9.62*** (0.80)	3.93 (1.21)	4.26 (1.25)	3.17** (0.26)	3.82 (1.31)	4.17 (1.35)	5.06*** (0.27)
Political/social intentions	NA	NA	NA	5.02 (1.34)	5.05 (1.26)	0.24 (0.02)	4.26 (1.39)	4.52 (1.38)	2.59* (0.19)	4.27 (1.52)	4.49 (1.54)	2.69** (0.14)
Psychology is helpful	3.87 (0.92)	4.06 (0.87)	2.83** (0.22)	3.86 (0.92)	4.11 (0.81)	3.47*** (0.29)	3.70 (0.93)	4.01 (1.06)	3.19** (0.31)	3.73 (0.97)	4.01 (0.93)	4.41*** (0.30)
Financial efficacy	NA	NA	NA	4.58 (0.53)	4.75 (0.47)	3.42*** (0.35)	4.60 (0.60)	4.68 (0.52)	1.34 (0.15)	4.52 (0.70)	4.42 (0.73)	−1.92 (−0.14)
Financial intentions	NA	NA	NA	6.36 (0.92)	6.36 (0.84)	0.08 (0.01)	6.31 (0.91)	6.30 (0.78)	−0.10 (−0.01)	5.57 (1.45)	5.82 (1.23)	2.708** (0.19)

Note. Means and *SD*s (in parentheses) are shown; t statistics are from paired t tests and are accompanied by a Cohen's d effect sizes (in parentheses). Personal climate impact, social impact, belief that psychology is helpful, and financial efficacy beliefs were recorded on a 5-point scale from 1 = *Not at* all to 5 = *Very much.* Behavioral and political/social intentions were recorded on a 7-point scale from 1 = *Very unlikely* to 7 = *Very likely.* *$p < .05$; **$p < .01$; ***$p < .001$.

included in the sample size noted above or analyses below, resulting in the following attrition levels: 14% in Fall of 2018, 2% Winter of 2019, 16% Spring of 2019, and 9% in Fall of 2019.

Procedure. All procedures were approved by the Institutional Review Boards of the respective institutions. In the middle of the academic term, 6–8 weeks prior to experiencing an in-class activity applying course topics to climate change, students were invited to complete a survey for extra credit that contained our pre-measures pertaining to addressing climate change (see Dependent Measures). The in-class activity took place on the final day of class when students were given a module exploring social influence and other course topics in the context of climate change. Toward the end of that same class session, students completed a course evaluation that included post-measures pertaining to addressing climate change. Our pre- and post-measures included several aspects of individual behavior, belief that individual actions would affect others, and opportunities to take further action (see Dependent Measures). In addition, in the Fall of 2019, we added measures to assess the specificity of our effects to climate-relevant actions.

Class Activity. The activity took place in a lecture designed for the last day of class, during a segment centered on the relevance of psychology to contemporary societal issues. The entire activity took approximately 15–20 min. It included a review of course content students had learned earlier in the term, and discussed how it may apply to climate change. This included a brief lecture on the problem of climate change and several psychological "barriers to action," including habituation, inattentional blindness, and diffusion of responsibility, as well as several psychological "tools for change," including social learning, the impacts of emotion on memory, conformity to social norms, and compliance techniques like foot-in-the-door. The social norm component was meant to illustrate that an individual's actions can influence others, including environmental behavior and voting rates (Bond et al., 2012), and conformity to sustainable trends even when those actions are currently done by a minority of people including eating less meat (Sparkman & Walton, 2017). This entire brief lecture took approximately 10 min (for full lecture materials, see Sparkman et al., 2023). Students were then asked to use these insights to craft a concrete strategy to move the needle on climate change and discuss their strategies with a small group of classmates (approximately 3 min). This design ensured that, even in a large classroom, each student had an opportunity to think and discuss how this content may facilitate social change. In two of the terms (Winter 2019 and Spring 2019 at University A), there was available time for some small groups to share their ideas with the larger class (approximately 5 min).

