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CLIMATE CHANGE EDUCATION AS A TOOL FOR MITIGATION

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Abstract. The data provided by the assessment reports of the Intergovernmental Panel on Climate Change (IPCC) leave no doubt about the climate crisis facing the planet and humanity as part of it. This is why it is essential to take climate change mitigation measures to curb this crisis. One of the mitigation measures with great potential for change is Climate Change Education, so it is important to evaluate its mitigation potential. In Uruguay there is no research related to Climate Change Education specifically, but there is some research related to Environmental Education, although not in a systematic way. The objective of this research was to develop a Climate Change Education program for high school students in order to assess the mitigation potential of climate change. For this purpose, the program was applied to first year high school students in a private institution and changes in attitudes and mitigation habits before and after the application of the program were evaluated through surveys and observations. The results showed that attitudes towards climate change improved and students began to develop more mitigation habits and demonstrated more awareness and interest in applying them in the future. This is evidence that a Climate Change Education program can be beneficial to promote climate change mitigation, so it is important to deepen research in this field using different methodologies.

Key words: Climate change, mitigation, climate change education, environment, Uruguay

LA EDUCACIÓN PARA EL CAMBIO CLIMÁTICO COMO HERRAMIENTA DE MITIGACIÓN

Resumen. Los datos proporcionados por los informes de evaluación del Grupo Intergubernamental de Expertos sobre el Cambio Climático (IPCC) no dejan dudas sobre la crisis climática que enfrenta el planeta y la humanidad como parte de este. Es por esto que se vuelve esencial tomar medidas de mitigación del cambio climático para frenar esta crisis. Una de las medidas de mitigación que se presenta con grandes posibilidades de cambio es la Educación para el Cambio Climático, por lo que es importante evaluar sus posibilidades de mitigación. En Uruguay no hay investigaciones relacionadas con la Educación para el Cambio Climático específicamente, sino algunas relativas a la Educación Ambiental, aunque no de manera sistemática. Esta investigación tuvo como objetivo desarrollar un programa de Educación para el Cambio Climático para alumnos de secundaria con el fin de evaluar el potencial de mitigación que este puede tener. Para esto se aplicó el programa en alumnos de 1º año de secundaria en una institución privada y se evaluaron mediante encuestas y observaciones los cambios de actitudes y hábitos de mitigación antes y después de la aplicación del mismo. Los resultados mostraron que las actitudes hacia el cambio climático mejoraron y los alumnos comenzaron a desarrollar más hábitos de mitigación y demostraron más conciencia e interés en aplicarlos a futuro. Esto evidencia que un programa de Educación para el Cambio Climático puede ser beneficioso para promover la mitigación del cambio climático, por lo que es importante profundizar la investigación en este campo utilizando distintas metodologías.

Palabras clave: Cambio climático, mitigación, educación para el cambio climático, ambiente, Uruguay

Introduction

The first part of the IPCC's Sixth Assessment Report on climate change published in mid-2021 leaves no doubt as to the climate emergency situation. It is unequivocally stated that human activity is directly related to climate change (changes in the atmosphere, oceans, cryosphere and biosphere) and the increase in the concentration of greenhouse gases since 1750, and that humans are one of the main precursors of climate change. It is also suggested that without significant GHG reductions, future scenarios are very unpromising (IPCC, 2021). Therefore, climate change mitigation is an urgent issue in order to preserve living conditions on the planet.

According to Cordero et al. (2020), there are several actions that can be taken to reduce GHG emissions, such as the use of clean energy, reforestation, the use of electric vehicles, energy efficiency in households and climate change education. According to the authors, the latter is one of the measures that can have a major impact on mitigation.

Although different actions have been taken in Uruguay to commit to avoid and ameliorate the causes of climate change, a report conducted by UNEP-REGATTA (n.d.) and another report published by Ludeña and Ryfisch (2015) for the IDB indicate that mitigation is not a priority line of action for the country.

Regarding climate change education in Uruguay, although there are some lines of work that propose environmental education (in a more general way) in the country and there is a National Environmental Education Plan, this does not include climate change education and at present it has not been systematically implemented, despite the fact that the plan was developed in 2014.

Likewise, UNESCO (2011) points out that climate change education is a tool to address the issue and help mitigate the effects of climate change by educating citizens who are sensitive and aware of the role they play in mitigation. In view of the fact that scientific reports are conclusive about the role of human activity in the current climate crisis, it is essential to learn how to change living and consumption habits to reduce GHG emissions.

It is for these reasons that this project investigates the influence of Climate Change Education (CCE) on mitigation through a curriculum in order to promote mitigation and serve as an initial study for future research in the area of mitigation through CCE.

A project of this type can be beneficial because all the knowledge related to climate change helps people, in this case younger people, to be able to face the consequences of climate change and make decisions that allow them to be a mitigating factor. It can also serve as an adaptation tool that allows young people to have resources to address the causes of the climate crisis.

