Can a values and video-based activity increase knowledge or pro-environmental attitudes and behaviour?

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Abstract. Environmental education is important in the face of the climate crisis. Although previous studies suggest that knowledge could boost pro-environmental attitudes, behavioural change is complex and may go beyond knowledge acquisition. Previous research highlighted biospheric and altruistic values as motivational factors related to pro-environmental behaviour (PEB). Video-based education has arisen as an accessible environmental learning medium. Video-sharing platforms offer accurate educational videos, although, it is unclear if they can increase knowledge, PEB or change attitudes. An online experiment randomly allocated 72 students in two conditions to watch an informational video on climate change, with one condition engaging in a values clarification task. Participants completed questionnaires on environmental attitudes, PEB, environmental self-efficacy and knowledge. Cross-correlations indicated complex inter-relationships and a non-significant relationship between knowledge and PEB at baseline. The values clarification task did not offer an advantage on PEB or pro-environmental attitudes. Both conditions experienced increases in knowledge, indicating that watching an educational video on climate change contributes to knowledge acquisition. The findings highlight complex mechanisms involved in increasing pro-environmental attitudes and behaviours. The study was part of the project "Be the Change: Innovative Higher Education for Environmental Sustainability," co-funded by the ERASMUS+ Programme of the European Union (Project number: 2022-1-SE01-KA220-HED-000087275).

1 Introduction

Scientific consensus highlights the negative impact of climate change and emphasizes the need for decisive action in terms of changes in human behaviour to mitigate its negative consequences [1,2]. In view of this call for action, studies have focused on factors associated with raising awareness, enhancing pro-environmental attitudes, and motivating pro-environmental behaviour (PEB) [3]. Despite a rich literature focusing on factors which predict pro-environmental behaviour such as pro-environmental attitudes and increases in environmental knowledge, fewer studies have explored the impact of interventions aiming at increasing PEB.

An area of focus has been raising awareness on climate issues through educational activities [4,5]. Studies have employed various methodologies in their efforts to increase knowledge, with their prime target group being individuals already involved in educational programs, such as students of tertiary education. Indeed, students have been considered as an appropriate target group for these interventions as due to their life-stage they may be more open to learning new information. Students are often actively involved in academic communities and therefore can actively disseminate their knowledge and be involved in the promotion of environmental practices as citizens of the future [6,7]. Increases in knowledge with respect to environmental issues have been found to be oftentimes beneficial in shifting environmental attitudes and PEB in students [8–10] and beyond [11–13]. Notably, studies have also explored the effectiveness of different types of educational mediums on environmental topics, including using widely accessible formats such as video-based education with positive findings [14–16]. Evidence of effectiveness of video-based education in enhancing knowledge, shifting attitudes, and nudging PEB could result in optimal exploitation of the numerous science education videos which appear on social media platforms yearly (e.g. YouTube) and attract substantial public engagement [17]. In fact, a study in Taiwan reported that different types of pro-environmental behaviour (e.g., promotional, proactive) were predicted by environmental attitudes and environmental self-efficacy which was mediated by participants engagement with media content on global warming [20]. However, despite the emerging importance and growing accessibility of education on environmental topics the link between knowledge and behaviour is oftentimes found to be indirect and certainly not causal [18,19] with other factors being involved in this relationship (e.g., pro-environmental self-efficacy, pro-environmental attitudes).

Another factor which has been of interest in the study of pro-environmental attitudes and PEB has been personal

