Supplementary Information

Additional information about C-ROADS and *World Climate*

C-ROADS is a member of the family of simple climate models (SCMs), consisting of a system of differential equations representing the carbon cycle, budgets and stocks of greenhouse gases (GHGs, including CO_2, CH_4, N_2O, SF_6, PFCs, CFCs, HFCs, aerosols and black carbon), radiative forcing and the heat balance of the Earth and a 5-layer ocean. The carbon cycle includes compartments for stocks of carbon in the atmosphere, biosphere, soils, and the 5-layer ocean. Users select pathways for the CO_2 and other GHG emissions of each region or bloc of nations. The model can be set up to provide emissions inputs for one, three, six, or fifteen different nations and blocs of nations, collectively adding up to global emissions. Fig S1 shows screenshots of the C-ROADS[1,2] user interface for *World Climate*. Users enter emissions pathways for the nation or bloc they represent (Fig S1A) and can adjust assumptions about climate sensitivity, CO_2 fertilization feedbacks, Arctic methane emissions, and other parameters, so that they can examine the sensitivity of results to uncertainty in these parameters and are not compelled to accept the default values (Fig. S1B). C-ROADS is fully documented; the model and documentation are freely available at https://www.climateinteractive.org.

Fig. S2 shows an overview of the sequence of a *World Climate* session. The workshop begins with a brief (~15-30 minutes) introduction, followed by the role play of the negotiation, with each delegation presenting their emissions pledges (Nationally Determined Contributions, or NDC) to the entire group, and simulation of the impact of the NDCs using C-ROADS. The impacts of the proposals emerging from C-ROADS are discussed, including changes in GHG concentrations, mean global surface temperature increase, ocean acidification, and sea level rise. In our experience, the collective impact of the first round NDCs almost always fall short of the emissions reductions required to limit expected warming to 2°C (they are often qualitatively similar to the actual NDCs that emerged from the Paris Agreement, leading to warming of approximately 3-4°C by 2100). Faced with these results, participants ask many questions about the structure and dynamics of the climate system to understand the simulation results and why

they differ from their expectations (as they often do). Participants then enter a second (and, if time allows, third) round of negotiation, each followed by simulation of the new proposals. The role-play concludes with a general debriefing conversation in which learners are actively engaged with each other and with the computer model. The active engagement of participants is evident from their responses to the simulation (Fig. 3A), and from the pictures of *World Climate* sessions from a diverse range of educational settings (Fig. S3). A short video showing excerpts from a World Climate session is available at https://www.youtube.com/watch?v=afO3lDX37tQ.

Theoretical basis of the learning model

Synergies between analytic and affective processing ("Knowledge" and "Affect" in Fig. 1) have been described in both the climate change psychology and educational literature. For example, Shi et al.[3] found that knowledge about the causes and impacts of climate change were positively correlated with concern, an affective response. Similarly, van der Linden et al. found a bidirectional, reinforcing relationship between climate change knowledge and affect[4].

Observation of participants in World Climate and their open-ended responses in the post-experience surveys support the learning model shown in Figure 1. Specifically, the qualitative data suggested synergies between gains in participants' climate change knowledge and affect that, in turn, led to gains in their desire to learn more and their intent to take action. To illustrate, below we present a sample of open-ended responses from a *World Climate* session included in the sample analyzed in this study (Table 1). Note that the participants, all ≈120 members of the MIT Executive MBA class of 2017, were required to participate in *World Climate* as part of the curriculum, ruling out concerns about self-selection bias. In response to the question, "How has participating in the *World Climate* exercise affected your understanding of climate change, if at all?" participants assessed their gains in knowledge:

> *"Just the knowledge and understanding and see[ing] the results in the model was enlightening."*
>
> *"It changed my mental model dramatically."*

"It gave me a better understanding of the extent of commitments (of GHG reductions) needed by each country/delegation in order to stabilize climate."

"I had a very vague idea before the exercise, and I have a much better understanding of the causes and consequences of the climate change now."

"Have a much better understanding of stock / flows of C02."

Similarly, gains in affective engagement (and, in some cases, their link to knowledge) were evident in many comments, e.g.:

"I understand the science of global warming more. I have a far greater understanding of how urgent it is that we act."

"The simulation brought out the urgency of this climate change impact, ie [sic] irreparable consequences if actions are not launched NOW."

Responses also suggest that gains in affect and knowledge led to both intent to act and desire to learn more. In responses to the question, "Has participating in World Climate affected how motivated you are to address climate change? If so, what do you plan to do?"

"I am much more worried and aware and willing to take action. Everyone can make an impact."

"Stronger desire to learn more and have the tools to change my peers' minds."

" I want to learn how to administer the exercise/simulation myself, I want my company to get involved, I want to reduce my own carbon footprint."

These responses are consistent with our hypothesis that gains in knowledge and affect lead to gains in intent to act on climate change and desire to learn more about it (Figure 1). The construct 'intent to act' includes four types of potential future actions captured in the post-survey, including reducing one's personal carbon footprint, discussing climate change with family and friends, discussing climate change with peers, and taking political action (questions 12A-D Post-Survey). The construct 'Desire to learn more' was assessed by five questions: climate change science, solutions, politics, economics, and energy policies (questions 14A-E, Post-Survey). The deficit model of science communication[5] suggests that gains in knowledge are directly linked to behavior change – i.e., if only people were presented with and understood the relevant information, their actions would be guided by that information. The deficit model is represented in the learning model (Fig. 1) by the link from Knowledge to Intent to Act and from

Knowledge to Desire to Learn. In contrast with the deficit model, a large and growing body of climate change psychology research has pointed to the importance of affect in risk perception and action (represented in Fig. 1 by the links from affect to intent to take action and desire to learn more). For example, worry, interest, and hope were more strongly associated with support for climate change policy than sociodemographic variables or cultural worldviews in a recent nationally representative survey in the U.S.[6]. Similarly, Leiserowitz et al.[7] found affect to be a strong predictor of climate change risk perception. Note that affect can either stimulate or hinder action, and affective responses to climate change information are often a barrier to learning, especially if that information threatens worldviews or cultural norms. For example, focusing on fear and the adverse impacts of climate change may cause those with 'just world' beliefs, i.e., that people get what they deserve and that justice prevails over injustice, to reject information about climate change[8]. Concerns that fearful messages about climate change may actually reduce risk perception and action have led to calls to avoid those messages and take a hopeful, solutions-oriented approach to climate change communication[8].

Survey instruments and data collection.

The pre- and post-survey instruments consisted of established items used in prior work[9] and new or modified items designed to measure constructs in our learning model not addressed in prior surveys. New items include questions about climate change impacts, reactions to the *World Climate* experience and the item addressing understanding of the relationship between the flux of CO_2 emissions and stock of atmospheric CO_2, which was based on Sterman and Booth Sweeney[10]). The item (Q20 and Q23 on the pre- and post-surveys, respectively) soliciting participants' perceived socioeconomic status was adapted from Goodman et al.[11,12]. Semantic differential scales[13], asking respondents to identify their affective response to climate change using bipolar emotions (e.g., hopeless to hopeful; not guilty to guilty; indifferent to engaged; etc.) were used to determine pre- to post-*World Climate* shifts in affect. All survey questions were tested by soliciting feedback from five educators using *World Climate*, two educational psychologists, and 10 undergraduate students who had not participated in the exercise. Pre- and post-surveys were matched using anonymous identifiers. The full pre- and post-surveys are provided below. The UMass Lowell Institutional Review Board reviewed and approved of our experimental approach (Protocol number 16-049-ROO-XPD.)

Testing for potential selection bias

As discussed in the main paper, survey completion was voluntary and about half of the participants included in our study (180 out of 364) had either voluntarily chosen to participate in a climate change-related event or participated in *World Climate* as part of a climate change- or sustainability-related course, suggesting they were already engaged with this issue. In addition. Therefore, there was a possibility of self-selection and response bias; specifically, it is possible that participants who chose to complete the surveys could have been those with the strongest prior beliefs about climate change or reactions to *World Climate*, either positive or negative. These issues raise the question of the external validity of the results, or their applicability to a broader population.

There was substantial variation in the proportion of participants who provided usable survey data across the different *World Climate* sessions in our sample. (We defined usable cases as those with both pre- and post-survey responses for >80% of the items included in our analyses, matched pre- and post-survey anonymous identifiers, and participants reporting no prior experience with *World Climate* in their pre-surveys; see Table 1.)