There are different works that have been carried out in Latin America and other parts of the world that were used as a reference for the creation of the education program for climate change and that show the relevance of the study of the subject. An important work regarding the collection of information on education for climate change mitigation in Latin America is that carried out by N. Cruz and P. Páramo in 2020, which derives from a doctoral thesis focused on the issue of climate change assessments in university students. As Cruz and Páramo (2020, p. 483) reflect:

> It is noteworthy that most of the papers do not evaluate the effectiveness of interventions on direct behavioral change and that descriptive articles are still predominant, although it is recognized that they are the baseline that opens the door to intervention or experimental studies.

This points to the need to develop more experimental studies that can show some relationship of how social representations and perception change after applying different methods and interventions, which is one of the objectives of this project.

Another important work regarding the relevance of climate change education on people's attitudes and perceptions is the one conducted by A. González Ordóñez in 2016. The results obtained after the application of the program are of great importance as a basis for the development of the unit to be applied with the sample in this final project. According to González Ordóñez (2016), after the application of the program, it was possible to notice in adolescents more knowledge about climate change and interest in the subject, more environmental awareness, more interest in sharing information within the closest circle, and as far as mitigation is concerned, they showed more interest in participating in workshops and actions to mitigate climate change.

In relation to studies conducted in other parts of the world outside Latin America, one of the surveys applied in the research is the "Climate Change Attitudes Survey" which measures the beliefs and intentions of high school students to promote positive environmental change in the United States. This climate change attitudes survey developed by R. Christensen and G. Knezek during 2014 and 2015 measures students' beliefs and intentions regarding the environment with a specific focus related to climate change. According to Christensen and Knezek (2015), one of the main objectives of this survey is to fill a gap in the measurement of high school students' affective responses to the environment and climate change. This instrument is useful for assessing changes in attitude before and after an intervention, so it is of great relevance to this research and is used as a measurement tool.

Regarding the identification of effective climate change education strategies, Monroe et al. (2017) conducted a systematic review of research in countries in Europe, Asia, and North America. According to the review by Monroe et al. (2017), the characteristics of successful climate change education programs are that they focus on making climate change information personally relevant and meaningful to students, and that educational activities or interventions are designed to actively engage students. Other important strategies that could be identified are that educators used deliberative discussion to help students better understand their own knowledge and other people's views on climate change; students had the opportunity to interact with scientists and specialists; programs included discussions about climate misconceptions; and students participated in the design and implementation of community projects to address a climate change issue. These aspects are taken into account for the implementation of the program.

The general objective of this project is to implement a mitigation-oriented climate change education program in a group of adolescents in the first year of secondary school in an educational institution in Montevideo, Uruguay.

The specific objectives are as follows:

- Create a climate change education program for 1st year high school students
- Implement a climate change education program for students in the 1st year of secondary school
- Describe climate change mitigation practices and attitudes towards climate change applied by students before and after the program

- To assess changes in students' attitudes and behaviors related to climate change and its mitigation.

Method

Research design

The research conducted was qualitative in nature with an action research approach in order to be able to describe climate change mitigation practices and attitudes towards climate change applied by students before and after the program and to evaluate these changes in attitudes in order to understand the relationship between climate change education (CCME) in high school students and behaviors and attitudes towards mitigation. This research allowed the approach of the problem from the educational community by applying an intervention that allowed a deep observation of the dynamics of the students with respect to climate change.

A qualitative type of research was chosen. Although data were collected in terms of attitudes, before and after the intervention, which are compared numerically, the focus was not placed on quantities in order to extrapolate objective data to other realities, but in order to understand the subjective reality and the processes that occurred during the intervention.

The research design applied was that of action research within the intervention, since it seeks to promote a change in a reality. In this case, we sought to generate a change in attitudes and behaviors related to climate change mitigation within the framework of the EpCC. The intervention carried out was a pedagogical intervention.

The cut of the research was longitudinal since changes in behavior and attitudes were analyzed over the time the intervention was carried out, collecting data before starting the intervention and once the intervention was completed through surveys and during the intervention through participatory observation.

Population and sample

The population that participated in this research was the students in 1st year of secondary school in a private educational institution in Montevideo, Uruguay, made up of 70 students.

The sample has the following characteristics:

- These are secondary school students who have successfully completed primary education and are 12 or 13 years old
- They are students of a private school that has the International Baccalaureate program as part of its educational program.
- They are students who attend double shifts at the school
- The students belong to middle and upper-middle class families
- The students did not take part in EpCC or EA programs

The sample chosen was a non-probabilistic sample of 36 students out of 70. This sample was chosen because it was the one approved by the educational institution that facilitated the possibility that the researcher could carry out the intervention.