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values. The study of values with regards to environmental sustainability is often connected to Schwartz's [21] theory of basic human values in which values are defined as "desirable transituational goals varying in importance, which serve as a guiding principle in the life of a person or other social entity" (p. 21). Values have also been considered as intrinsic, appetitive motivators for action in behavioural change models where they are seen as qualities of action (not fixed goals) which are consistent with a conceptualisation of how an individual wishes to behave in the world [22]. Despite the differences among theories, values are thought to motivate behaviour, affect decision as well as increase the saliency of information that is consistent with one's values. Considering the environmental context, individuals' values may affect where one's focus rests on the topic of environmental protection (e.g., human concern, environmental concern) and affect both their topic-related attitudes as well as their willingness to alter their behaviour to more sustainable practices [23]. Interestingly, studies have identified a predictive role of values on environmental attitudes and PEB, highlighting an influential role of this variable in potential efforts to influence or prompt PEB [24–26]. More specifically, previous studies have identified specific types of values related to pro-environmental attitudes and behaviours, namely, altruistic and biospheric values [24]. Whereas altruistic values focus on a concern on the welfare of other human beings (welfare which can be compromised through the effects of climate change through increases in illnesses and conflict), biospheric values are more concerned with the preservation of the environment and the wellbeing of nature. Both value domains are reflective of self-transcendence values (values concerned with the interests of the collective), as named in Schwartz's theory [21] and are more predictive of pro-environmentalism compared to self-enhancement values (focused on the interests of the individual) [27]. Studies in behavioural psychology have indicated that, although values are relatively stable, activities where values become more salient or are activated may have impact on motivating certain value-consistent types of behaviour [28–31]. For example, an individual may hold competing values which may influence pro-environmental behaviour. To illustrate, an individual who values both environmental protection and comfort, may not choose to walk extra time in the hot weather to identify a recycling bin but may be more inclined to do so if the value of environmental protection has been recently highlighted in their awareness [32]. To our knowledge the experimental manipulation of value saliency has not been previously examined as an active ingredient in the context of shifting pro-environmental attitudes or increasing short-term PEB although previous research indicated that it may be a promising avenue to pursue.

This study capitalises on evidence from previous studies regarding the relationships among knowledge obtained through video-based education, personal values, environmental attitudes, environmental self-efficacy, and PEB (e.g. 8, 20, 24). The study focuses on the student population who were perceived as ambassadors of a new generation of citizens concerned with managing climate change. Given evidence that increasing value saliency through an activity might be a useful task for influencing PEB, we use experimental methodology to explore this question. Obtaining evidence that an online values clarification activity can boost the benefits of an educational video can provide tools to increase the impact of climate change education. Specifically, in this study students from tertiary education were randomised in either a knowledge condition where they watched a popular educational video from You Tube on climate change or to a knowledge-values condition where they engaged in an environmental values clarification activity and then watched the same video. All participants responded to questionnaires measuring environmental attitudes, self-efficacy, knowledge, and PEB before the activities (pre-test) and at 1-week post-test. In forming the study hypotheses, we firstly predicted a replication of previous literature in terms of finding positive correlations across pro-environmental attitudes, pro-environmental behaviour, self-efficacy, and knowledge **(H1)**. Second, we expected that the knowledge-values condition would result in a more pronounced shift in pro-environmental attitudes **(H2)** and PEB **(H3)**. Lastly, we predicted that the knowledge-values condition would result in more acquired knowledge after watching the educational video, as we expected that participants would be more attentive to the video after reflecting on environmental values **(H4)**.

2 Method

2.1. Procedure

After obtaining ethical approval from the Cyprus Bioethical Committee, the study was set up as an online experiment (on Qualtrics platform) in two stages (pre-test and post-test separated by one week). Participants were recruited directly from tertiary educational institutions as well as from online platforms such as Sona Systems, Survey Circle and Reddit. Upon providing informed consent, participants were randomized into two experimental conditions: Knowledge-Values and Knowledge. Participants were then given access to the pre-test questionnaires, the experimental task, and finally to the educational video, video reactions scale and demographics questionnaire. The pre-test lasted approximately 30 minutes per participant. After one-week, participants were asked to complete the post-test with the outcome questionnaires.

Knowledge-Values condition. The valuing task is based on an experimental activity described by Engle and Follette (2018) on activating values towards altruistic behaviour and adapted for this study. It approximates a common values clarification task from within the behaviour change literature (22). Participants were presented with a 1st prompt in which they were asked to choose 1 issue that moved them to act to help the environment (hotter temperatures, rising ocean levels, severe storms, increased drought, loss of species, not enough food supply (hunger), more health risks (pressures on health systems, new germs and viruses), poverty, climate migration (moving populations), and other) [33].

