AIMS Geosciences, 8(4): 645–657.
DOI: 10.3934/geosci.2022035
Received: 01 June 2022
Revised: 17 August 2022
Accepted: 07 September 2022
Published: 19 September 2022

http://www.aimspress.com/journal/geosciences

Research article

University student perception of sustainability and environmental issues

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Abstract: There is a global consensus among scientists that human-caused climate change is threatening the environment and communities worldwide and that major changes must be implemented to reduce the increasing rate of CO_2 emissions. Moreover, environmentally unsustainable practices are both endangering and degrading the quality of life on Earth. One major and often underestimated aspect of this problem is the difference in individual environmental risk perception and evaluation. It is evident that the responsibility for Earth's future lies in the hands of young generations and raising their awareness of environmental issues is a substantial challenge for education institutions. Students need to develop new values, skills and behaviors to foster sustainable development. As institutions of higher education, universities have a major impact on society and play a key role in the development of environmental awareness in young people. The paper describes the results of a survey administered to students in the *Cultural Geography B* course at the University of Torino. The purpose of the analysis was to determine if there is a relationship between environmental perception, attitude and behavior. The results showed that the students had a good knowledge of and positive attitude to the environment. However, as past studies have already revealed, there is a gap between their awareness and proactive environmental behaviors. Knowledge does not appear to be the only variable needed and other hypotheses should be explored to change the behavior of young generations. This study provides some insights for implementing integrated sustainability processes and engaging students. Moreover, the results will support the structuring of a future *Geography* course that focuses on sustainable development and environmental risk.

Keywords: environmental education; student perception; university; climate change; sustainability

1. Introduction

The Earth has recently suffered a major exacerbation of global warming that is expected to intensify the frequency and severity of future catastrophic events [1]. The impact of climate change will endanger the economic system of many countries and all economic sectors [2]. Additionally, economic growth will lead to the overexploitation of natural resources and expose people and assets to pollution and natural disasters, primarily in cities [3]. This will engender harmful impacts on communities, economies and ecosystems [4]. The ecological crisis caused by human interference with nature [5] now poses a serious threat to the long-term survival of humankind. If we continue down this path, it is likely that we will deplete the planet of its resources and deprive humanity of its wellbeing.

Environmental research studies throughout the world continue to demonstrate how our economic and productive systems are on a collision course with natural systems and jeopardizing human survival. They also show how the overall economic and social situation has produced unsustainable development models that must change course without delay [6].

The notion of sustainable development is embodied in a multitude of actions, guidelines, policies and tools that drive efforts to solve environmental issues. Their implementation will require the shifting of production and consumption mechanisms in a more equitable direction through conservation and regeneration of the limited resources currently being consumed or degraded.

Sustainability is based on the idea that, if current human actions affecting the environment are not changed, future generations will not be able to use and enjoy many of the resources that past generations have benefited from, as has been highlighted in the 1987 Brundtland Report entitled "Our Common Future" (WCED) [7].

Responsibilities towards future generations were also defined in a resolution adopted by the General Conference of the United Nations Organization for Education, Science and Culture (UNESCO) held in Paris in 1997 [8]. The resolution encourages present generations to act for lasting development and preservation of life, which includes maintaining the quality and integrity of the environment and ensuring that future generations do not suffer from environmental degradation that endangers their health or existence.

The three main pillars of sustainable development are economic growth, environmental protection and social equality [7]. Implementation of these principles requires (i) "top down" interventions that will change production and consumption mechanisms through actions, guidelines, policies and tools and will encourage people to work with respect for environmental issues in all strategic, political, economic and social choices and (ii) "bottom up" ecological behaviors that move in a more just direction and satisfy the current and future needs of all people. In this context, citizen participation in strategic, economic, political and social issues is vital. The path to sustainability will not create a healthy nature-human balance until people learn how to "regenerate an ecological thought" that can change their behavior [9].

The main beneficiaries of sustainable development are young generations, who are also responsible for the fate of the Earth through their behavior. In other words, they have both the right to enjoy a clean planet and the duty to take care of it. Therefore, it is of the highest importance that students at every school level are taught about the environmental and develop awareness, values and skills that enable them to foster a sustainable society [10].