Variables

In this research the independent variable was "climate change education" and the dependent variable was "climate change mitigation attitudes and behaviors", since the

dependent variable made up of these mitigation attitudes and behaviors can be hypothetically influenced by the independent variable, climate change education.

In order to carry out the research, the theoretical variables and the operational variables that will allow the measurement of the theoretical variables were defined:

Theoretical variable 1: Climate change education

Operational variable 1: Knowledge about climate change (indicators to be measured to obtain information about this knowledge: what is climate change, knowledge about the causes, knowledge about the consequences, knowledge about what is mitigation)

Theoretical variable 2: Climate change mitigation attitudes and behaviors

Operational variable 2: greenhouse gas emission indicators (consumption, transport, food, use of products with high/low footprint).

Measuring instruments and techniques

The techniques used to collect data are the survey and participant observation.

To record the observations made, the instrument used was an observation form that was completed each class with the students.

The second technique used to collect data was two surveys that were administered before the intervention began and after its completion.

Procedures

Table 1 summarizes the steps followed in the research.

Table 1
Procedure for conducting the investigation

	Duration	Remarks
Design and review of the EpCC plan to be implemented	8 weeks	The design was carried out by applying the teaching knowledge and the bibliography presented regarding EA, EpCC and previous research.
Observation sheet design		The observation sheet was designed taking into account the relevant parameters to be observed.
Survey design and adaptation	1 week	The CCAS survey was in English, so an official translation was required. In the case of the initial and final surveys, it was necessary to process the information from the relevant study and adapt it to this project.
Request for approval of the proposal by the educational institution	2 weeks	Once the project design was completed, the proposal was presented to the educational institution in a formal instance that included a presentation with all the characteristics of the intervention, surveys, observations to be made and a description of the project. After an analysis, the institution gave its approval.
Request for ethics committee approval	2 weeks	After submitting the necessary documentation, the university's ethics committee approved the project
Conducting baseline surveys with students prior to beginning the intervention	40 minutes	Students completed the surveys following the instructions on the surveys.
Intervention following the EpCC plan	12 weeks	The intervention was carried out by having classes twice a week for 12 weeks. The intervention followed the outline in Annex 6. In all classes I made observations that were documented on the observation sheet.
Completion of final surveys at the end of the intervention	40 minutes	Students completed the surveys following the instructions on the surveys.

Note. Table prepared by the authors.

Statistical analysis

The statistical analysis performed was descriptive in nature. For the creation and coding of the survey database, Google Forms was used, which works in conjunction with Google Spreadsheets, allowing the information obtained from the surveys to be coded in tables. Frequency percentages and averages were used to analyze the data, which are presented in the form of graphs showing the results obtained. To perform these operations and graphs, Excel was used to export the data obtained in Google spreadsheets.

Results

The results presented below were obtained from the surveys conducted with the sample before and after the implementation of the EpCC program and from the classroom observations carried out in each of the implementation instances. The program was carried out in a sample of 36 students divided into two groups identified as Group A and Group B. Each group consisted of 18 students and the same program was applied. The results obtained are shown for both groups separately.

The results obtained in the initial and final surveys are divided into different categories, the results of which are presented below.

Climate change knowledge

Regarding knowledge of climate change before starting the program, all participants reported having heard of climate change. In both Group A and Group B, 38.9% of the participants said they had heard about climate change and knew what it was; the rest said they were not clear about what it was or did not know about the phenomenon. In both groups, the places where they heard the most about the topic were social networks, TV and school.

When asked if they would like to know more about climate change, none of the students answered "no". The majority (77.8% in Group A and 83.3% in Group B) expressed wanting to know more about the topic in the initial survey. And as for how much they feel they learned about climate change after applying the program (from 1 to 10), the majority of students in both groups (100 % in the case of Group B and 88.9 % in Group A) answered to have learned a lot (between 7 and 10).

In the case of whether they perceive climate change as a serious problem or not as a problem, there is a change towards considering climate change as a more serious problem in the perception of both groups after the program was applied.

In relation to the importance of climate change in the lives of the participants, before the program 66.7% of Group A and 50% of Group B considered climate change as something important or very important in their lives, while at the end of the program 100% of Group A and 83.3% of Group B considered it important or very important.

Causes of climate change

Regarding knowledge of the causes of climate change, before the program was applied, 22.2% of Group A and 55.5% of Group B said they knew the causes, and at the end of the program 94.4% of Group A and 100% of Group B said they knew the causes. As to whether or not these causes that they expressed to know are correct or not, in the case of the causes expressed before the program, some are correct and others are consequences and not causes.

In relation to whether a person's habits influence climate change, before the program 66.7% of Group A and 88.9% of Group B answered yes before starting the program, while 100% of both groups answered yes after its implementation.