Participants were then instructed to write continually for 3 minutes by answering the question 'Tell us more about why this environmental issue matters to you. What you write may be personal, related to you, your local community, or people you know, or it may be general information about the topic'. Participants were then introduced to a 2nd prompt where they were asked to answer the following question writing continually for 3 minutes: 'How do you choose to express your care/concern for this environmental issue which you chose as most important?' (Definition: "expressing your concern/care through your actions: There are countless ways you may have already done this or would like to do this. For example, some people may express their care/concern about the environment by working hard to conserve energy or reduce their carbon emissions. Another person who cares about protecting the environment may create posts in social media that raise awareness about climate change.") Upon completion of this task, participants were then asked to rate the importance that they ascribed to values related to helping the environment by completing the Environmental-Portrait Values Questionnaire as a specific prompt to pro-environmental values [34].

Knowledge condition. Participants in this condition followed the exact same procedure, however they engaged in a 6-minute-long unrelated task, following the 2-prompt rationale. Participants were presented with the 1st prompt and asked to choose a time management practice from a list of practices valued by society (-staying organized, planning, making commitments that you keep, working steadily towards deadlines, setting goals, keeping a routine, maintaining work life balance, keeping a schedule). Participants then were instructed to write continually for 3 minutes, answering the question: "Tell us more about why this practice matters to you. What you write may be personal, related to you, your local community, or people you know, or it may be general information about the topic." Participants were then introduced with a 2nd prompt again writing for 3 minutes and answering the question "How do you choose to express through actions this practice which you chose as most important in your life?" Participants were then asked to rate the importance of statements on the topic of time management. Each statement was altered to reflect the two original subscales of the E-PVQ, however on the topic of time management.

Video Selection. The video (https://www.youtube.com/watch?v=-D_Np-3dVBQ) was selected based on an analysis of video engagement statistics on You Tube in a previous study [17]. This video was amongst the videos with the highest popularity score according to the study's algorithm and it was evaluative as being representative of a common YouTube video on climate change as it was presented by an influencer (not a scientist), contained infographics, and lasted for approximately 8 minutes. Importantly it was ascertained that the video contained accurate information and included sections on the causes, consequences, and solutions to climate change.

2.2 Measures

Demographics Questionnaire. This scale collected information such as gender, age, socioeconomic status, living location, and field of study.

Environmental Attitudes Inventory [35]. Two scales of the Environmental Attitudes Inventory were used consisting of 10 items each and measured on a 7-point Likert-scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The scale 'Support for interventionist conservation policies' consisted of two subscales and measured attitudes either towards conversation policies such using as eco-friendly energy (ProEnviron) or measured opposition to such policies (ProHuman). The scale 'Conservation motivated by anthropocentric concern' measured anthropocentric factors (i.e., supporting human welfare) relating to conservation policies (Humconcern) versus motivated by concern regarding environmental factors (Envconcern).

Pro-environmental Behaviour. The scale was adapted by Busch et al. [36] who used eight items to investigate pro-environmental actions across three levels of environmental behavior: private, non-activist behavior in the public sphere and environmental activism. The questions enquired about the last week and included personal actions such as turning off the lights or recycling across a 6-point frequency Likert-Scale, ranging from 0 (Never), to 5 (Almost every day). Three further questions were added from Nicolai et al. [37] relating to PEB in the private sphere, while one additional question was included from Milfont and Duckitt [35] relating to environmental activism.

Pro-Environmental Self-Efficacy. Participants' perceived efficacy with regards to PEB was adapted from a study by Flora et al. [38] using two questions measuring one's perceived confidence in affecting climate change on a 5-point Likert-scale ranging from 1 (Not Confident at all), to 5 (Extremely Confident).

Knowledge. The knowledge test regarding the causes and effects of climate change was adapted from the Yale Project on Climate Change Communication's survey [39]. Eight multiple choice questions (four possible answers) were prepared to measure the knowledge of climate change of participants directly related to the video they watched whilst partaking in the study.

Video Reactions. This scale measured participants' perception of the video. Participants had the opportunity to like or dislike the video and state whether they would share it or on social media.