Dependent Measures. Participants completed a variety of measures pertaining to their actions and climate change. Pre-survey items completed several weeks before the class activity were included as part of a brief extra credit survey that took approximately 5–10 min to complete (with the relevant items estimated to take 1–2 min). The post-survey items completed after the class activity were part of a broader overall course evaluation which took about 15–20 min for students to complete (with the relevant items estimated to take about 2 min). Pre- and post-survey measures included items on how much their actions could help address climate change, and to what extent those actions would influence others they knew as well as broader spheres such as the conduct of business and politicians. Students were also asked about their intentions to adopt climate mitigation behaviors (e.g., to conserve energy), as well as their intentions to engage in political actions to address climate change or social and organizing actions. Below, we describe each outcome measure. The survey items were designed by the research team and followed best practices as outlined in research on Likert item design (Krosnick, 1999), including recommendations such as using 7-point scales for Likert items with two conceptually opposite ends, 5-point scales for Likert items that range from an absence of a construct to a high degree of it, and labeling all scale points (see OSF for full item wording and scale point labels: Sparkman et al., 2023).

Belief in Ability to Have a Personal Climate Impact. Two items were assessed in both pre- and post-surveys and for all four courses that asked about one's own belief they could have an impact on climate change on a 5-point scale (from 1 = *Not at all* to 5 = *Very much*). In addition, another item was included in this scale in both waves of the Fall 2018 term, but was later removed to accommodate adding more items in future terms. Across all courses and surveys, these items formed a reliable scale ($a = 0.70$).

Belief in Ability to Have a Social Impact. Three items were assessed in both pre- and post-activity surveys and for all four courses that asked about students' own beliefs that, if they lived in a sustainable way, those choices would lead others to also take action on climate change, including other individuals, businesses, and politicians. These were recorded on a 5-point scale (from 1 = *Not at all* to 5 = *Very much*). Across all courses and surveys (pre and post), these items formed a reliable scale ($a = 0.81$).

Personal Action Intentions. Three items were assessed in both pre- and post-surveys and for all four courses that asked about students' intentions to adopt sustainable behaviors, including eating a more sustainable diet, reducing travel by flight, and reducing residential energy consumption. How likely there were to adopt these behaviors was recorded on a 7-point scale (from 1 = *Very unlikely* to 5 = *Very likely*). Across all courses and surveys, these items formed a reliable scale ($a = 0.62$).

Political and Social Action Intentions. Starting in the second term that we assessed (Winter 2019 and later), we added three items to pre- and post-surveys that asked about students' intended political and social actions to address climate change, such as posting about the issue on social media, or volunteering for a political campaign that sought to address climate change. How likely there were to adopt these behaviors was recorded on a 7-point scale (from 1 =

Very unlikely to 7 = *Very likely*). Across all these courses and surveys, these items formed a reliable scale ($a = 0.77$).

Belief that Psychology is Helpful. Two items were assessed in pre- and post-surveys and for all four courses that asked about students' belief that psychology was helpful in addressing problems like climate change. These were recorded on a 5-point scale (from 1 = *Not at all* to 5 = *Very much*). Across all courses and surveys, these items formed a reliable scale ($a = 0.87$).

Information Seeking Behavior. Starting in the second term that we assessed (Winter 2019 and later), we added two items to the post-survey where students were given a description of two climate change mitigation organizations: the Citizens' Climate Lobby and the Sunrise Movement. After reading these descriptions, they selected if they wished to be signed up for either (or both) of those organizations' email lists.

Specificity Items: Financial Efficacy and Intentions. Starting on the second term that we assessed (Winter 2019 and later), we added two items that we did not expect would be impacted by our intervention as a measure of specificity. These items were included to illustrate that students were not simply uplifted by some general seasonal pattern or by the general view, emphasized in the class activity, that psychology is relevant to solving practical problems. Both items dealt with managing one's personal finances, a domain that had no clear connection to the climate change activity. The first was modeled on the efficacy items pertaining to climate change, but instead asked how efficacious students felt about the ability to save money and was recorded on a 5-point scale (from 1 = *Not at all* to 5 = *Very much*). The second item was modeled on the sustainable intentions items, but instead asked whether students intended to save money in the near future and was recorded on a 7-point scale (from 1 = *Very unlikely* to 7 = *Very likely*).