2. Sustainability and environmental education in higher education institutions

Educational institutions, particularly higher education, play a vital role in society, as their main purpose is to produce future experts and leaders [10–12]. Thus, they must be strongly committed to participating in the worldwide transition to sustainable development, as it has been defined in many international summits and programs.

The concept of sustainability in education was first introduced on a global level in the 1975 UNESCO-UNEP International Environmental Education Program [13]. Since then, a number of international declarations on the importance of providing sustainability-related knowledge and principles in schools have been widely accepted in the education community [14].

UNESCO has been implementing education initiatives for sustainable development that foster greater environmental awareness and encourage pro-environmental behaviors [10]. In 2019, the organization published the Framework for the Implementation of Education for Sustainable Development (ESD) [15]. The framework focuses on "policies, learning environments, teachers and educators, youth as well as communities" and aims to strengthen the contribution of education to the achievement of the 17 Sustainable Development Goals (SDGs) established in the Agenda 2030, which was adopted at the Rio +20 Conference in 2012. The most recent UNESCO thematic paper, entitled "The concept of sustainability and its contribution towards quality transformative education" [16], presents an update of the recommendation published in 1975 and broaden its objectives. The document explores the contribution of education to sustainability, discussing its role in addressing current global challenges such as climate change, climate justice and biodiversity loss.

In 2002, Carvalho stated that all education is environmental education, as all teaching and learning processes involve an environmental dimension. When this dimension is absent, these processes lose their meaning and do not support human survival [17,18]. While best practices for sustainability have been adopted worldwide [11], there is still much that can be done to integrate sustainability values into university programs [10].

Both environmental awareness and education of young people usually begin in the family and continue through their social lives and relationships. Parallel to this, media and information and communication technologies (ICTs) have an ongoing effect on their perceptions of sustainability and environmental issues [19]. In fact, when media considers such problem to be serious, they are also perceived as serious by people [20]. Moreover, ICTs are known to create change in perceptive processes and behaviors [17].

Raising environmental awareness in individuals should be a continuous process throughout all levels of education and should include proactive involvement in environmental protection actions, such as practicing recycling, reducing food waste, using renewable energy resources, etc.

There is a large amount of sustainability literature that cites the influential role of universities in both raising awareness and encouraging pro-environmental behaviors. In 2012, Rieckmann [21] involved 18 sustainable development experts in a survey to identify key competencies regarding sustainability. The results identified twelve crucial competencies, with the most relevant ones being systemic thinking, anticipatory thinking and critical thinking. Many higher education institutions have become committed to sustainable development through the signing of international declarations [22]. In 2013, Lozano et al. [11] analyzed eleven of these declarations and partnerships, which presented the universities' intentions to support the effectiveness of Education for Sustainable Development, thus helping universities to become sustainable development leaders. The study concluded that, notwithstanding a number of initiatives, universities have remained mainly traditional in engaging with sustainable development.

More recent studies show that some European universities have already seen significant results from integrating environmental themes into their programs and campus life [10,23,24]. Italy is becoming more sensitive to environmental problems, which is a positive development as the country is very susceptible to hydrogeologic and climate-connected hazards. A historic change in Italian legislation took place on 8 February 2022, when Parliament approved a constitutional reform law that added protection of the environment, biodiversity and ecosystems to the fundamental principles of the Constitution (Article 9). Furthermore, the law refers specifically to the interests of future generations and protection of health and the environment in relation to economic activities (in Article 41) [25]. Sustainable development is also a core concept of policies governing the Italian Recovery Fund and the Recovery and Resilience National Plan (PNRR) [26].

In 2021, the Italian Ministry of University and Research allocated funding for research contracts specifically regarding the green transition, ecosystem conservation, biodiversity and reduction of climate change impacts. In that same year, through the National Operational Program, the Italian Government used European money from the Axis IV "Education and Research for Recovery—REACT-EU" fund to launch two new PhD programs and research contracts on innovation and green topics [27]. The contracts also include the teaching of green and environmental topics as a transversal theme in other university disciplines.