2.3 Participants

After removing responses from participants with missing data (e.g. not completing the post-test; n=76) and participants with problematic response patterns (n=2) or who did not engage with the experimental task (n=2), the analysis focused on 72 higher education students who fully completed both pre and post measures. Thirty-three (n=33) students were randomly allocated to the Knowledge-Values condition and 39 to the Knowledge condition. Participants' mean age was 26,83 (*SD* = 8,54). Most were enrolled in an undergraduate degree (45,8%;

n=33), while 27,8% (n=20) were enrolled in a postsecondary degree or diploma and the remaining 23,6% who responded (n=17) were enrolled in a postgraduate program. Most participants were female (72%, n=52), 22% male (n=16) and 5,6% (n=4) as 'other' or 'do not wish to respond'. Participants came from a variety of areas of study including anthropology, architecture, artificial intelligence, business, climate studies and sustainable development, computing, engineering, estate management, psychology, marine studies, marketing, mathematics, project management, science and sport and exercise science. Most participants resided in the United Kingdom (43%), the United States (15%), Cyprus (18%), India (4%), Spain (2,8%), among other countries. Most participants (61%) resided in a large or medium-sized city.

3 Results

3.1 Data preparation

A perusal of histograms and skewness and kurtosis statistics indicated that all variables were normally distributed.

3.2 Experimental task and video validation

The 33 participants in the Knowledge-Values condition had contributed at least 2 sentences each in the values clarification activities and were considered as having engaged sufficiently with the experimental task. Furthermore, 80,6% of all the participants noted that they would 'like' the video on social media and 55,6% that they would 'share' it. Only a small percentage 2,8% said that they would 'dislike' the video. A 14% of participants also indicated that they would 'definitely not share' this video with others on social media.

3.3 Pre-experimental relationships among variables

Table 1 shows the correlations among variables pre-experimentally. As expected, PEB was positively correlated with support for interventionist conservation policies (ProEnviron) but not with opposition to such policies (ProHuman). Interestingly, PEB was positively correlated with conservation motivated by anthropocentric concern (HumConcern) and motivated by environmental concern (EnvConcern). As expected, environmental self-efficacy was significantly associated with PEB. Contrary to expectations, knowledge was not correlated with pro-environmental behaviour. Also, consistent with expectations knowledge was positively related to interventionist conservation policies (ProEnviron). Resulting from these findings, hypothesis 1 (H1) was partly supported.

Table 1. Pre-experimental correlations among study variables (*N*=72).

	PEB	ProEnviron	ProHuman	EnvConcern	HumConcern	Efficacy
ProEnviron	.31 **					
ProHuman	-.04 75	-.16 .16				
EnvConcern	.30 **	.54 ***	-.13 .30			
HumConcern	.31 **	-.05 .67	.25 *	-.29 **		
Efficacy	.46 ***	.14 .25	.11 .37	-.04 .76	.22 .07	
Knowledge	.17 .16	.28 **	-.14 .25	.23 .06	-.15 .20	-.15 .21

Note. * $p < .05$, ** $p < .01$, *** $p < .001$.

3.4 Test of experimental activities

Repeated measures ANOVAs were conducted with time as a within subject variable (pre-experimental, post-experimental), experimental condition as a between subject variable and PEB, knowledge and pro-environmental conservation attitudes as dependent variables. Table 2 presents the findings indicating that contrary to the study's hypotheses (H2-H4), none of the dependent variables were differentially affected by the values-based experimental task.

To explore the impact of the educational activity on participants knowledge acquisition, paired-samples T-tests were also conducted for each condition independently. Both conditions resulted in a significant increase in participants knowledge from pre-test to post-test irrespective of the experimental manipulation (Knowledge condition: *Mdiff* = .69, *SD* = 1.25, $t(38)=3.43$, $p<.001$; Knowledge-Values condition: *Mdiff* = .42, *SD* = 1.34, $t(32)=1.81$, $p<.040$).

Table 2. Means, standard deviations, and repeated measures interaction effect of condition on dependent variables over time.