We addressed the following questions to test for selection bias:

1. Did participants who provided only pre-survey responses differ from those who completed both the pre- and post-surveys?

2. Do the regression analyses results differ if all sessions are included, as opposed to eliminating those sessions with very low rates of post-survey completion (specifically, those with less than 30% of participants providing usable data as defined above)?

3. Is the proportion of usable cases in each session a significant predictor of learning outcomes? If there is self-selection or non-response bias then the impact of World Climate would differ in sessions with high response rates compared to low rates.

4. Are there significant differences between responses from sessions with high vs. low response rates?

Question 1 was addressed by comparing means of sociodemographic factors and constructs for participants who only provided pre-survey responses to those who provided usable cases across sessions with at least 30% usable cases out of total participants (Table S5A) and across all sessions (Table S5B). In the former (>30% usable cases), the only statistically significant difference between participants who provided usable cases and those who did not was that the usable case group was more likely to be in a post-secondary educational setting (rather than secondary school) (Table S5.A). However, when all sessions were included, differences were found across one of the constructs (pre-survey Knowledge of Impacts) and across several session-level and sociodemographic variables (Table S5.B). Therefore, regression analyses were conducted with both the full set of sessions and again with only those sessions with >30% usable cases (addressing question 2, above). While reducing the dataset by eliminating sessions lowers statistical power in some relationships, overall, the results shown in Fig. 2 were not changed by including or eliminating sessions with <30% usable cases (Tables S6-7). We present results from both sets of regression analyses here, but chose to focus on the larger dataset for results presented in the paper (e.g., Table 2; Fig. 2-3). Together, these results support the conclusion that response bias did not have substantive influence on our findings.

Question 3 was addressed with two approaches: (a) by using the percent of usable cases in a given session as a covariate in regression analyses (Tables S3-S4), and (b) carrying out a median split of the sample by fraction of usable cases, then comparing the means of pre, post, and pre – post gains in constructs and learning outcome items from sessions with low vs. high rates of usable cases. For (a), the percentage of usable cases was not statistically significant predictor in any regression that included it (Tables S3-S4). For (b), out of 18 t-tests comparing outcomes from 'low' and 'high' sessions, only two differences were statistically significance (Table S8). Lastly, there were robust pre- to post-gains in all constructs and outcomes no matter which subset of sessions were included (e.g., all sessions, or sessions with only >30% or >47% usable

cases). The results of all tests provide essentially no evidence of response bias among participants, although we note that we are not able to test for all forms of self-selection or response bias, specifically selection effects arising from the fact that participation in most of the workshops was voluntary.

Ceiling effects

As mentioned above, about half of the respondents included in our full analysis (i.e., 180 out of 364) had selected to take a course or workshop whose climate change and/or sustainability content was made explicit and were therefore likely to have relatively high levels of climate change knowledge and issue engagement prior to *World Climate* compared to the broader population. For example, among our respondents who provided usable cases from sessions in the US (N = 249), before *World Climate* 89% were somewhat (45%) or very worried (43%) about climate change, while only 74% of Americans are somewhat (58%) or very (16%) worried[32]. While statistically significant gains were observed in all areas examined (Table 2), high pre-survey levels of affect, knowledge, and motivation likely impeded our ability to detect the full range of treatment effects due to ceiling effects. Despite this, 96% of post-survey respondents said that their motivation to address climate change either increased a lot (42%), a little (39%), or stayed high (15%) (Fig. 3). Similarly, 87% (N=363) agreed that the experience increased their sense of urgency to take action against climate change and that they wanted to learn more about leading or affecting change in the area of climate change (with 59% strongly agreeing). Large majorities (78-90%, N=362) also reported that they were more interested in learning about climate change science, solutions, politics, economics, and energy policy as a result of participating (Fig. 3).

References

1 Sterman, J. *et al.* Climate Interactive: The C-ROADS Climate Policy Model. *System Dynamics Review*, doi:DOI: 10.1002/sdr.1474 (2012).

2 Sterman, J. *et al.* Management flight simulators to support climate negotiations. *Environ. Model. Softw.* **44**, 122-135, doi:10.1016/j.envsoft.2012.06.004 (2013).

3 Shi, J., Visschers, V. H. M., Siegrist, M. & Arvai, J. Knowledge as a driver of public perceptions about climate change reassessed. *Nature Clim. Change* **6**, 759-762, doi:10.1038/nclimate2997

http://www.nature.com/nclimate/journal/v6/n8/abs/nclimate2997.html - supplementary-information (2016).
4 van der Linden, S. On the relationship between personal experience, affect and risk perception:The case of climate change. *European Journal of Social Psychology* **44**, 430-440, doi:10.1002/ejsp.2008 (2014).
5 Pearce, W., Brown, B., Nerlich, B. & Koteyko, N. Communicating climate change: conduits, content, and consensus. *Wiley Interdisciplinary Reviews: Climate Change* **6**, 613-626, doi:10.1002/wcc.366 (2015).
6 Smith, N. & Leiserowitz, A. The role of emotion in global warming policy support and opposition. *Risk analysis : an official publication of the Society for Risk Analysis* **34**, 937-948, doi:10.1111/risa.12140 (2014).
7 Leiserowitz, A. Climate change risk perception and policy preferences: The role of affect, imagery, and values. *Climatic Change* **77**, 45-72 (2006).
8 Feinberg, M. & Willer, R. Apocalypse soon? Dire messages reduce belief in global warming by contradicting just-world beliefs. *Psychological science* **22**, 34-38, doi:10.1177/0956797610391911 (2011).
9 Leiserowitz, A., Smith, N. & Marlon, J. r. American Teens' Knowledge of Climate Change. (Yale University, New Haven, CT, 2011).
10 Sterman, J. D. & Booth Sweeney, L. Understanding public complacency about climate change: Adults' mental models of climate change violate conservation of matter. *Climatic Change* **80**, 213-238 (2007).
11 Goodman, E. *et al.* Adolescents' perceptions of social status: development and evaluation of a new indicator. *Pediatrics* **108**, e31-e31 (2001).
12 Goodman, E., Maxwell, S., Malspeis, S. & Adler, N. Developmental trajectories of subjective social status. *Pediatrics* **136**, e633-e640 (2015).
13 Osgood, E., Suci, G. & Tannenbaum, P. *The Measurement of Meaning*. (University of Illinois, 1957).

Table S1. Exploratory factor analysis results for all sessions.

Model Sector	*Items in FA*	*Items included in scale*	*Construct*	*Component*	*Eigenvalue*	*Cumulative % variance*	*Alpha*	*N*
Affect	Q9, Q10A-G, Q11	Q9, Q10C-G, Q11	Urgency	1	3.887	43.194	0.854	658
		10A-B	Hope	2	1.721	62.315		
Knowledge	Q2, Q3, Q4, Q5A-O	Q5A, 5E, 5F, 5H, 5K, 5N	Impacts	1	3.439	38.215	0.779	630
		Q2, Q3	Cause	2	1.023	49.578		
		[Q8]	Stock-Flow					
Intent	Q12A-D	Q12A-D	Intent	1	2.649	66.213	0.719	818
Desire to Learn	Post-Q14A-E	Post -Q14A-E	Learn	1	2.491	49.825	0.743	361

Table S2. Survey items with loading factors used for constructs

Model component	*Construct*	*Actual Q#*	*Loading values*	*Question*
Affect	Urgency	Q9	0.817	How worried are you about climate change?
		Q10C	0.678	Feelings about climate change - Indifferent to engaged
		Q10D	0.575	Feelings about climate change - Not guilty to guilty
		Q10E	0.717	Feelings about climate change - Calm to outraged/angry
		Q10F	0.812	Feelings about climate change - Unconcerned to alarmed
		Q10G	0.766	Feelings about climate change - Not afraid to very afraid
		Q11	0.805	How important is the issue of climate change to you personally?
	Hope	Q10A	0.851	Feelings about climate change - Hopeless to Hopeful
		Q10B	0.869	Feelings about climate change - Discouraged to Empowered
Knowledge	Impacts	Q5A	0.621	Impacts of climate change - Increased temperatures globally
		Q5E	0.674	Impacts of climate change - An overall decrease in clean, potable water globally
		Q5F	0.76	Impacts of climate change - Increased incidence and intensity of heat waves
		Q5H	0.754	Impacts of climate change - Increased rates of extinction of plant and animal species
		Q5K	0.627	Impacts of climate change - Increased global sea level
		Q5N	0.754	Impacts of climate change - Increased intensity of storms across many regions
	Cause	Q3	0.77	Do you think that climate change is happening?
		Q4	0.77	Cause of climate change
Action	Action	Q12A	0.688	Likelihood - Take action to reduce your personal carbon footprint
		Q12B	0.895	Likelihood - Discuss climate change with your family and friends
		Q12C	0.886	Likelihood - Discuss climate change with your peers
		Q12D	0.768	Likelihood - Take some form of political action in support of climate change policy
Desire to Learn	Learn	Post-Q14A	0.681	Effect on desire to learn - The science of climate change
		Post-Q14B	0.681	Effect on desire to learn - Potential solutions for mitigating the effects of climate change
		Post-Q14C	0.73	Effect on desire to learn - Politics as it relates to climate change
		Post-Q14D	0.681	Effect on desire to learn - Economics as it relates to climate change
		Post-Q14E	0.753	Effect on desire to learn - Energy policies