Results

The means, standard deviations, and paired *t*-tests comparing outcomes pre- and post-class activity for every course and survey outcome can be found in Table 1. To see the effects across courses, a forest plot of the effect sizes for each outcome can be found in Figure 1.

Belief in Ability to Have a Personal and Social Impact. After the class activity, every course saw a significant shift in students' expected personal impact, such that students felt their actions were more likely to help mitigate climate change. The meta-analyzed effect size was $d = 0.42$, 95% CI = [0.35, 0.50]. Every course saw a significant shift in students' expected social impact, such that students felt their actions were more likely to encourage sustainable actions among others. The meta-analyzed effect size was $d = 0.66$, 95% CI = [0.58, 0.74].

Personal, Political, and Social Action Intentions. After the class activity, every course saw a significant increase in students' intentions to engage in more sustainable behaviors. The meta-analyzed effect size was $d = 0.35$, 95% CI = [0.28, 0.42]. Most courses saw a significant increase in students' intentions to engage in political and social actions to help mitigate climate change. The meta-analyzed effect size was $d = 0.14$, 95% CI = [0.06, 0.21].

Belief That Psychology is Helpful. After the class activity, every course saw a significant increase in students' belief that psychology was useful to addressing contemporary problems like climate change. The meta-analyzed effect size was $d = 0.27$, 95% CI = [0.20, 0.35].

Information Seeking Behavior. Between 19% and 27% of students chose to sign up for an email list for a political organization focused on mitigating climate change.

Table 2. Comparison of Pre- and Post-Class Activity Effects for Climate Activity and Control Activity.

	Climate Activity (n = 272)		Control Activity (n = 201)						
Outcome Measure	Pre	Post	Pre	Post	Diff. of diff.s	*t* (df)	*p*	95% CI of the diff.s	SPR^2
Social impact	2.25	2.94	2.56	3.01	0.242	2.07 (456)	.039	0.01, 0.47	0.004
Personal climate impact	2.77	3.25	2.94	3.15	0.265	2.23 (453)	.027	0.03, 0.50	0.005
Behavioral intentions	3.60	4.32	4.01	4.17	0.563	3.54 (488)	<.001	0.25, 0.87	0.011
Political/social intentions	4.19	4.87	4.62	4.74	0.565	2.76 (459)	.006	0.16, 0.97	0.008
Psychology is helpful	3.73	4.19	3.92	4.11[a]	0.277	2.32 (452)	.021	0.04, 0.51	0.005
Financial efficacy	5.60	5.84	5.80	5.75	0.284	1.64 (446)	.102	−0.05, 0.62	0.003
Financial intentions	4.39	4.43	4.37	4.51	−0.098	−1.03 (432)	.302	−0.28, 0.09	0.001

Note. Condition means and the difference of differences (Diff. of diff.s) are from mixed model estimates. Personal climate impact, social impact, belief that psychology is helpful, and financial efficacy beliefs were recorded on a 5-point scale from 1 = *Not at* all to 5 = *Very much.* Behavioral and political/social intentions were recorded on a 7-point scale from 1 = *Very unlikely* to 7 = *Very likely.* The difference in differences reported are the regression coefficient from the interaction term for a dummy variable for condition (0 = Control Activity, 1 = Climate Activity) and pre- and post-activity scores (pre = 0, post = 1).
[a]Note this difference from pre to post within the control condition was not significant, $t(147) = 1.352$, $p = .105$. Semi-partial R^2 (SPR^2) effect sizes for each interaction term are computed using the r2beta function in the R package r2glmm (Jaeger, 2017).