Consequences and effects of climate change

Regarding knowledge of the consequences and effects of climate change, 33.3 % of Group A and 55.6 % of Group B said they were aware of them before starting the program, while 100 % of both groups said they were aware of the consequences and effects at the end of the program. The consequences presented by the students before and after can be found in Annex 9.

In relation to whether climate change affects everyone in the world, in Group A the affirmative answer changed from 55.6% to 94.4%, while in Group B it was from 55.6% to 61.1%. As for who they think it affects, if they answered that it does not affect all people (in

the initial survey), some students from both groups said that it affects animals, the atmosphere and living beings, without focusing on human beings; while in the final survey some students from Group B said that it affects people with fewer resources.

Actions and measures to curb climate change

As to whether they have heard about climate change mitigation, in the initial survey no students in Group A said they knew about the topic, and 22.2% of Group B said they had heard about mitigation, while after the program was implemented, 33.3% of Group A and 16.7% of Group B said they had not heard about the topic.

In relation to whether anything can be done to slow down climate change, in the case of Group A, 66.7% said yes before implementing the program and 94.4% said yes after completing it. In the case of Group B, responses ranged from 77.8% to 83.3% after completion. No student expressed that nothing could be done at the end of the program, while 5.6 % of both groups expressed a refusal before starting.

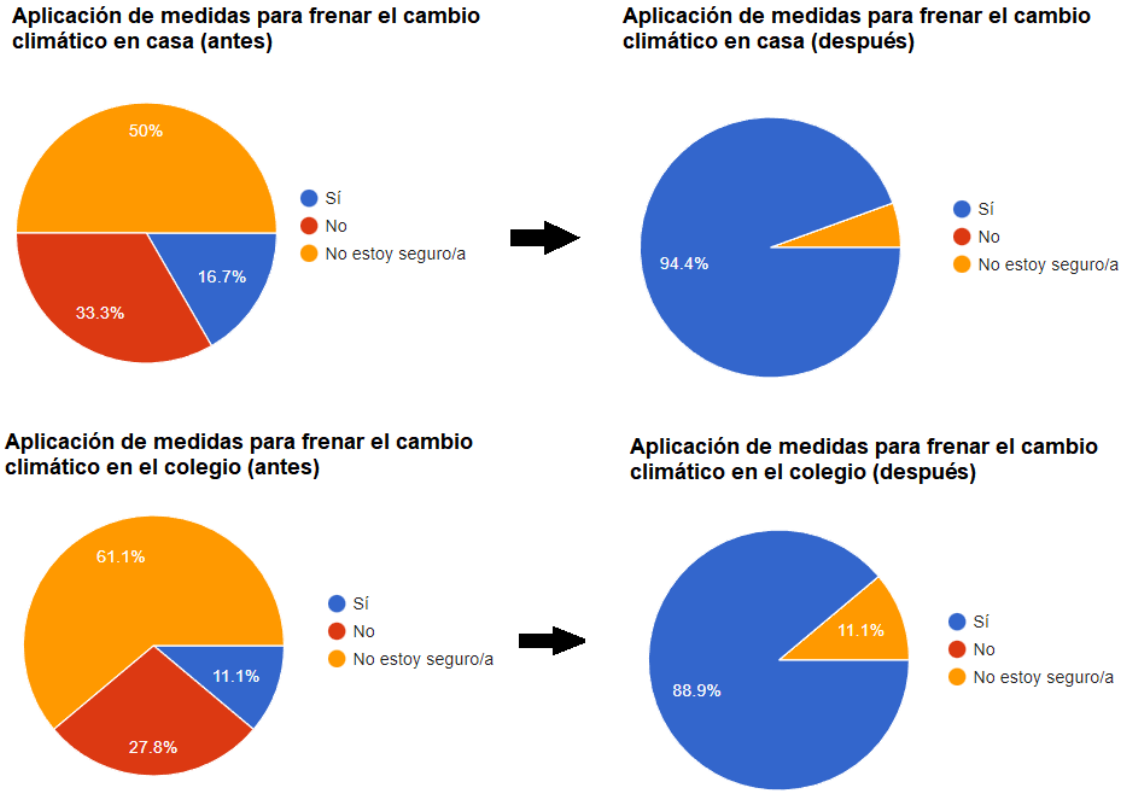
Regarding knowledge of measures to curb climate change, before starting the program, 55.6% of Group A and 22.2% of Group B stated that they did not know any measures, while only 5.6% of Group B expressed ignorance at the end of the program. The number of measures to be applied as explained by the students before and after the program can be seen in Annex 9. It can be observed that the number of measures and their relevance increased at the end of the program.

The item related to actions taken to curb climate change was divided into actions taken at home and at school. In both groups, the actions applied increased at the end of the program as shown in Figure 1 for Group A and Figure 2 for Group B.