Table S3. Analysis US-based participants who opposed government regulation of free markets.

a. Comparison of pre- and post-survey means and paired t-tests for constructs reflecting climate change affect ('Urgency,' and 'Hope'), knowledge ('Impacts,' 'Cause', 'Stock-flow task'), and intent to take action ('Intent') for participants in the US who were somewhat or strongly opposed when asked, "To what extent are you in favor of the government placing regulations on the free market?" Scales for each item were weighted based on loading values from factor analysis (Tables S1-S2) and normalized to 1.

	Pre-mean	***Post mean***	***Post-Pre***	***Pre-SD***	***Post-SD***	***N***	***T***	***df***	***p-value***	***ES***
Urgency construct	0.70	0.80	0.09	0.13	0.12	78	7.708	77	0.000	0.73
Hope construct	0.62	0.66	0.04	0.17	0.21	82	1.724	81	0.089	0.20
Impacts construct	0.90	0.97	0.07	0.12	0.08	78	4.699	77	0.000	0.67
Cause	0.72	0.90	0.18	0.45	0.30	82	3.698	81	0.000	0.48
Stock-flow task	0.37	0.59	0.22	0.49	0.50	78	3.500	77	0.001	0.45
Intent construct	0.84	0.89	0.05	0.17	0.18	80	2.980	79	0.004	0.29

b. Comparison of means and t-tests for US-based participants who were somewhat or strongly in favor of ("favor") to those somewhat or strongly opposed to ("opposed") government regulation of free markets for pre-, post-, and gains in each construct. Scales for each item were weighted based on loading values from factor analysis (Tables S1-S2) and normalized to 1.

	Favor Mean	*Opposed Mean*	*Favor SD*	*Opposed SD*	*Favor N*	*Opposed N*	*T*	*df*	*p-value*
Pre-Urgency	0.755	0.708	0.155	0.129	117	76	2.256	130	**0.025**
Pre-Hope	0.585	0.620	0.180	0.166	118	79	-1.409	176	0.160
Pre-Knowledge: Impacts	0.905	0.897	0.160	0.122	194	78	0.378	180	0.706
Pre-Knowledge: Cause	0.797	0.722	0.404	0.451	118	79	1.193	155	0.235
Pre-Knowledge: Stock-Flow	0.440	0.370	0.499	0.486	100	76	0.957	164	0.340
Pre-Intent	0.861	0.841	0.155	0.174	117	78	0.843	152	0.401
Post-Urgency	0.813	0.798	0.129	0.126	114	75	0.751	161	0.454
Post-Hope	0.629	0.656	0.223	0.213	118	79	-0.846	172	0.399
Post-Knowledge: Impacts	0.942	0.968	0.111	0.081	112	76	-1.843	185	0.067
Post-Knowledge: Cause	0.907	0.911	0.292	0.286	118	79	-0.110	170	0.913
Post-Knowledge: Stock-Flow	0.590	0.580	0.495	0.496	102	77	0.051	164	0.959
Post-Intent	0.900	0.890	0.150	0.186	116	78	0.377	141	0.707
Desire to Learn More	0.933	0.925	0.089	0.130	118	79	0.497	126	0.620
Gain in Urgency	0.057	0.092	0.110	0.106	113	75	-2.174	162	**0.031**
Gain in Hope	0.044	0.036	0.171	0.203	118	79	0.306	148	0.760
Gain in Knowledge: Impacts	0.042	0.069	0.132	0.132	102	76	-1.352	162	0.178
Gain in Knowledge: Cause	0.110	0.190	0.314	0.455	118	79	-1.355	127	0.178
Gain in Knowledge: Stock-flow	0.206	0.125	0.475	0.428	80	16	0.680	23	0.503
Gain in Intent	0.039	0.049	0.132	0.158	115	77	-0.416	142	0.678

Table S4A. Model parameter estimates for linear regression for Urgency gains with all sessions included in the analysis. *P*-values ≤ 0.05 are in bold.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		**0.002**		**0.003**		**0.003**		**0.004**		**0.006**
Gain in Knowledge: Impacts	0.34	**0.000**	0.346	**0.000**	0.32	**0.001**	0.32	**0.001**	0.32	**0.001**
Gain in Knowledge: Cause	0.05	0.565	0.051	0.595	0.06	0.527	0.03	0.793	0.04	0.723
Gain in Knowledge: Stock-Flow	0.10	0.176	0.121	0.122	0.10	0.174	0.13	0.106	0.14	0.105
Pre-Urgency	-0.53	**0.000**	-0.520	**0.000**	-0.53	**0.000**	-0.54	**0.000**	-0.55	**0.000**
Pre-Knowledge: Impacts	0.17	0.069	0.173	0.072	0.16	0.093	0.17	0.071	0.18	0.065
Pre-Knowledge: Cause	0.05	0.631	0.051	0.600	0.05	0.575	0.03	0.763	0.05	0.652
Pre-Knowledge: Stock-Flow	0.03	0.673	0.044	0.573	0.02	0.756	0.04	0.645	0.04	0.591
Percent usable cases			-0.106	0.252					-0.08	0.419
Facilitated by our team			-0.010	0.902					0.01	0.914
Educational Setting (Higher Ed or Secondary)			0.030	0.734					-0.02	0.911
Country type (Developed or Developing)			0.063	0.470					0.00	0.979
Gender					-0.06	0.325			-0.06	0.397
Age					0.06	0.379	0.18	0.066	0.17	0.175
Education of Parents									-0.02	0.748
Education of Self							-0.18	0.088	-0.13	0.505
Science Major							0.10	0.204	0.10	0.232
Perceived socioeconomic status							-0.09	0.195	-0.10	0.187
Favor regulation of free market							0.02	0.788	0.02	0.770
R^2		0.385		0.393		0.393		0.405		0.414
ANOVA F		13.595		8.705		10.775		8.353		5.527
p-value		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
df regression		7		11		9		12		18
df residual		152		148		150		147		141
df Total		159		159		159		159		159

Table S4B. Model parameter estimates for linear regression for Hope gains with all sessions included in the analysis. *P*-values ≤ 0.05 are in bold.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		0.094		0.118		0.140		0.146		0.091
Gain in Knowledge: Impacts	-0.03	0.805	-0.031	0.775	-0.04	0.709	-0.04	0.701	-0.04	0.728
Gain in Knowledge: Cause	0.10	0.371	0.134	0.239	0.10	0.369	0.13	0.276	0.15	0.216
Gain in Knowledge: Stock-Flow	0.01	0.917	-0.033	0.729	0.02	0.866	-0.04	0.713	-0.04	0.731
Pre-Hope	-0.32	**0.000**	-0.352	**0.000**	-0.32	**0.000**	-0.36	**0.000**	-0.38	**0.000**
Pre-Knowledge: Impacts	-0.02	0.831	-0.027	0.801	-0.03	0.752	-0.04	0.709	-0.04	0.756
Pre-Knowledge: Cause	0.05	0.635	0.081	0.478	0.06	0.617	0.08	0.475	0.10	0.417
Pre-Knowledge: Stock-Flow	-0.01	0.901	-0.050	0.591	-0.01	0.874	-0.04	0.678	-0.04	0.696
Percent usable cases			-0.153	0.163					-0.14	0.223
Facilitated by our team			0.136	0.177					0.16	0.142
Educational Setting (Higher Ed or Secondary)			0.145	0.176					0.10	0.582
Country type (Developed or Developing)			0.037	0.714					0.07	0.537
Gender					0.02	0.811			0.00	0.959
Age					0.05	0.496	-0.02	0.902	0.04	0.800
Education of Parents									-0.10	0.236
Education of Self							0.10	0.419	-0.04	0.883
Science Major							0.08	0.383	0.06	0.522
Perceived socioeconomic status							0.06	0.466	0.04	0.629
Favor regulation of free market							-0.04	0.662	-0.02	0.789
R^2		0.104		0.142		0.107		0.129		0.159
ANOVA F		2.533		2.226		2.007		1.814		1.481
p-value		**0.017**		**0.016**		**0.042**		0.051		0.105
df Regression		7		11		9		12		18
df Residual		152		148		150		147		141
df Total		159		159		159		159		159