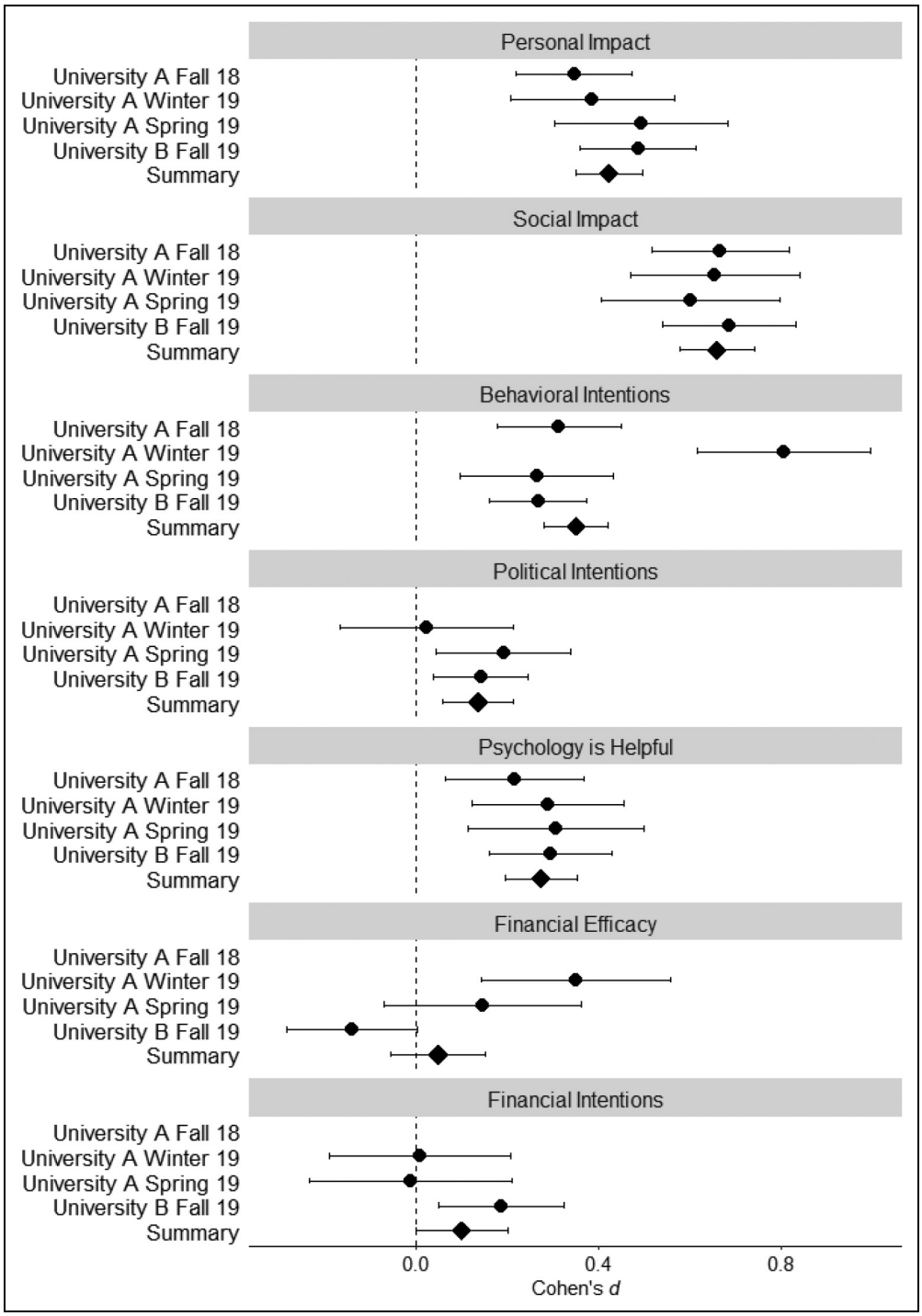

Figure 1. Forest plot of effect sizes for outcome measures.

Specificity Items: Financial Efficacy and Intentions. While students' intentions to adopt sustainable behaviors were increased after the class activity, an increase in their intent to save money during this same time was non-significant in two of the three classes it was assessed in, and the meta-analysis of this effect edges on zero (meta-analyzed $d = 0.10$, 95% CI = [0.00, 0.20]). Notably, this shift in intention was smaller than that for sustainable behavior ($d = 0.35$, 95% CI = [0.28, 0.42]). Students also showed no increase in their perceived ability to save money during this time (meta-analyzed $d = 0.05$, 95% CI = [− 0.06, 0.15]).