In the case of the question on whether they would like to take action to curb climate change, the results obtained in the initial and final survey did not vary much in Group A (88.9% to 83.3% affirmative answers) and in Group B the affirmative answers went from 94.4% to 72.2%. The same trends can be observed in the participation in conferences to curb climate change.

Figure 1

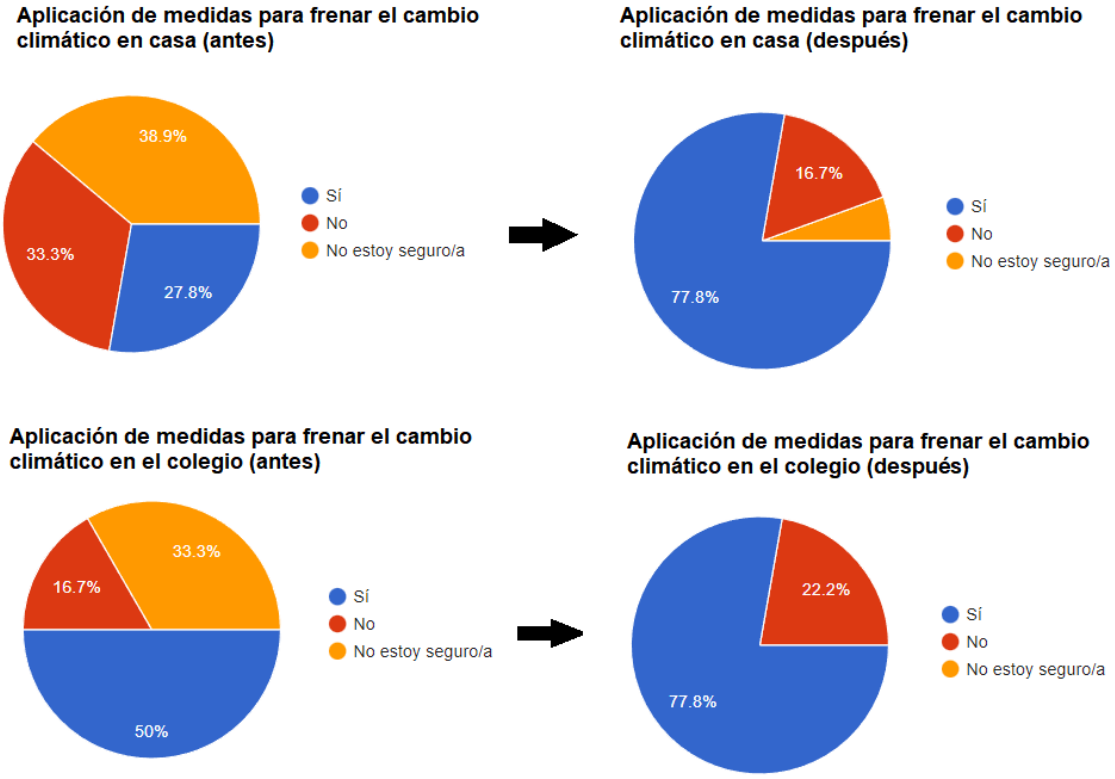
Comparison of actions taken before and after the program was applied in Group A.



Note. Figure prepared by the authors based on survey data.

Figure 2

Comparison of actions performed before and after the program was applied in Group B.



Note. Figure prepared by the authors based on survey data.

Climate change information exchange

Regarding the information shared on climate change, it can be observed that in both groups more information was shared after the end of the program.

The sources of information that were mentioned before and after as sources of information on climate change in both groups were mainly television, social networks and internet before starting the program, while after its implementation one of the important sources that is marked is the unit on the subject.

Feedback

Before starting the program, the majority of students (88.9% in both groups) expressed the need for climate change to be addressed in the educational institution and the need to learn measures to curb climate change (94.4% in both groups).

At the end of the program the students expressed how much they changed their habits regarding climate change mitigation, how much they learned and what they planned to do in the future.

Most of the students in both groups expressed that what they learned was useful, that they learned a lot about climate change, that they improved their habits to reduce GHG

emissions, and that they plan to make changes to further reduce these emissions. The habits that the students expressed their intention to adopt after applying the program are the following:

- Buy second hand clothes
- Do not consume products containing palm oil
- Reducing the amount of waste produced and recycling
- Do not consume so much plastic
- Stop consuming products that generate a lot of GHGs
- Switching from bottled water to a purifier
- Use non-disposable face masks
- Bicycling and walking more instead of driving
- Eating organic food
- Use renewable energies
- Reduce meat consumption
- Adopting a vegan lifestyle
- Raise awareness of the issue on social networks and with people you know
- Use products without packaging (solid shampoo and conditioner)