Table S4C. Model parameter estimates for linear regression for gains in knowledge about impacts with all sessions included in the analysis. *P*-values < 0.05 are in bold.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
Gain in Affect: Urgency	0.32	**0.000**	0.315	**0.000**	0.31	**0.000**	0.31	**0.000**	0.30	**0.000**
Gain in Affect: Hope	-0.02	0.635	-0.023	0.623	-0.03	0.541	-0.03	0.479	-0.03	0.591
Pre-Knowledge: Impacts	-0.63	**0.000**	-0.651	**0.000**	-0.64	**0.000**	-0.64	**0.000**	-0.66	**0.000**
Pre-Urgency	0.20	**0.001**	0.209	**0.000**	0.20	**0.000**	0.20	**0.000**	0.21	**0.000**
Pre-Hope	-0.05	0.300	-0.025	0.601	-0.06	0.242	-0.06	0.231	-0.04	0.480
Percent usable cases			0.093	0.141					0.11	0.091
Facilitated by our team			0.089	0.115					0.10	0.095
Educational Setting (Higher Ed or Secondary)			0.000	0.997					-0.06	0.596
Country type (Developed or Developing)			0.084	0.149					0.03	0.623
Gender					0.02	0.647			0.01	0.756
Age					0.12	**0.008**	0.08	0.221	0.13	0.115
Education of Parents									0.04	0.390
Education of Self							0.04	0.539	-0.04	0.752
Science Major							0.01	0.878	0.02	0.751
Perceived socioeconomic status							-0.02	0.746	0.02	0.662
Favor regulation of free market							-0.05	0.300	-0.04	0.358
R^2		0.471		0.502		0.485		0.489		0.512
ANOVA F		47.307		29.294		35.478		24.935		16.731
p-value		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
df regression		5		9		7		10		16
df residual		266		262		264		261		255
df Total		271		271		271		271		271

Table S4D. Model parameter estimates for linear regression for gains in knowledge about cause with all sessions included in the analysis. *P*-values < 0.05 are in bold.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		**0.014**		**0.021**		0.078		**0.025**		0.624
Gain in Affect: Urgency	0.12	**0.015**	0.119	**0.013**	0.12	**0.019**	0.10	0.054	0.11	**0.037**
Gain in Affect: Hope	0.04	0.324	0.058	0.180	0.04	0.359	0.05	0.254	0.06	0.163
Pre-Knowledge: Cause	-0.71	**0.000**	-0.710	**0.000**	-0.71	**0.000**	-0.70	**0.000**	-0.71	**0.000**
Pre-Urgency	0.11	**0.031**	0.106	**0.036**	0.11	**0.031**	0.09	0.081	0.11	**0.048**
Pre-Hope	0.04	0.400	0.045	0.303	0.03	0.498	0.05	0.328	0.05	0.301
Percent usable cases			0.086	0.139					0.10	0.111
Facilitated by our team			-0.090	0.082					-0.04	0.457
Educational Setting (Higher Ed or Secondary)			-0.030	0.588					0.14	0.150
Country type (Developed or Developing)			-0.036	0.504					-0.09	0.163
Gender					0.03	0.464			0.03	0.491
Age					0.02	0.627	0.13	**0.033**	0.20	**0.008**
Education of Parents									0.11	**0.022**
Education of Self							-0.17	**0.012**	-0.35	**0.004**
Science Major							0.05	0.329	0.02	0.690
Perceived socioeconomic status							-0.04	0.385	-0.03	0.484
Favor regulation of free market							0.03	0.574	0.01	0.768
R^2		0.496		0.503		0.497		0.508		0.528
ANOVA F		61.328		34.682		41.627		29.214		19.356
p-value		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
df regression		5		9		7		10		16
df residual		312		308		295		283		277
df Total		317		317		302		293		293

Table S4F. Model parameter estimates for linear regression for intent to take action with all sessions included in the analysis. *P*-values ≤ 0.05 are in bold.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		0.264		**0.037**		0.119		0.382		0.194
Gain in Urgency	0.38	**0.000**	0.377	**0.000**	0.39	**0.000**	0.41	**0.000**	0.42	**0.000**
Gain in Hope	0.20	**0.008**	0.174	**0.028**	0.22	**0.006**	0.23	**0.015**	0.17	0.084
Gain in Knowledge: Impacts	0.09	0.315	0.101	0.263	0.09	0.329	-0.03	0.795	-0.03	0.757
Gain in Knowledge: Cause	-0.13	0.243	-0.115	0.305	-0.12	0.319	-0.03	0.831	-0.03	0.852
Gain in Knowledge: Stock-Flow	0.12	0.155	0.054	0.541	0.10	0.259	0.20	0.050	0.19	0.072
Pre-Action	-0.54	**0.000**	-0.537	**0.000**	-0.57	**0.000**	-0.69	**0.000**	-0.66	**0.000**
Pre-Urgency	0.28	**0.013**	0.346	**0.002**	0.31	**0.008**	0.40	**0.003**	0.46	**0.001**
Pre-Hope	0.13	0.096	0.117	0.157	0.10	0.197	0.11	0.282	0.10	0.359
Pre-Knowledge: Impacts	0.21	0.026	0.209	**0.026**	0.22	**0.017**	0.18	0.094	0.18	0.106
Pre-Knowledge: Cause	-0.04	0.703	-0.046	0.679	-0.04	0.725	0.07	0.604	0.06	0.642
Pre-Knowledge: Stock-Flow	0.03	0.693	-0.079	0.362	0.00	0.974	0.17	0.113	0.12	0.266
Percent usable cases			-0.113	0.216					-0.17	0.121
Facilitated by our team			0.043	0.634					0.01	0.948
Educational Setting (Higher Ed or Secondary)			0.285	0.004					0.27	0.122
Country type (Developed or Developing)			0.284	0.003					0.17	0.185
Gender					-0.03	0.680			0.07	0.487
Age					0.15	0.044	0.03	0.815	0.02	0.848
Education of Parents									0.05	0.575
Education of Self							0.07	0.537	-0.01	0.947
Science Major							-0.15	0.159	-0.17	0.117
Perceived socioeconomic status							0.27	**0.005**	0.28	**0.005**
Favor regulation of free market							-0.17	0.077	-0.20	0.050
R^2		0.339		0.399		0.37		0.449		0.485
ANOVA F		6.301		5.81		5.725		4.68		3.685
p-value		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
df Regression		11		15		13		16		22
df Residual		135		131		127		92		86
df Total		146		146		140		108		108

Table S4E. Model parameter estimates for linear regression for gains in knowledge about emissions trajectory (dynamics of atmospheric CO_2 accumulation) with all sessions included in the analysis.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		0.043		0.539		0.030		0.104		0.682
Gain in Affect: Urgency	0.19	0.012	0.184	0.010	0.19	0.012	0.20	0.006	0.20	0.008
Gain in Affect: Hope	0.00	0.979	-0.030	0.635	0.00	0.979	-0.03	0.596	-0.03	0.660
Pre-Knowledge: Emissions trajectory (PreQ8)	-0.46	0.000	-0.511	0.000	-0.46	0.000	-0.50	0.000	-0.52	0.000
Pre-Urgency	0.06	0.447	0.058	0.414	0.06	0.468	0.04	0.589	0.04	0.550
Pre-Hope	-0.19	0.004	-0.200	0.003	-0.19	0.006	-0.24	0.000	-0.20	0.003
Percent usable cases			0.097	0.258					0.05	0.567
Facilitated by our team			0.140	0.068					0.08	0.342
Educational Setting (Higher Ed or Secondary)			0.102	0.223					0.06	0.699
Country type (Developed or Developing)			0.011	0.886					0.15	0.108
Gender					-0.02	0.737			-0.03	0.644
Age					-0.06	0.344	-0.29	0.001	-0.30	0.007
Education of Parents									0.01	0.927
Education of Self							0.35	0.000	0.26	0.142
Science Major							0.12	0.098	0.13	0.080
Perceived socioeconomic status							0.00	0.962	0.04	0.573
Favor regulation of free market							0.06	0.337	0.07	0.265
R^2		0.279		0.350		0.283		0.380		0.405
ANOVA F		14.525		11.018		10.238		10.653		7.148
p-value		0.000		0.000		0.000		0.000		0.000
df regression		5		9		7		10		16
df residual		188		184		182		174		168
df Total		193		193		189		184		184