Study 2: Comparison to a Control Activity

Study 1 showed that a classroom activity that reviewed previously taught introductory psychology concepts, including

social influence, and applied them to the problem of climate change, shifted students' attitudes across the full array of dependent measures taken. After this activity, students were more likely to feel their actions could make a difference in mitigating climate change and could lead others to follow suit. They also showed increased intentions to adopt sustainable behaviors and engage in political actions to address climate change.

Study 1 supported the idea that a brief end-of-term activity could help students feel more empowered to act on climate change. The specificity items help rule out the possibility that students feel generally empowered at the end of an introductory psychology class; students did not consistently feel as empowered or more motivated to act in a domain irrelevant to the classroom activity (personal finances). Study 2 provides an additional test of the specificity of this effect by comparing the climate-change activity to a similar end-of-term activity focused on applying course concepts to a different social issue: increasing well-being on campus. Further, using a control group in a between- and within-subjects design helps eliminate possible concerns about seasonal shifts driving effects found in Study 1.

Hypotheses

By having students apply pertinent psychological theories to address climate change, we anticipated they would feel more empowered and inclined to action to address climate change as was found in Study 1. We do not expect the same impact to occur for a parallel activity not focused on climate change. Thus, in Study 2, we hypothesized that students' changes from pre- to post-activity would be larger in the climate change activity than the control activity in all five dependent measures (personal climate impact, social impact, behavioral intentions, political/social intentions, and belief that psychology is helpful) but we did not predict this would occur for the items used to assess specificity (financial efficacy and financial intentions). We also hypothesized that a greater number of students in the climate activity would show information-seeking behavior to join climate activism groups than would do so in the control activity.

Method

Participants. Participants were students who completed at least one of the surveys (either pre- or post-activity, or both, total $N = 473$) while in an introductory psychology course in the Fall of 2021. This study was conducted at the same two universities where Study 1 had been previously run. Participants at University B were assigned to the same climate change activity from Study 1 ($n = 272$), while those at University A were assigned to a control activity ($n = 201$). Given the wide range of students who enroll in an introductory psychology course, participants included those from a variety of majors and years in college (for full demographic information for each study, see supplemental Table 1 on OSF: Sparkman et al., 2023). Like Study 1, students who only completed the pre-survey were not included in the sample size above or analyses below (13% of students at University A and 7% of students at University B[1]).

Procedure. Like Study 1, participants were invited to complete a survey for extra credit as part of a course evaluation twice during their class, once pre-activity in the middle of the term, and again at the end of the term, after the class with the activity. As in Study 1, this survey contained various measures pertaining to addressing climate change. As in Study 1, the class activity took place on the final day of class.

Although the control and climate change activities were conducted at two different universities (A and B, respectively), the courses, including the class period length and lecture content, were highly similar because the instructors of these classes had previously collaborated on the creation of all course materials and taught together.

Class Activity. The same activity was used from Study 1. The control activity mirrored the class activity used in Study 1 in that both discussed how psychological theories pertained to real-world problems, but rather than discussing this in the context of climate change, it focused on using the course concepts of nudges (Thaler & Sunstein, 2008), conformity (Bond et al., 2012), and an understanding of culture (Markus & Conner, 2013) and how these may increase health and happiness on campus (see OSF for full control activity slides: Sparkman et al., 2023). The initial lecture portion of the control activity was somewhat briefer than the climate change activity as it did not discuss climate change (about 5 vs. 10 min). Like the climate activity, it featured a brief review of research covered in previous lectures that was pertinent to increase the target outcomes (in the control, health, and happiness) as well as psychological approaches and behavioral interventions that may improve these outcomes. In both the climate change and control activity, students discussed strategies with their classmates to address climate change or campus wellness, respectively (approximately 3 min). The groups did not share their ideas with the larger class in either activity.