Thanks to this funding, the 2022/2023 *Geography* course, which will be taught by the author of this study, will focus extensively on green and sustainability issues. The study presented below will be of major importance in (i) formulating the objectives of the new course by considering students' prior knowledge, attitudes and expectations, (ii) raising student awareness of the need to support environmental initiatives and (iii) ensuring more effective teaching of sustainable development.

The 2021/2022 *Cultural Geography B* course only addressed environmental issues related to urban development and the dangers of air and water pollution in cities. While the themes of climate change and natural disasters were only mentioned in one lesson without being thoroughly explored.

3. Methodology and survey results

A number of studies have examined the role of universities as key organizations for the deepening and expansion of human knowledge (e.g. [22,28]) and encourage such institutions to address the challenge of proactively building a sustainable society [29,30]. These studies have employed literature reviews [29–32], semi-structured interviews [33] and surveys or questionnaires, e.g. [10,19,34–36] to explore student perception of environmental issues at both lower and higher education levels.

To date, only a few studies have been developed in Italy to analyze university student perception. With an objective similar to the present study, Sonetti et al. [37] administered a survey to 1,408 students at the Polytechnic University of Torino, which investigated free associations with sustainability, self-reported measures of knowledge and relevance of sustainability goals. More studies are expected to be developed in Italy, with the aim of evaluating the efficacy of the most recent government funding program through the abovementioned National Operational Program.

The survey questions used in the present research (e.g. [10,19,34–36]) were either created specifically for this case study or inspired by questions from other studies and adapted accordingly. Moreover, the results were analyzed by comparison with similar research papers.

The closed-question survey was administered online and queried students about their knowledge, perceptions, attitudes and behaviors regarding sustainable development and environmental issues. The results were analyzed using descriptive statistics methods, in order to gather thorough data and to both

understand participant perception of climate change and environmental issues and investigate their behaviors. The survey was administered in January 2022 to students in *Cultural Geography B* a month after the course ended. They participated in the study voluntarily and received the link via their academic email addresses. Out of the 250 students solicited, a sample of 199 students was obtained, resulting in an 80% response rate.

The first set of questions were about age, sex, area of study, course access and residency. Respondent ages ranged from 19 to over 24, with three quarters of them (150 out of 199) being 20 or 21 years old and only 9 being older than 24. Of the 199 participants, 182 (91.5%) were females and 17 (8.5%) males, which was to be expected because the majority of students in the *Cultural Geography B* course were female. Unfortunately, this result means that it was not possible to analyze whether gender is an influential factor in environmental behavior. Regarding area of study, 196 students are in their second year of a bachelor's degree in Languages and Cultures for Tourism and three are doing a different bachelor's degree program within the Department of Foreign Languages and Literatures and Modern Cultures.

The 2021/2022 *Cultural Geography B* course was offered both in-class and online and access was as follows: 99 students (around 50%) attended in-class lessons, 53 (26.5%) watched live lessons on the Webex platform (synchronous mode) and 47 (23.5%) watched recorded lessons on the Moodle platform (asynchronous mode). This strategy was adopted for the current academic year because the previous year (2020/2021) had been conducted entirely online due to the COVID-19 pandemic. At the moment, it is not possible to say whether the University of Torino will continue with this strategy, which has nonetheless obtained good results both in terms of involving students who were unable to attend in-class lessons and using new technologies and visual methods to teach *Geography*, as explained in more detail by various researchers, e.g. [38–40].

The objective of the next set of questions was to understand student knowledge and perception of environmental and sustainability issues and compare both to their behavior. The first question was "According to your perception, which of the following phenomena require the most urgent intervention?" (Figure 1). Students were allowed to select up to four options and the top answer was global warming (chosen by 159 out of 199 or about 80%); while astonishingly only 30% (60 out of 199) selected natural disasters, showing that they have a strong disconnect between cause (global warming) and effect (natural disasters). While it is heartening that students have concerns about climate change, it is possible that they do not clearly understand the direct correlation between it and the threat of drought, glacier loss, floods, landslides, forest fires and heat waves in urban areas. This result is significant and clearly indicates that the new *Geography* course must thoroughly examine how climate change brings about natural disasters, particularly as Italy is a very high-risk area for hydrogeological phenomena.