Table S4G. Model parameter estimates for linear regression for desire to learn more with all sessions included in the analysis.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
Gain in Urgency	0.33	**0.001**	0.352	**0.000**	0.33	**0.001**	0.34	**0.001**	0.34	**0.001**
Gain in Hope	0.06	0.451	0.022	0.788	0.05	0.503	0.03	0.697	0.02	0.853
Gain in Knowledge: Impacts	0.09	0.433	0.070	0.527	0.06	0.565	0.07	0.516	0.06	0.577
Gain in Knowledge: Cause	-0.06	0.602	-0.026	0.811	-0.06	0.603	-0.03	0.786	-0.05	0.695
Gain in Knowledge: Stock-Flow	0.05	0.580	-0.016	0.862	0.06	0.502	-0.02	0.851	-0.01	0.913
Pre-Urgency	0.38	**0.000**	0.381	**0.000**	0.39	**0.000**	0.36	**0.001**	0.36	**0.001**
Pre-Hope	0.13	0.124	0.071	0.399	0.11	0.178	0.07	0.410	0.05	0.570
Pre-Knowledge: Impacts	0.09	0.403	0.085	0.447	0.07	0.544	0.09	0.437	0.08	0.485
Pre-Knowledge: Cause	0.00	0.978	0.017	0.878	0.00	0.979	0.02	0.832	0.01	0.929
Pre-Knowledge: Stock-Flow	0.11	0.188	0.062	0.493	0.11	0.200	0.05	0.549	0.06	0.511
Percent usable cases			0.007	0.946					0.01	0.905
Facilitated by our team			0.094	0.339					0.13	0.220
Educational Setting (Higher Ed or Secondary)			0.120	0.251					0.12	0.525
Country type (Developed or Developing)			-0.075	0.458					-0.08	0.484
Gender					0.07	0.350			0.06	0.468
Age					0.08	0.286	-0.01	0.949	0.14	0.320
Education of Parents									0.01	0.869
Education of Self							0.14	0.275	-0.14	0.551
Science Major							0.13	0.172	0.09	0.330
Perceived socioeconomic status							0.03	0.701	0.02	0.808
Favor regulation of free market							0.05	0.502	0.05	0.502
R^2		0.171		0.214		0.181		0.207		0.230
ANOVA F		3.604		2.826		2.71		2.504		1.967
p-value		**0.001**		**0.001**		**0.002**		**0.003**		**0.011**
df Regression		10		14		12		15		21
df Residual		149		145		147		144		138
df Total		159		159		159		159		159

Table S5A. Model parameter estimates for linear regression for Urgency gains with analysis limited to sessions with >30% usable cases out of total participants.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		**0.007**		**0.007**		**0.007**		**0.008**	0.10	**0.007**
Gain in Knowledge: Impacts	0.35	**0.000**	0.352	**0.001**	0.34	**0.001**	0.34	**0.001**	0.10	**0.001**
Gain in Knowledge: Cause	0.11	0.265	0.118	0.252	0.12	0.239	0.09	0.358	0.03	0.340
Gain in Knowledge: Stock-Flow	0.11	0.169	0.117	0.173	0.11	0.175	0.13	0.125	0.02	0.133
Pre-Urgency	-0.53	**0.000**	-0.528	**0.000**	-0.54	**0.000**	-0.56	**0.000**	0.06	**0.00**0
Pre-Knowledge: Impacts	0.16	0.111	0.161	0.137	0.16	0.125	0.17	0.102	0.09	0.087
Pre-Knowledge: Cause	0.08	0.426	0.081	0.437	0.09	0.375	0.08	0.460	0.03	0.434
Pre-Knowledge: Stock-Flow	0.07	0.414	0.065	0.448	0.06	0.483	0.07	0.432	0.02	0.448
Percent usable cases			-0.077	0.350					0.07	0.440
Facilitated by our team			-0.022	0.760					0.03	0.816
Educational Setting (Higher Ed or Secondary)			-0.004	0.961					0.04	0.992
Country type (Developed or Developing)			0.060	0.495					0.03	0.974
Gender					-0.08	0.248			0.02	0.335
Age					0.05	0.543	0.21	0.087	0.01	0.114
Education of Parents									0.01	0.801
Education of Self							-0.20	0.098	0.02	0.279
Science Major							0.08	0.314	0.02	0.324
Perceived socioeconomic status							-0.07	0.321	0.00	0.309
Favor regulation of free market							0.00	0.989	0.01	0.983
R^2		0.419		0.424		0.428		0.441		0.451
ANOVA F		12.552		7.913		9.980		7.682		5.072
p-value		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
df regression		7.000		11.000		9.000		12.000		18.000
df residual		122		118		120		117		111
df Total		129		129		129		129		129

Table S5B. Model parameter estimates for linear regression for Hope gains with analysis limited to sessions with >30% usable cases out of total participants.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		0.248		0.579		0.205		0.301		0.272
Gain in Knowledge: Impacts	0.02	0.897	0.002	0.986	0.01	0.916	0.02	0.903	0.02	0.870
Gain in Knowledge: Cause	0.12	0.338	0.146	0.246	0.13	0.323	0.14	0.267	0.17	0.182
Gain in Knowledge: Stock-Flow	-0.06	0.601	-0.098	0.367	-0.06	0.586	-0.12	0.275	-0.15	0.201
Pre-Hope	-0.27	**0.004**	-0.335	**0.001**	-0.25	**0.008**	-0.34	**0.001**	-0.36	**0.001**
Pre-Knowledge: Impacts	0.01	0.942	-0.003	0.979	0.02	0.899	0.00	0.979	0.02	0.865
Pre-Knowledge: Cause	0.03	0.825	0.063	0.616	0.03	0.809	0.05	0.676	0.07	0.602
Pre-Knowledge: Stock-Flow	-0.02	0.816	-0.067	0.528	-0.03	0.774	-0.07	0.515	-0.10	0.397
Percent usable cases			-0.014	0.892					0.01	0.899
Facilitated by our team			0.176	0.050					0.17	0.073
Educational Setting (Higher Ed or Secondary)			0.177	0.058					0.15	0.376
Country type (Developed or Developing)			-0.026	0.808					0.02	0.858
Gender					-0.09	0.317			-0.10	0.289
Age					0.00	0.990	-0.25	0.093	-0.23	0.162
Education of Parents									-0.10	0.313
Education of Self							0.33	0.028	0.17	0.427
Science Major							0.08	0.415	0.05	0.655
Perceived socioeconomic status							-0.03	0.755	-0.05	0.612
Favor regulation of free market							-0.02	0.823	0.01	0.952
R^2		0.075		0.141		0.083		0.128		0.170
ANOVA F		1.419		1.760		1.210		1.431		1.266
p-value		0.203		0.069		0.295		0.161		0.224
df Regression		7		11		9		12		18
df Residual		122		118		120		117		111
df Total		129		129		129		129		129