DV	Knowledge				Knowledge-values				*F* (1, 70)	*p*	η^2_p
	Pre-		Post-		Pre-		Post-				
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*			
PEB[a]	3.76	1.51	3.91	1.30	3.73	1.00	3.83	1.06	.11	.75	.00
Pro-Environ[b]	29.48	4.25	29.72	4.33	29.33	3.06	29.67	3.99	.12	.91	.00
Knowledge	4.64	2.08	5.33	1.91	4.81	2.04	5.24	2.25	.76	.38	.01

[a] pro-enrivonrmental behaviour; [b] pro-environmental conservation policy attitudes; [c] pro-environmental self-efficacy

4 Discussion

4.1 Main findings

This study explored the potential of an online values clarification task alongside a short video-based educational activity in accentuating pro-environmental knowledge, conservationist attitudes and PEB. We predicted that conservationist attitudes would correlate positively with pro-environmental behaviour, environmental self-efficacy, and knowledge and that the values clarification task would significantly increase PEB, attitudes and knowledge compared to a control condition. To our knowledge this is the first study which explored the potential impact of a values clarification activity on PEB. The results of the study failed to support our experimental hypotheses although the relationships among the study's variables were mostly in the expected directions.

Specifically, as found in previous literature [40,41], pro-environmental conservationist attitudes were positively correlated with PEB and so was support for conservation due to environmental concern. Pro-environmental self-efficacy was also positively correlated to PEB, although it did not seem to be positively related to any of the other variables of interest. These findings are reflective of the theory of planned behaviour (TPB; [40]) which proposes that attitudes and perceived behavioural control (self-efficacy) alongside subjective norms affect behavioural intent and shape behaviour. Interestingly, PEB was also positively associated with conservationist attitudes motivated by human concern (i.e., the protection of human interests) not only with environmental concern, thus displaying the complex interplay among attitudinal factors. To highlight the complexity of attitudes related to the environment, the endorsement of conservationist attitudes motivated by human concern (e.g., the worst thing about the loss of the rain forest is that it will restrict the development of new medicines) was also positively related to expressing opposition to conservationist policies in favour of human interests (e.g., I am completely opposed to measures that would force industry to use recycled materials if this would make products more expensive). In our view this finding further emphasizes the role of individualized motivations such as personal values (i.e., coined subjective norms in TPB) in the process of selecting behaviours towards the environment. For example, this finding is consistent with the proposal that environmental education and messages may need to be specifically selected taking in mind the personalized sentiments and motivations of the receiver [42,43].

Contrary to the study's expectations, knowledge was not positively associated with pro-environmental behaviour. Although previous studies have managed to demonstrate a link between knowledge and PEB [12,13], there have also been examples of studies indicating a lack of a relationship between these variables [44–46]. In delineating these findings, a previous study proposed and found evidence that knowledge may have an indirect effect (moderating impact) on the relationship between environmental attitudes and PEB [47]. Furthermore, drawing from the assumption that to impact behaviour, environmental education may need to be of personal significance to the receiver (e.g., aspects of climate change that are visible in their lives) it is possible that the link between knowledge and pro-environment behaviour may also be affected by the types of knowledge questions asked. For example, in this study, knowledge questions were not personalized to student concerns but focused on general scientific facts related to climate change (e.g., If animals and plant species become extinct, this may result in a cascade of consequences on the natural ecosystem. What is the main reason for their current struggle?). It is therefore possible that this lack of personalization of the educational content may have resulted in a disconnect between knowledge and pro-environmental behaviour although, this cannot be concluded from the findings.