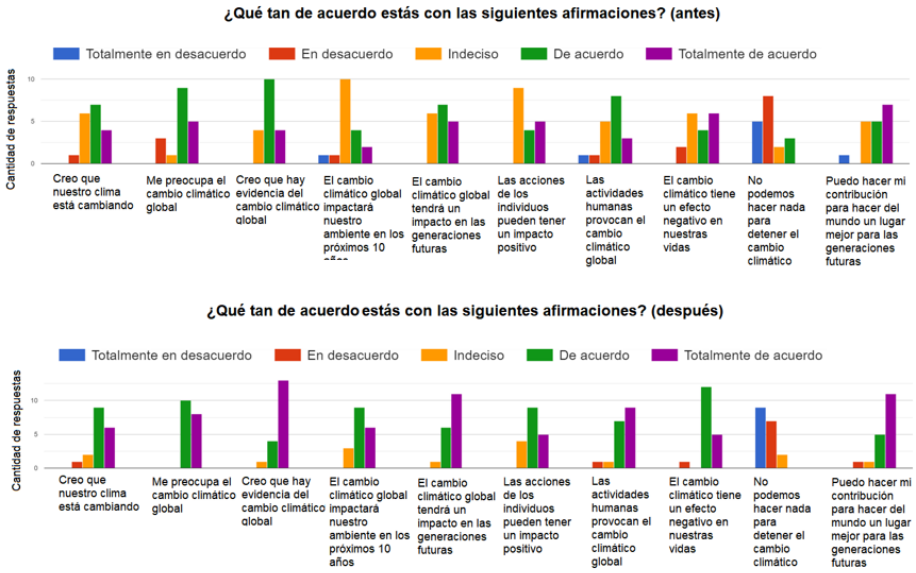
Some students (38.9% in Group A and 11.1% in Group B) expressed that they would have liked to take certain actions or make changes that they could not do because of their age, because their families did not support them or because they do not know how to do it or find it too difficult.

Results of the Climate Change Attitudes Survey (CCAS)

The CCAS survey was administered before and after the program and Figures 3, 4, 5 and 6 show the variations in responses before and after the application of the program in both groups. These responses are discussed in Chapter 5.

Figure 3

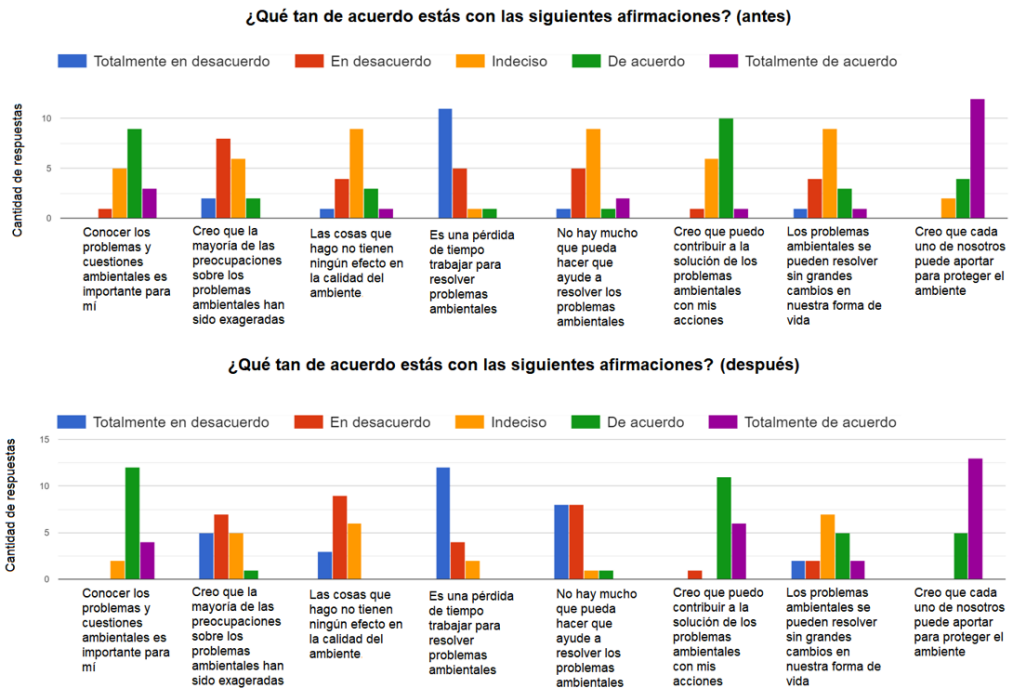
Variation in responses to Part 1 of the CCAS survey regarding attitudes towards climate change before and after program implementation in Group A.



Note. Figure prepared by the authors based on survey data.