Table S5C. Model parameter estimates for linear regression for gains in knowledge about impacts with analysis limited to sessions with >30% usable cases out of total participants.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
Gain in Affect: Urgency	0.33	**0.000**	0.317	**0.000**	0.32	**0.000**	0.32	**0.000**	0.32	**0.000**
Gain in Affect: Hope	0.02	0.661	0.012	0.801	0.02	0.664	0.01	0.832	0.02	0.671
Pre-Knowledge: Impacts	-0.66	**0.000**	-0.681	**0.000**	-0.67	**0.000**	-0.67	**0.000**	-0.71	**0.000**
Pre-Urgency	0.22	**0.000**	0.233	**0.000**	0.23	**0.000**	0.23	**0.000**	0.25	**0.000**
Pre-Hope	-0.01	0.905	0.007	0.886	-0.01	0.844	-0.02	0.642	0.00	0.968
Percent usable cases			0.059	0.259					0.02	0.705
Facilitated by our team			0.080	0.083					0.06	0.232
Educational Setting (Higher Ed or Secondary)			0.018	0.711					-0.10	0.231
Country type (Developed or Developing)			0.100	0.071					0.09	0.154
Gender					0.04	0.422			0.04	0.414
Age					0.12	0.011	0.08	0.284	0.05	0.516
Education of Parents									0.06	0.245
Education of Self							0.04	0.626	0.11	0.305
Science Major							0.00	0.956	0.02	0.703
Perceived socioeconomic status							0.05	0.313	0.10	0.053
Favor regulation of free market							-0.04	0.471	-0.03	0.518
R^2		0.515		0.536		0.529		0.531		0.554
ANOVA F		50.144		29.832		37.499		26.710		17.465
p-value		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
df regression		5		9		7		10		16
df residual		236		232		234		213		225
df Total		241		241		241		241		241

Table S5D. Model parameter estimates for linear regression for gains in knowledge about cause with analysis limited to sessions with >30% usable cases out of total participants.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		**0.021**		**0.044**		0.126		0.052		0.941
Gain in Affect: Urgency	0.17	**0.002**	0.171	**0.001**	0.17	**0.002**	0.15	**0.008**	0.16	**0.005**
Gain in Affect: Hope	0.07	0.141	0.080	0.089	0.07	0.120	0.08	0.122	0.10	0.053
Pre-Knowledge: Cause	-0.68	**0.000**	-0.681	0.000	-0.69	**0.000**	-0.68	**0.000**	-0.68	**0.000**
Pre-Urgency	0.10	0.072	0.092	0.101	0.11	0.056	0.08	0.169	0.09	0.132
Pre-Hope	0.04	0.419	0.036	0.467	0.03	0.495	0.05	0.372	0.06	0.232
Percent usable cases			0.075	0.146					0.07	0.245
Facilitated by our team			-0.064	0.160					-0.07	0.147
Educational Setting (Higher Ed or Secondary)			-0.023	0.636					0.04	0.642
Country type (Developed or Developing)			-0.060	0.267					-0.08	0.223
Gender					0.05	0.263			0.05	0.318
Age					0.01	0.812	0.08	0.304	0.10	0.213
Education of Parents									0.14	0.005
Education of Self							-0.09	0.256	-0.14	0.210
Science Major							0.04	0.454	0.02	0.746
Perceived socioeconomic status							-0.02	0.762	0.00	0.986
Favor regulation of free market							0.03	0.588	0.00	0.934
R^2		0.497		0.505		0.499		0.501		0.527
ANOVA F		51.301		29.035		36.723		23.258		15.736
p-value		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
df regression		5		9		7		10		16
df residual		260		256		258		232		226
df Total		265		265		265		242		242

Table S5E. Model parameter estimates for linear regression for gains in knowledge about emissions trajectory (accumulation dynamics of atmospheric CO_2) with analysis limited to sessions with >30% usable cases out of total participants.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	p	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		**0.004**		0.434		**0.001**		**0.020**		0.575
Gain in Affect: Urgency	0.17	**0.042**	0.168	**0.045**	0.18	**0.034**	0.20	**0.027**	0.19	**0.032**
Gain in Affect: Hope	-0.03	0.713	-0.059	0.423	-0.03	0.708	-0.07	0.339	-0.08	0.264
Pre-Knowledge: Emissions trajectory (PreQ8)	-0.52	**0.000**	-0.546	0.000	-0.51	**0.000**	-0.52	**0.000**	-0.55	**0.000**
Pre-Urgency	0.00	0.982	0.021	0.799	-0.01	0.939	0.01	0.874	0.02	0.786
Pre-Hope	-0.23	**0.002**	-0.249	**0.001**	-0.23	**0.002**	-0.30	**0.00**0	-0.27	**0.001**
Percent usable cases			0.087	0.282					0.14	0.119
Facilitated by our team			0.125	0.079					0.13	0.094
Educational Setting (Higher Ed or Secondary)			0.086	0.258					0.23	0.085
Country type (Developed or Developing)			0.053	0.530					0.20	**0.040**
Gender					-0.05	0.529			-0.07	0.337
Age					-0.12	0.093	-0.33	**0.008**	-0.39	**0.002**
Education of Parents									0.02	0.827
Education of Self							0.29	0.021	0.06	0.702
Science Major							0.12	0.130	0.09	0.262
Perceived socioeconomic status							-0.03	0.668	0.01	0.877
Favor regulation of free market							0.04	0.607	0.03	0.725
R^2		0.336		0.369		0.350		0.397		0.457
ANOVA F		13.938		8.711		10.469		7.893		5.990
p-value		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
df regression		5		9		7		10		16
df residual		138		134		136		120		114
df Total		143		143		143		130		130

Table S5F. Model parameter estimates for linear regression for gains in intent to take action with analysis limited to sessions with >30% usable cases out of total participants.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		0.589		0.164		0.691		0.525		0.704
Gain in Urgency	0.28	**0.008**	0.364	**0.001**	0.27	**0.012**	0.39	**0.001**	0.38	**0.001**
Gain in Hope	0.09	0.318	0.146	0.131	0.09	0.316	0.20	0.065	0.15	0.190
Gain in Knowledge: Impacts	-0.08	0.471	0.181	0.121	-0.07	0.483	0.00	0.973	-0.02	0.856
Gain in Knowledge: Cause	0.17	0.210	-0.114	0.383	0.17	0.208	0.10	0.503	0.09	0.527
Gain in Knowledge: Stock-Flow	0.11	0.260	0.059	0.599	0.11	0.274	0.19	0.076	0.24	**0.034**
Pre-Action	-0.61	**0.000**	-0.557	**0.000**	-0.61	**0.000**	-0.74	**0.000**	-0.74	**0.000**
Pre-Urgency	0.28	**0.029**	0.391	**0.009**	0.25	0.054	0.35	**0.014**	0.39	**0.008**
Pre-Hope	0.10	0.242	0.121	0.274	0.09	0.319	0.12	0.268	0.11	0.301
Pre-Knowledge: Impacts	0.17	0.125	0.162	0.152	0.18	0.106	0.24	**0.040**	0.25	**0.043**
Pre-Knowledge: Cause	0.16	0.219	-0.101	0.456	0.17	0.190	0.20	0.155	0.20	0.156
Pre-Knowledge: Stock-Flow	0.17	0.090	-0.098	0.336	0.14	0.153	0.27	**0.020**	0.30	**0.019**
Percent usable cases			-0.117	0.493					-0.19	0.090
Facilitated by our team			0.103	0.647					-0.09	0.386
Educational Setting (Higher Ed or Secondary)			0.257	0.201					0.24	0.169
Country type (Developed or Developing)			0.321	**0.024**					0.03	0.836
Gender					-0.11	0.189			0.06	0.562
Age					0.11	0.219	-0.05	0.724	-0.09	0.604
Education of Parents									0.02	0.854
Education of Self							0.08	0.604	-0.01	0.969
Science Major							-0.11	0.293	-0.14	0.228
Perceived socioeconomic status							0.21	**0.043**	0.19	0.066
Favor regulation of free market							-0.17	0.087	-0.20	**0.048**
R^2		0.3		0.429		0.322		0.495		0.545
ANOVA F		4.162		4.215		3.84		4.529		3.699
p-value		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
df Regression		11		15		13		16		22
df Residual		107		84		105		74		68
df Total		118		99		118		90		90

Table S5G. Model parameter estimates for linear regression for desire to learn more with analysis limited to sessions with >30% usable cases out of total participants.