Dependent Measures. The same outcome measures were assessed as in the 2019 samples in Study 1. These included the measures of students' beliefs in their ability to have a personal impact on climate change, to impact others regarding climate change, intentions to adopt specific behaviors to address climate change (e.g., eating a sustainable diet, etc.), intentions to take political and social actions to address climate change, and belief that psychology is helpful in addressing problems like climate change. As in Study 1, participants were given an opportunity to sign up for the mailing list of two climate change mitigation organizations. As in Study 1, we also included specificity items that asked how efficacious students felt about the ability to save money and whether they intended to save money in the near future.

Results

To assess if the changes from pre- to post-activity were larger in the climate change activity than the control, we tested the interaction of condition and pre- or post-activity for each outcome measure in a mixed model regression, with a random intercept clustering data by each participant.[2] The condition means and differences in the pre- and post-activity effects between conditions for every survey outcome can be found in Table 2.

Belief in Ability to Have a Personal and Social Impact. Students who experienced climate activity had a larger increase in their sense of being able to impact others regarding climate change than students in the control activity. They also showed a larger increase in their sense of being able to have an impact on climate change than students in the control activity.

Personal, Political, and Social Action Intentions. Students who experienced the climate activity had greater intentions to engage in sustainable behaviors than students in the control activity. They also had greater intentions to engage in political actions to help mitigate climate change than students in the control activity.

Belief That Psychology is Helpful. Students who experienced the climate activity had greater increases in their belief that psychology was useful to addressing contemporary problems like climate change than students in the control activity.

Information Seeking Behavior. Comparing the two activities in a between-subjects analysis, we find a significant difference in the proportion of students who chose to sign up for an email list for a political organization focused on mitigating climate change, $\chi^2 = 4.74$ (1, $N = 419$), $p = .029$. Specifically, those who experienced the climate activity were more likely to sign up (19%) compared to those who experienced the control activity (11%).

Specificity Items: Financial Efficacy and Intentions. Students in the climate activity did not differ from those in the control activity in their levels of change on financial efficacy or their financial intentions.

Discussion

Across four trials in Study 1, students felt more empowered to address the problem of climate change after a brief class activity where they reviewed pertinent psychological theory and research, including social influence, and applied their knowledge to strategies to mitigate climate change. Specifically, students experienced a substantial increase in their belief that their personal sustainable actions matter when it comes to mitigating climate change and can inspire others to follow suit. After the activity, students also strengthened their intentions to engage in sustainable behaviors and political activities to help mitigate climate change. Indeed, when given the chance, several students signed up to the email list for a climate change mitigation activist organization sometime after the activity. More broadly, students increased their belief that psychology was important in addressing major social problems like climate change after the activity.

Additional specificity measures help rule out possible seasonal effects and improve our confidence in attributing the above benefits to participating in the class activity. Specifically, we observed no equivalent consistent shift in students' beliefs about efficacy in a theoretically irrelevant domain to the class activity: their personal finances. Thus, students did not appear to (coincidentally) become more self-efficacious generally during the same time as the activity. This inference is bolstered by Study 2, where we found that effects were greater in a classroom with this activity than in a classroom with a control activity that applied psychological concepts to campus well-being and was tested at the same time.

Limitations and Future Directions

Taken together, the present findings support the potential for introductory psychology to change how students think about important real-world problems like climate change, and specifically to empower them to use their knowledge of psychology to address them. There are several limitations of the present study, however, that we hope will guide additional research. First, although the specificity measures in Study 1 and the control group in Study 2 help rule out alternative explanations, a randomized control trial of this activity (where individual students were randomized to condition) would be ideal to further strengthen the causal attribution between the class activity and the resulting effects. However, it is possible the activity works best as completed by an entire classroom, making randomization more difficult in an academic setting. Future researchers may consider ways to overcome this challenge, possibly by scaling up the design of Study 2 and randomizing many classrooms to this type of activity.

The present research primarily focuses on whether students feel empowered because of this activity, while providing some evidence of shifts in intentions, and preliminary evidence of behavior changes (information seeking). Future research may wish to complement the effects demonstrated here by assessing more behavioral outcomes and assessment effects over a longer period. For example, did students change any of their actual behaviors related to climate change, such as their diet or energy use, after experiencing the class activity, and did these behaviors, as well as feelings of empowerment, linger over the weeks or months that followed?