As for the other options, over 50% of interviewees (100 answers) indicated their concern about pollution caused by plastics and industries, 37% (74 participants) are worried about forest loss and food contamination and waste and 33% (37 participants) about intensive farming. Issues perceived as the least urgent are soil pollution and pesticide use and pollution caused by forest fires, noise and electromagnetism.

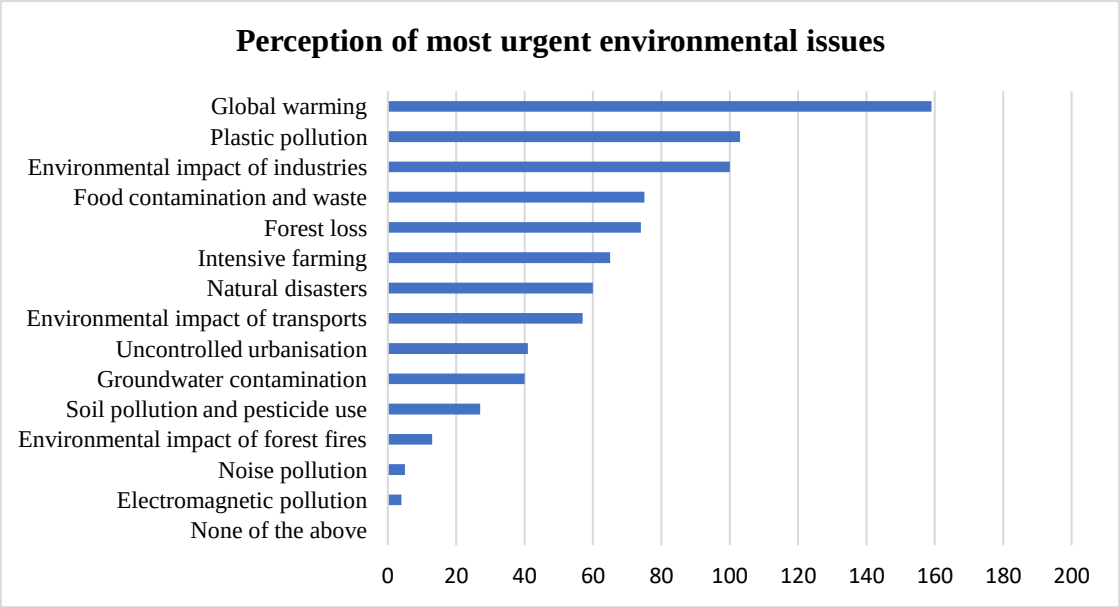

Figure 1. Perception of must urgent environmental issues.

The second question, which was "Do you practice sustainable behavior in your daily life?", offered a wide range of answers and no limit to the number of responses (Figure 2). About 90% (180 participants) said that they separate recyclable waste and 68.8% (137 participants) that they try to reduce their water and electricity consumption. However, less than 50% (93 out of 199) of them indicated that they understand the concept of circular economy, which is directly connected to this behavior, and only 25% understand it well. On a positive note, only 1% indicated that they do not practice any type of sustainable behavior.

About one third indicated that they use a bicycle or public transport rather than a car and that they buy or sell used or recycled clothes and items. Given the young age of the interviewees, a greater interest in these two issues was expected and reassuring. Finally, only 4.5% of the students (9 out of 199) use carsharing and carpooling apps. According to other studies, e.g. [42], reduced public transportation can be due to a greater availability of private cars.

Referring back to the question on the perception of urgency, although more than a third of the students had indicated their concern about food contamination and waste and intensive farming, surprisingly only 15.6% of them (31 participants) indicated that they eat organic and zero-km food and only 21.6% (43 out of 199) use food waste apps such as Too good to go, My foody, etc.

Regarding personal interest and activism, 16.1% (31 participants) said that they read news and participate in social network discussions on green issues, while only 2.5% (5 participants) participate in environmental activities and volunteer in environmental associations. Environmental volunteering is a synthetic criterion that can be used to evaluate the effectiveness of environmental education, even if the rate is usually quite low, i.e., about 4% in the European Union [34].

Figure 2. Student sustainable behaviors.