	Model 1: No controls		***Model 2: Session controls***		***Model 3: Gender/ Age***		***Model 4: Other demographic info***		***Model 5: All controls***	
Parameter:	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*	Beta	*p*
Constant		**0.000**		**0.000**		**0.000**		**0.000**		**0.000**
Gain in Urgency	0.26	**0.021**	0.280	**0.014**	0.26	**0.023**	0.27	**0.022**	0.27	**0.023**
Gain in	0.05	0.571	0.003	0.976	0.05	0.566	0.02	0.814	0.00	0.986
Gain in Knowledge: Impacts	0.19	0.143	0.190	0.148	0.18	0.175	0.18	0.187	0.19	0.178
Gain in Knowledge: Cause	-0.01	0.954	-0.002	0.986	-0.01	0.956	0.00	0.997	0.00	0.981
Gain in Knowledge: Stock-Flow	-0.04	0.680	-0.070	0.525	-0.04	0.740	-0.08	0.491	-0.08	0.540
Pre-Urgency	0.30	**0.011**	0.309	**0.009**	0.30	**0.011**	0.29	**0.017**	0.29	**0.021**
Pre-Hope	0.11	0.260	0.030	0.760	0.11	0.270	0.05	0.649	0.02	0.870
Pre-Knowledge: Impacts	0.18	0.175	0.181	0.179	0.17	0.217	0.17	0.213	0.18	0.208
Pre-Knowledge: Cause	-0.06	0.641	-0.046	0.717	-0.06	0.659	-0.04	0.751	-0.04	0.752
Pre-Knowledge: Stock-Flow	0.02	0.857	0.004	0.967	0.02	0.851	0.00	0.975	0.00	0.989
Percent usable cases			0.063	0.534					0.05	0.676
Facilitated by our team			0.101	0.268					0.10	0.318
Educational Setting (Higher Ed or Secondary)			0.098	0.303					0.06	0.724
Country type (Developed or Developing)			-0.127	0.241					-0.12	0.372
Gender					0.02	0.811			0.02	0.856
Age					0.04	0.691	-0.05	0.764	0.02	0.896
Education of Parents									-0.01	0.919
Education of Self							0.11	0.476	0.01	0.947
Science Major							0.12	0.246	0.09	0.428
Perceived socioeconomic status							0.02	0.847	-0.01	0.943
Favor regulation of free market							0.01	0.928	0.03	0.781
R2		0.126		0.162		0.128		0.147		0.168
ANOVA F		1.723		1.592		1.430		1.313		1.035
p-value		0.083		0.092		0.162		0.206		0.429
df Regression		10		14		12		15		21
df Residual		119		115		117		114		108
df Total		129		129		129		129		129

Table S6. Correlation matrices for session-level control variables (A) and participant-level variables (B).

A.

		Educational setting	*Facilitator training*	*Facilitator training*	*% usable cases*
Educational setting	Pearson Correlation	1	.691	-0.42	0.268
	Sig. (2-tailed)		0.001	0.058	0.239
	N	21	21	21	21
Facilitator training	Pearson Correlation	.691	1	-0.42	0.221
	Sig. (2-tailed)	0.001		0.058	0.337
	N	21	21	21	21
Country type	Pearson Correlation	-0.42	-0.42	1	0.355
	Sig. (2-tailed)	0.058	0.058		0.114
	N	21	21	21	21
% usable cases	Pearson Correlation	0.268	0.221	0.355	1
	Sig. (2-tailed)	0.239	0.337	0.114	
	N	21	21	21	21

B. Please see tab data file.

Table S7. Comparison of pre-survey responses for the participants who completed the post-survey (i.e., >80% of items in both pre- and post-surveys provided) to those who did not.

A. Analysis limited to sessions with >30% usable cases out of total participants.

	Pre-only mean	***Usable cases mean***	***Pre-only SD***	***Usable cases SD***	***Pre-only N***	***Usable cases N***	***T***	***df***	***p-value***
Pre-Urgency	0.713	0.739	0.147	0.138	97	291	0.00	155	0.997
Pre-Hope	0.628	0.628	0.181	0.171	100	338	-1.38	121	0.171
Pre-Knowledge: Impacts	0.861	0.888	0.177	0.132	91	316	-0.68	158	0.501
Pre-Knowledge: Cause	0.743	0.776	0.439	0.418	101	339	-1.56	156	0.121
Pre-Knowledge: Stock-flow	0.330	0.350	0.471	0.478	92	315	-0.47	150	0.640
Pre-Intent to Act	0.791	0.810	0.188	0.151	101	336	-0.92	141	0.360
Facilitated by our team	0.830	0.900	0.376	0.301	101	339	-1.67	140	0.098
Educational Setting (Higher Ed or Secondary)	0.760	0.900	0.428	0.305	101	339	-2.94	132	0.004
Country type (Developed or Developing)	0.830	0.780	0.376	0.418	101	339	1.28	180	0.203
Gender	1.520	1.470	0.502	0.506	101	338	0.95	165	0.342
Age	3.860	3.680	1.233	1.280	101	338	1.30	170	0.194
Education of Parents	4.440	4.390	1.042	0.937	87	317	0.37	127	0.712
Education of Self	3.130	3.370	1.228	0.948	87	314	-1.73	116	0.086
Science Major	0.460	0.580	0.501	0.494	96	327	-2.12	153	0.036
Perceived socioeconomic status	4.290	4.350	1.964	1.938	98	332	-0.28	157	0.778
Favor regulation of free market	3.150	3.200	1.258	1.277	100	333	-0.36	165	0.723

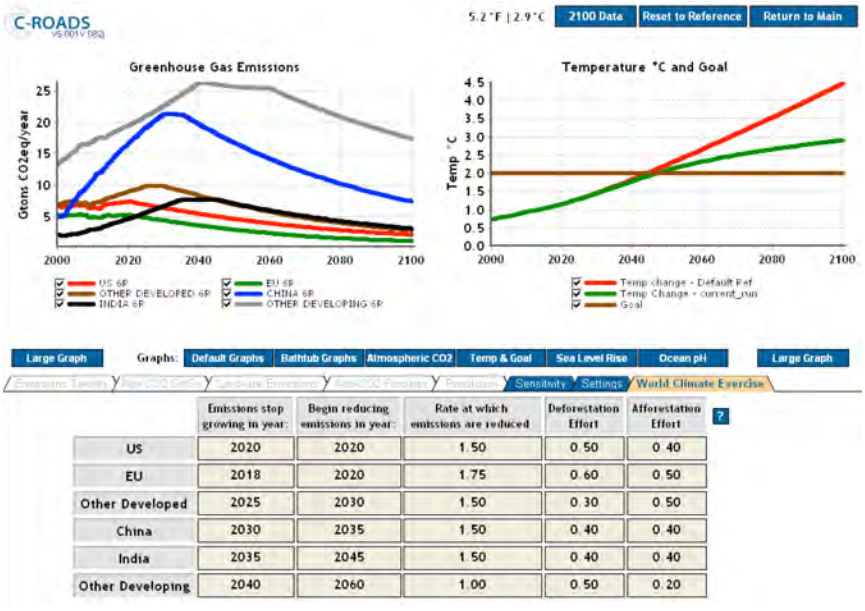
B. Analysis includes all sessions, including those with low rates of data collection.

	Pre-only	*Usable cases*	*Pre-only SD*	*Usable cases SD*	*Pre-only N*	*Usable cases N*	*T*	*df*	p-value
Pre-Urgency	0.729	0.741	0.149	0.141	270	359	-0.94	564	0.345
Pre-Hope	0.650	0.632	0.174	0.179	285	451	1.34	615	0.180
Pre-Knowledge: Impacts	0.853	0.882	0.155	0.129	197	400	-2.27	333	0.024
Pre-Knowledge: Cause	0.686	0.750	0.465	0.433	290	452	-1.87	585	0.062
Pre-Knowledge: Stock-flow	0.260	0.310	0.441	0.463	262	424	-1.29	573	0.197
Pre-Intent to Act	0.788	0.805	0.174	0.153	289	447	-1.34	558	0.182
Facilitated by our team	0.420	0.820	0.495	0.388	290	452	-11.54	511	0.000
Educational Setting (Higher Ed or Secondary)	0.460	0.820	0.499	0.386	290	452	-10.34	505	0.000
Country type (Developed or Developing)	0.840	0.690	0.363	0.462	290	452	5.01	710	0.000
Gender	1.470	1.460	0.540	0.517	290	451	0.19	597	0.846
Age	3.730	3.490	1.138	1.355	203	426	2.38	466	0.018
Education of Parents	4.250	4.350	1.044	1.001	269	427	-1.25	552	0.212
Education of Self	2.370	3.110	1.325	1.126	268	424	-7.54	501	0.000
Science Major	0.360	0.590	0.481	0.493	259	428	-5.95	555	0.000
Perceived socioeconomic status	4.780	4.480	2.021	1.950	252	440	1.92	508	0.056
Favor regulation of free market	3.300	3.210	1.109	1.206	278	443	1.00	625	0.318

Table S8. Comparison of cases from sessions with higher-than-median participation in survey-taking to those with low participation. High participation (Hi-part) was defined as ≥47% usable cases out of the total number of participants in a session, while low participation was <47% usable cases (Low-Part).