Figure 4

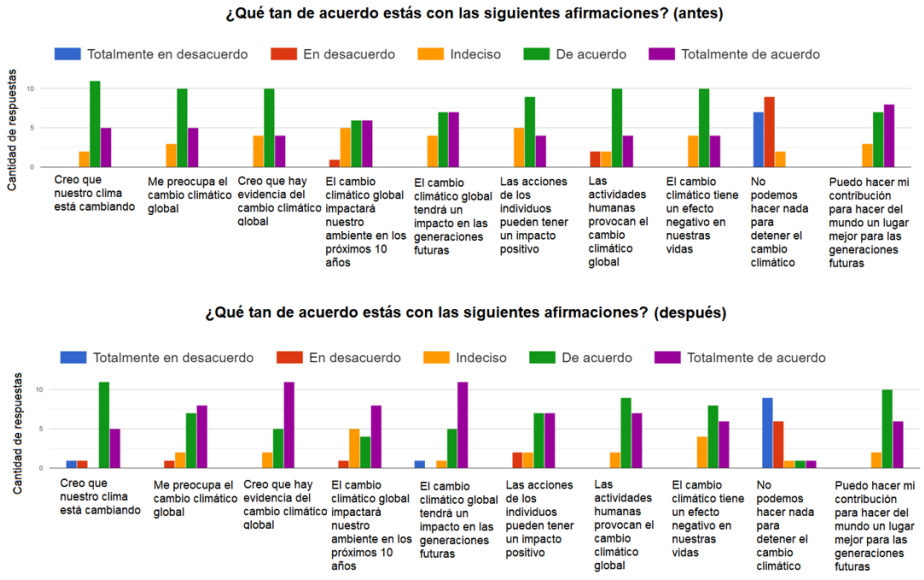
Variation in responses to Part 2 of the CCAS survey regarding attitudes towards climate change before and after program implementation in Group A.



Note. Figure prepared by the authors based on survey data.

Figure 5

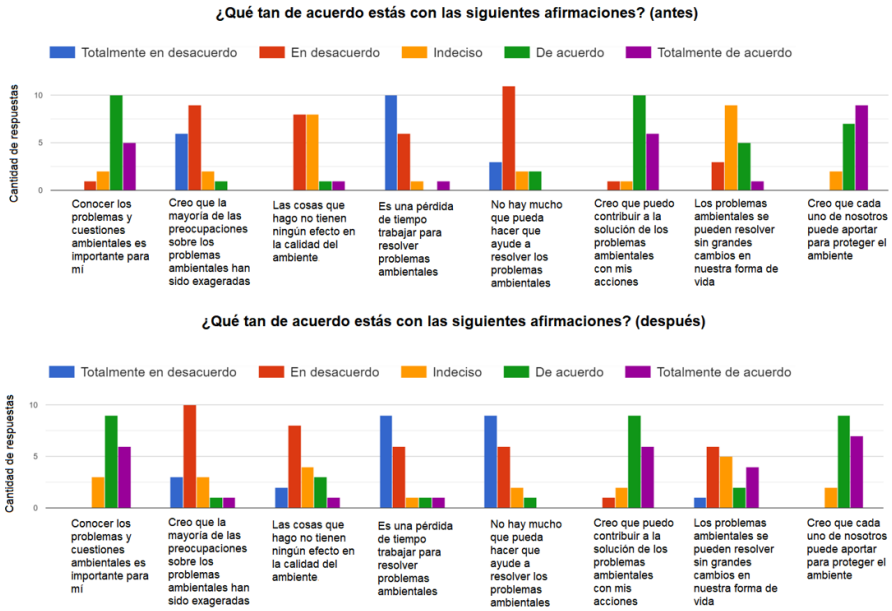
Variation in responses to Part 1 of the CCAS survey regarding attitudes towards climate change before and after program implementation in Group B.



Note. Figure prepared by the authors based on survey data.

Figure 6

Variation in responses to Part 2 of the CCAS survey regarding attitudes towards climate change before and after program implementation in Group B.



Note. Figure prepared by the authors based on survey data.

Results obtained from observations

In each of the meetings with the students of the two groups during the application of the program, observations were made regarding the doubts, comments, attitudes and feelings of the participants with respect to climate change, taking into account the objectives of this research. Observations were recorded in a spreadsheet during and after each instance. In those cases where a comment was considered relevant or important, it was noted at the time. Likewise, at the end of each class, a record was made of the attitudes and feelings regarding climate change that could be observed in that instance.

It was possible to observe how different reactions to the problem emerged in the course of the program's implementation. At the beginning there was more ignorance, but in general, a desire to learn more about the subject, as different parts of the program developed, feelings of indignation, despair, hope, desire for change arose, and at the end of the program in general there was a great willingness on the part of most of the students to be able to mitigate climate change.

Discussion and conclusions

The results of the surveys before and after the implementation of the curriculum and the observations during the curriculum show a change in the students' attitude towards climate change, its importance and the mitigation measures implemented.

Taking into account the different categories evaluated before and after the program, changes can be observed in the following areas: knowledge about climate change, causes and consequences of climate change, measures and actions to mitigate it, and information exchange on the subject.