Students were then asked to indicate if they had been introduced to sustainability issues through secondary school, university, media or social networks. Only 4.5% (9 participants) said that they had encountered the concept of sustainability for the first time in the *Cultural Geography B* course. Most of them had already learnt about it at secondary school or on social networks and the Internet. A small percentage said that they had been exposed to the idea in a different university course or on television.

These results have confirmed that younger generations are getting a lot of environmental information and education through social media. Therefore, it would be incumbent on teachers to verify that their students have not been misinformed by all the fake news and inaccuracies that are spreading out of control on social networks and the Internet.

The next 15 questions queried the students' level of worriedness regarding sustainability issues on a global, municipal, university and personal level. The five possible answers were: "Yes, a lot", "Yes, partially", "No, not much", "Not at all" and "I don't know". Most students responded that they are worried or very worried about the environmental situation of the planet, in particular about climate change and poor quality of life in cities. However, only 117 out of 199 students (59%) have a solid perception that environmental problems are negatively affecting their lives. It appears that there is both a gap in their thinking and a lack of vision with regards to the future impact of climate change. This must be remedied by in-depth discussion in the new *Geography* course. It is very troubling that 41% of the interviewees have no perception of the fact that the current environmental situation could negatively impact their lives. If they do not understand how environmental problems pose a risk to themselves, it is difficult to imagine how they could intervene concretely towards protecting the rights of future generations.

Students were then asked who they blame for current environmental problems. Out of the 199 interviewees, 163 (82%) believe that governments are not adequately addressing environmental issues and 181 think that responsibility for the planet's future falls on every single person. It is encouraging that the majority of students recognize that responsibility for the environment exists on various levels and further education can show them what strategies must be undertaken by stakeholders to find solutions.

Students are unsure if movements and associations that address environmental issues, such as "Fridays for Future", are actually achieving concrete results. Almost half of them do not believe that these movements are accomplishing their goals, while 89 believe that they are partially successful and

only nine are convinced of their efficiency. Their lack of participation in such associations could be attributed to this skepticism.

The questions then focused on their perception of the environmental situation in the City of Torino. Seventy-seven percent think that Torino is polluted and unsustainable and about half of them are not aware of what the municipality is doing to address its urban sustainability problems. Only 70 out of 199 students (35%) believe that Torino should involve its citizens in the resolution of these problems. During the 2021/2022 *Cultural Geography B* course, only one case study on the regreening of Torino [3] was discussed, which may have influenced these responses. The theme of urban projects will certainly need to be better explored in the 2022/2023 course.

Regarding environmental activities at the University of Torino, 158 students think that university spaces are sustainable thanks to the presence of recycling bins and efforts to reduce the use of paper, plastic and energy, while 139 think that the University is dealing with sustainability problems by organizing awareness-raising activities and conferences for students. However, they may not be aware of all the initiatives that the university undertakes to address environmental issues.

The objective of the last set of questions was to gather valuable information for structuring the future *Geography* course. Students were asked whether they had dealt with environmental and sustainability issues in any other university courses they had taken so far besides *Cultural Geography B*. Most said that they had studied these themes only superficially or not at all. Thus, students believe that it would be useful for all Departmental bachelor's degrees to include a *Geography* course that deals primarily with these issues. The majority of students would also be interested in studying such topics as food contamination and waste, urban sustainability, intensive farming and climate change. However, they are less interested in natural disasters, plastic pollution, waste recycling and the circular economy. According to the survey, the least interesting topics are forest loss and electromagnetic pollution. Moreover, atmospheric, groundwater and soil pollution do not seem to interest them, most probably because these ideas have already been addressed in the 2021/2022 academic year.

4. Conclusions

The study sought to determine if a relationship exists between environmental perception, attitude and behavior within a specific group of students. Firstly, results showed that the surveyed students had a particularly good knowledge of and positive approach to environmental issues. However, while students have concerns about climate change, their responses did not particularly correlate with their degree of familiarity with risks linked to natural disasters. Secondly, students strongly associate their environmental behaviors and individual sustainable lifestyle with "light green" actions such as separating recyclable waste and reducing their water and electricity consumption. Regarding other types of behavior, only one third of them use a bicycle or public transport rather than a car and buy or sell used or recycled clothes and items and even less of them pay attention to food quality and provenance. Thirdly, while respondents appear to have a positive outlook regarding sustainability-oriented challenges and the future of the planet, they claim to have little personal interest in environmental activism and volunteer activities.