	Hi-part[1] mean	***Low-part[2] mean***	***Hi-part SD***	***Low-part SD***	***Hi-part N***	***Low-part N***	***T***	***df***	***p-value***
Urgency Diff	0.0661	0.0508	0.10254	0.10782	232	34	0.809	264	0.420
Hope Empower Diff	0.0468	0.0098	0.17445	0.13244	247	50	1.416	295	0.158
Impacts Diff	0.0499	0.023	0.1191	0.05875	226	46	1.493	270	0.137
Cause Diff	0.1174	0.0392	0.35838	0.28006	247	51	1.468	296	0.143
Stock Diff	0.2395	0.1571	0.4261	0.33806	119	35	1.05	152	0.296
Action Diff	0.0502	0.0406	0.12495	0.08801	241	51	0.522	290	0.602
Pre-Urgency	0.7396	0.7382	0.13838	0.13458	242	34	0.055	274	0.956
Pre-Hope Empower	0.6099	0.6545	0.16281	0.17406	247	50	-1.743	295	0.082
Pre-Knowledge: Impacts	0.9013	0.884	0.13358	0.10975	231	46	0.826	275	0.41
Pre-Knowledge: Cause	0.7895	0.8235	0.40851	0.38501	247	51	-0.547	296	0.585
Pre-Knowledge: Stock-flow	0.38	0.32	0.488	0.471	226	50	0.857	274	0.392
Pre-Intent to Act	0.8145	0.791	0.15514	0.14727	244	51	0.995	293	0.321
Post-Urgency	0.8029	0.7918	0.12008	0.11699	235	36	0.519	269	0.604
Post-Hope Empower	0.6567	0.6632	0.20649	0.19289	247	51	-0.205	296	0.838
Post-Knowledge: Impacts	0.9487	0.9023	0.09666	0.12184	239	50	2.994	287	0.003
Post-Knowledge: Cause	0.9069	0.8627	0.29119	0.34754	247	51	0.952	296	0.342
Post-Knowledge: Stock-flow	0.59	0.51	0.493	0.505	228	51	1.074	277	0.284
Post-Intent to Act	0.8652	0.8316	0.14693	0.11878	244	51	1.532	293	0.127

A.



	Emissions stop growing in year:	Begin reducing emissions in year:	Rate at which emissions are reduced	Deforestation Effort	Afforestation Effort
US	2020	2020	1.50	0.50	0.40
EU	2018	2020	1.75	0.60	0.50
Other Developed	2025	2030	1.50	0.30	0.50
China	2030	2035	1.50	0.40	0.40
India	2035	2045	1.50	0.40	0.40
Other Developing	2040	2060	1.00	0.50	0.20

B.

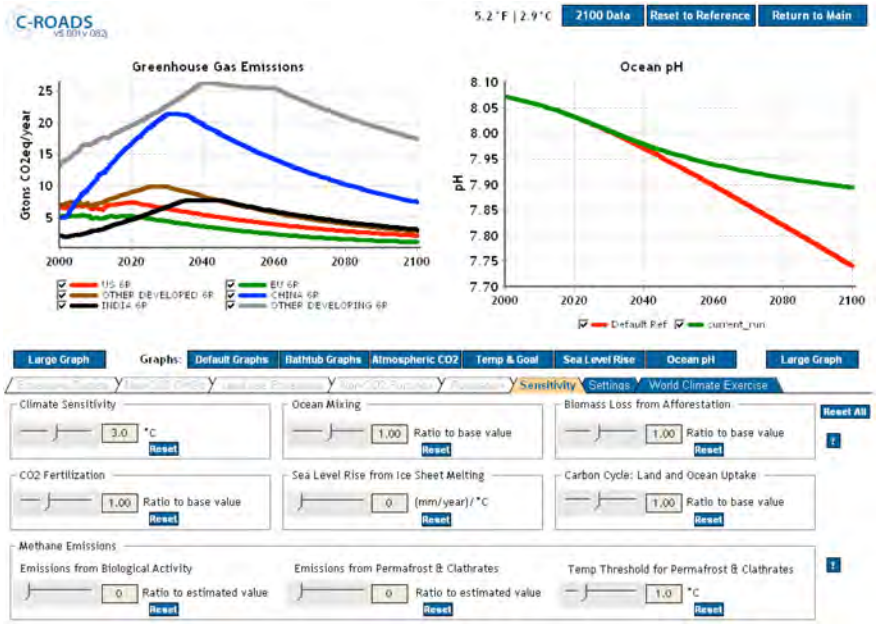


Figure S1. Screenshots from the C-ROADS computer model. Panel A is the six-region *World Climate* interface for inputting participants' decisions, i.e., the year in which emissions stop growing, the year in which they begin to reduce emissions, the annual rate of decline (%), and the efforts exerted against deforestation and for afforestation (both on scales of 0-1, with 0 being business-as-usual and 1 being the maximum possible effort). Resulting CO_2 emissions trajectories (upper left) and global mean surface temperature rise from pre-industrial levels (upper right) are also shown. Panel B shows additional information and interfaces available in C-ROADS, including ocean acidification (upper right) and levers for adjusting climate sensitivity and strength of both reinforcing (e.g., Arctic methane) and balancing (e.g., CO_2 fertilization) feedbacks in the climate system (lower half).

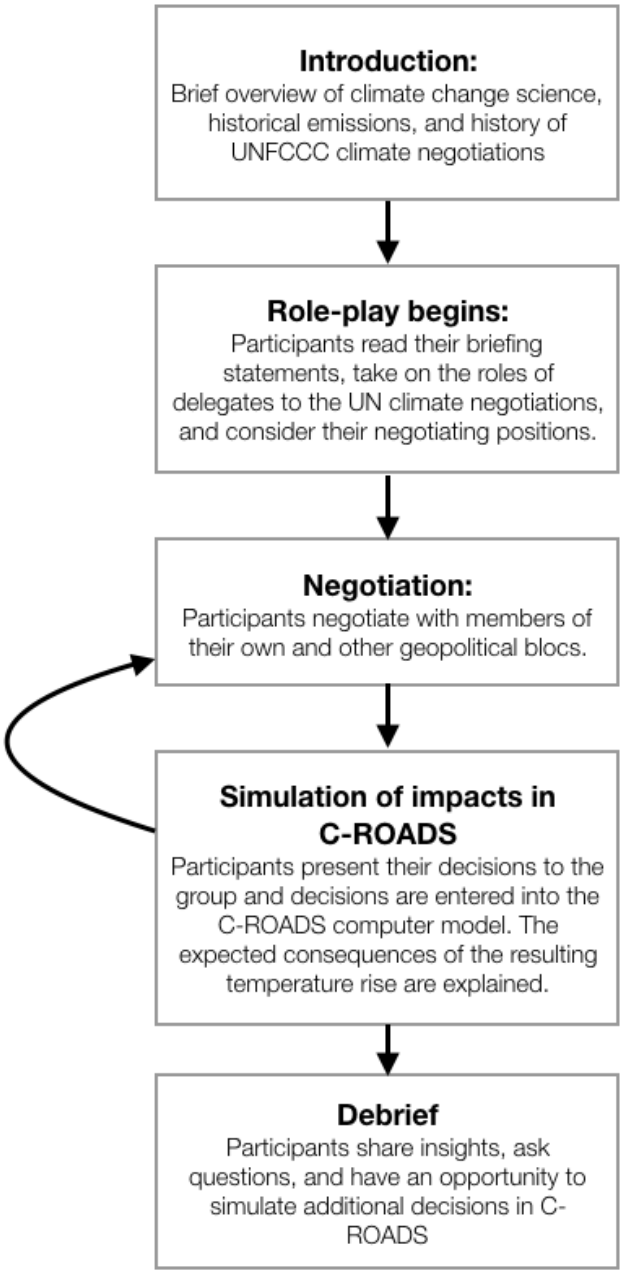


Figure S2. Overview of the components of a *World Climate* session.

Figure S3. Images from *World Climate* sessions. Sessions shown here were held at COP21 in Paris (A), the Climate Change Resource Center in Nairobi, Kenya (B), Reutlingen University (C); and a high school in Cambridge, Massachusetts (D).