It was from this premise of complexity that this study introduced a values clarification task alongside an educational video to increasing the saliency and relevance of pro-environmental educational content and instil motivation for behaviour change. Despite a plethora of studies highlighting the role of altruistic and biospheric values in in triggering salutary effects on pro-environmental behaviour [24,48,49], to our knowledge no previous study had exploited values clarification techniques from within the field of behavioural psychology to enhance PEB. Contrary to expectations the values clarification task did not differentially shift pro-environmental attitudes nor PEB. In attempting to discuss these findings we will focus on two possible interpretations. Firstly, it is probable that given the complexity and plethora of factors identified in the literature to be associated with PEB (e.g., personality, political beliefs, proximity to the problem; [49]) a single component activity is not sufficiently powerful to elicit a change in behaviour. Moreover, even though biospheric and altruistic values have been found to be associated to PEB in previous studies, in the values clarification task participants were not restricted as to what to write and how to express their care and concern for the environment. However, as observed in the correlational findings of this study, the motivational factors associated with PEB can be contradictory (e.g., people may choose to protect the environment as means of benefiting personally rather than for the sake of the environment). As a result, and despite our efforts at priming pro-environmental values we cannot be certain how individuals approached the values clarification exercise and whether they felt emotionally connected to motivations for protecting the environment or otherwise. More detailed qualitative analysis of the textual data may help clarify these questions and even indicate whether the focus and content of the values clarification exercise was truly related to pro-environmental values. Besides, it is likely that an online setting may not be a contextually suitable environment for activating pro-environmental values and that future studies may need to consider the utilization of natural and environmental settings where people can connect with natural resources. As an effective example, a study by Douglas et al. [50] combined an online educational course with proposed offline,

experiential nature-based activities thus resulting in changes in both attitudes and behaviour.

A second explanation for our findings may be that the activity was simply too brief to have any meaningful impact on participants after one week. Values clarification activities are usually performed at in vivo training spaces where participants usually spend more time reflecting on and discussing their personal values privately or in groups. Attempting to replicate this process through a timed (total of 8 minutes) online activity may not be sufficiently impactful, especially since we cannot be certain how much of this time was consumed on the values clarification activity and how much of this time participants were distracted by other irrelevant tasks. Moreover, the value clarification activity was a fully individual task without encouraging a reflective discussion between students, as it is often the case, an approach which potentially could have positively affected findings.

Nonetheless, the educational video did significantly support knowledge increase in both conditions from pre-test to post-test although the effect size of this change was small. Given that individuals who watch educational videos on YouTube or other media on a topic usually consume more than one video as encouraged by the media's algorithmic recommendation, it is conceivable that videos on social media can significantly contribute towards knowledge gains. As found in our study however, the translation of knowledge to pro-environmental practice may require the involvement of additional factors. Future studies may need to consider multicomponent and longer interventions to arrive at meaningful changes in PEB.

4.2 Limitations

The study had a number of strengths including the replication of a values clarification paradigm from a previous investigation [28], the random allocation of participants to conditions and the utilization of a real and widely viewed video on climate education from YouTube, thus increasing the face validity of the knowledge task. On the other hand, the study suffered from a number of limitations. Specifically, apart from reviewing the quality of the values clarification text provided by, there is no way of being certain to what extent participants fully engaged with the experimental tasks. Although the question of engagement is a common issue in online studies, it is more impactful in small sample experimental designs such as the present investigation. Secondly, the study recruited participants from various countries in the English language and although most participants were from the UK or other European countries it is difficult to factor out cultural or contextual environmental factors that may have affected the results. Finally, the use of a single YouTube video may restrict the conclusions that can be drawn from this study. Despite choosing a video that met various effectiveness characteristics in terms of video engagement on YouTube [17], we still cannot be certain that it was sufficiently engaging for our target group of university students. Similarly, it is likely that a video including a topic of environmental sustainability that was less general and more aligned with students' daily concerns might have had a bigger impact.

4.3 Conclusions

The study's findings indicate that a values clarification activity alongside a short online educational video is not sufficiently powerful to shift conservationist attitudes, environmental knowledge or pro-environmental behaviour. Given previous findings on the strong association between biospheric and altruistic values and pro-environmental attitudes and behaviour, future interventions may still benefit from exploring interventions interested in increasing the saliency of these values. However, the methodology of these interventions will need to be altered. It is proposed that future programs consider the implementation of multistage values clarification activities consisting of both theoretical (writing about values) and practical value activation (in vivo connecting with the environment). Furthermore, we propose that future programs consider the possibility of choosing environmental knowledge topics with more content (to mark larger effect sizes in terms of learning outcomes) and which will be personally relevant to the learner (rather than consisting of general climate science information) to facilitate the activation of personal significance alongside the learning experience.

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