Generally, in keeping with several previous studies that analyze the environmental knowledge and behavior of university students, e.g. [10,25,41–43], the survey participants are clearly aware of environmental issues. However, it seems evident that this sensitivity does not translate into proactive behavior and willingness to intervene in person either as an individual or part of an environmental protection association. This study found a link between sustainability awareness and an increase in sustainable behavior that varies according to the type of behaviors. As for other studies, e.g. [43],

results show that this link does not exist for all behaviors, for example the use of sustainable transportation. Knowledge does not seem to be the only variable needed to strengthen environmental behaviors and other strategies should be explored to change young generation attitudes.

While the present study does not claim to be exhaustive or offer a deep understanding of student perception of sustainability, it can help to (i) foster environmental awareness through education, (ii) encourage long-lasting behavioral changes and (iii) provide some suggestions for implementing integrated sustainability processes among students. It can also contribute to filling the gap of providing insights for people working in the field of sustainable development in higher education.

As already suggested by past studies, this can be achieved by adapting university curricula [42], integrating curricula assessment [44] and taking an interdisciplinary approach [10]. Therefore, understanding the key drivers of change in sustainable behavior can influence university policy, guide the allocation of resources and help campuses reach their sustainability goals. Governments will need to fund universities that foster pro-environmental behavior. A further policy suggestion is to enlarge the range of activities in order to create synergy through teaching, research, social engagement, governance, policy activities and the physical environment of universities [45].

The findings obtained here cannot be generalized, as the study was conducted on a sample of students all doing the same university degree. However, the results can be used to design both the new *Geography* course and future studies on the environmental perception, attitude and behavior of students.

Further research will be of vital importance to effectively change student perception and subsequent behavior and could help translate results into good practices. Given the interdisciplinary nature of the subjects involved, actions for sustainability and environmental protection at the university level should include more multidisciplinary collaboration. While investigating ecological issues and social impacts, future *Geography* courses and research will need to link all disciplines and be included in all degrees. A future goal could be to involve other Departments that address environmental issues and propose a survey aimed at a larger and more varied sample of students in terms of fields of study.

Moreover, raising environmental awareness and encouraging proactive behavior should involve more than just students and professors. A close collaboration between higher education institutions and external stakeholders can have major influence on advancing sustainability [10]. The involvement of local stakeholders, such as citizens, associations and businesses, can foster community engagement [46] and develop collaborative work that will protect the environment and address sustainability challenges.

In the future, development and implementation of comprehensive methodologies will be needed in order to conduct integrated research, education and outreach regarding sustainability at higher education institutions and to evaluate the long-term impact of this education [14]. Use of new ICTs can bring changes in attitude, behavior and values, as well as cognitive and perceptive processes [17]. Given the growing role that social media play in learning processes, teachers must carefully examine and determine the veracity of all information provided by these means of communication. New didactic methods and approaches are required when teaching environmental geography in order to meet the needs of new generations and achieve mutual understanding.

The future *Geography* course will require more in-depth discussion to identify, critique and compare facts and attitudes towards nature and the environment, as well as more use of simulation games to immerse students in ecological situations [24]. Case studies and simulations presented by both professors and external experts will foster independent thinking and encourage students to change their attitude and behavior towards achieving common objectives. In the words of Riordan and Klein [31], "sustaining the environment relies on students becoming problem-solvers, critical-thinkers, and ultimately, change-makers".

This study can help create two surveys for the 2022/2023 academic year. One can be a comparative study specifically for students of the new *Geography* course to see how much the new, more comprehensive content affects their responses. The other can be a more detailed questionnaire administered to a larger group of students studying a variety of disciplines to determine their awareness and knowledge of environmental issues and willingness to participate in proactive environmental protection activities.

Finally, these future studies will be of vital importance in determining the effectiveness of research and teaching financed through funds for the green transition that the Italian Ministry of University and Research allocates to its National Operational Program. The promotion, development and comparison of these types of studies will be fundamental in determining the success of the program.

Conflict of interest

The authors declare no conflict of interest.

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