Future research might focus on identifying the specific ingredients that make the classroom activity efficacious. For instance, much of the benefit of the classroom activity we tested may come from emphasizing the importance of climate change as an important problem. While we doubt that emphasizing climate change is enough to make students feel empowered to act and specifically boost their sense that they can influence others as we observed, future studies might test other control learning activities to rule out that possibility. The activity also contained a recap of many psychological theories, spanning from attention, memory, emotion, and social influence

domains, and these theories were all directly connected to the threat of climate change in the activity. Whether any or all these concepts are most responsible for the observed effects is a question for future research. Given that climate change is a collective action problem, we suspect that concepts related to social influence are critical in driving the present effects. Social influence research can help students see their own beliefs and actions as connected to the beliefs and actions of others, and thus capable of mobilizing change across a larger social network.

If this type of activity were used in introductory psychology courses, it would be important to periodically update the research discussed in the activity to maintain relevance to ongoing social and environmental issues and increase students' exposure to new theories. Learning about novel and up-and-coming psychological approaches to address climate change might especially empower students to address this existential threat. For example, students may benefit from learning about how we generally underestimate how concerned others in society are about climate change (Sparkman, Geiger, & Weber, 2022; Sparkman et al., 2022) or how one can effectively counter misinformation campaigns related to climate change (Maertens et al., 2020). Furthermore, global polling shows that climate anxiety is a growing clinical concern, especially among youth (Long, 2021). Research in this field illustrates the growing impact of climate change on mental health, and approaches to address this rising concern (Clayton et al., 2021). This research is clearly relevant to the intersection of climate change and psychology and including it would help keep the material covered up to date. Further, while the activity discussed in the present research was not designed to address climate anxiety per se, it was designed to help students feel empowered more generally. Future research could make a valuable contribution by investigating if activities like the one designed here can help address climate anxiety among students.

Finally, while the present research examined a classroom activity focused on climate change, future research could assess benefits of similar activities addressing other specific large-scale social problems. For example, future classroom activities might be designed to address different problems such as social justice, voting, or healthcare behaviors (e.g., vaccinations). Future work might also examine how feelings of empowerment regarding a specific social issue might generalize to others that were not addressed in class. The present findings suggest that the benefits of the classroom activity may be quite narrow. Findings from Studies 1 and 2 suggest that reviewing and applying concepts to a specific problem of climate change influenced students' beliefs and intentions related to climate change but did not make students feel broadly empowered in other domains such as personal finance. In Study 2, we found that a control learning activity focused on improving campus well-being had significantly less or no effect on students' beliefs or intentions related to the domain of climate change. Although these findings support the efficacy of the classroom activity, they may be discouraging to instructors who wish to broadly empower students to address important problems in the world. Future studies might examine whether the class activity could be modified to inspire broader feelings of empowerment, such as by reviewing and applying concepts to a broader collection of problems, or by asking students to reflect on how they could approach other problems, besides climate change, using a similar approach.

Conclusion

Having students connect introductory psychology topics, like social influence, to solving climate change leads students to feel more empowered to address this global challenge, to presume their actions can help shift society in a more sustainable direction and increase their intentions and take preliminary steps to engage in personal and political climate actions. This activity serves as a concrete example that helps illustrate to students the value of psychology in addressing contemporary societal problems. This activity could readily be scaled up to thousands of undergraduate psychology courses taught around the world every year, reaching a massive number of people and helping connect psychology to a major issue of our time.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

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Open Practices

For publishing their materials and data, Sparkman et al. received badges for open materials and open data. The public content may be retrieved from https://osf.io/wth43/.

Notes

1. Note that, while attrition differs by condition χ^2 $(1, N = 473) = 4.36$, $p = .037$, the attrition pattern observed would not be consistent with participants dropping out of the experimental condition in higher numbers, making self-selection bias an unlikely factor in explaining possible effects (i.e., if effects were driven by those who disliked the climate activity dropping out of the intervention condition at higher numbers, then University B should have larger attrition, which is not what is found).
2. Students with some missing data were included in the analyses as mixed models are robust to missing data for outcome measures.

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