Regarding knowledge about climate change, it was observed that although most of the students did not know what climate change was, they had heard about it and after applying the program, the seriousness of the problem became visible, since although at the beginning many students perceived that climate change was a problem, they did not consider it to be so serious. This coincides with the results obtained by González Ordóñez (2016) after applying the environmental education program. Although there are differences between the two programs in terms of the time of application (the program applied by González Ordóñez was developed for two years), the type of sample (in the case of González Ordóñez it was children, adolescents and adults, and in this research it was adolescents), and the number of people in the sample (751 people in the case of González Ordóñez and 36 in this case), the two programs were applied with the purpose of obtaining a change in attitude with respect to climate change and its mitigation, and in both cases the needs of the people in the sample were taken into account to develop the program. Likewise, the categories evaluated are similar, in order to be able to make a comparison between the results of the two studies.

Regarding knowledge of the causes and consequences of climate change and whether people's habits influence it, as in González Ordóñez's 2016 research, adolescents expressed that after the program was applied their knowledge increased by a large amount.

Regarding the actions applied to mitigate climate change, there was a noticeable increase in the number and variety of actions that students began to apply after the program was implemented, which shows the effectiveness of the program in promoting mitigation actions. This is closely related to the results obtained by Cordero et al. (2020), as the program used the tools outlined by the authors: exploration of the connections between personal life and climate change and a project where students could apply what they learned to mitigate climate change.

One of the points in which no changes were seen before and after the program is in the implementation of actions and participation in conferences to curb climate change. In one of the groups the number of positive responses decreased after the program, unlike what is seen in González Ordóñez (2020). This may be because the students did not fully understand what a climate change journey is (in fact some raised the question when answering the survey) or because they felt they had already participated and therefore completed their homework. This is an important point to make in order to improve the program by placing more emphasis on the relevance of continuous participation. Likewise, it is important that the programs are applied systematically and not on an ad hoc basis, in order to strengthen students' links with the community and their participation in events related to climate change mitigation.

In the case of information exchange, it can be observed how the exchange with friends and family was strengthened after the program, as shown in González Ordóñez (2016). In the case of the exchange with teachers, which is not evaluated in the program applied by González Ordóñez, which was evaluated in this project, no changes are noted before and after the application of the program. This may be because prior to the start of the program, the major exchange of information on climate change that students had was with teachers, and this has probably not changed as they continued to exchange in the same way.

As can be seen in the results, the feedback received at the end of the program application was mostly positive. One of the observations made by some participants is that they were unable to take action due to obstacles in their family, which may be a point to take into account in order to involve families in a meaningful way. In addition, as mentioned above, it is important to

highlight the importance of continuing with the changes after the program has ended and changing habits with respect to climate change mitigation so that they remain over time. Similarly, the list of habits that students expressed their intention to apply (or were already applying) to reduce their GHG emissions and, therefore, mitigate climate change is significant and although the nature of this qualitative study was not intended to measure these emissions, if these actions are applied and maintained over time, a great potential for mitigation is identified in the case of the EpCC, as Cordero at al. (2020).

In the case of the CCAS survey, which proved useful for measuring changes before and after a program in high school students (Christensen and Knezek, 2015), it can be observed how attitudes towards climate change change change positively. Although the attitude of the students at the beginning of the program was not negative in general with respect to their attitude and the importance of climate change and the problems it represents, it could be observed that attitudes regarding what can be done to mitigate climate change and the responsibility that human beings have becomes more visible and in those cases where students were in agreement or undecided regarding human participation or mitigation measures, a change towards total agreement is noticeable. The results of this survey are in line with those obtained in the initial and final surveys.

Systematic observation of what happened in each class in which the program was carried out allowed us to understand some of the students' decisions and how to improve the implementation as we received comments and feedback from the participants. It is important to note that the context of the participants is highly positive in socioeconomic terms. This set some guidelines when it came to feeling directly affected by climate change, as some students expressed that they would not be affected directly or with an "emergency" because they had the means to adapt. However, through class discussions the students developed tools to understand that climate change does affect them and even if they do not feel the effects directly, it affects their community members. As noted by Monroe et al. (2017), deliberative discussion helps students to better understand other people's points of view and in this way, they can size up the effects of climate change, not only in their lives but in the community.

Conclusions

The lack of information among the population regarding climate change, the lack of EpCC programs in the Uruguayan educational plan (covering the entire population and not just some sectors) and the seriousness of the effects of climate change make it an urgent matter to consider programs and plans that promote environmental awareness, a change of attitude towards climate change and encourage attitudes of climate change mitigation in the population in order to reduce GHG emissions.

It was evident that before applying the EpCC program there was a lack of knowledge about climate change (causes, consequences and ways to mitigate it) in most of the students who participated. While many had heard of the subject, they did not have solid or accurate knowledge.

Regarding the objective of creating an EpCC program and applying it with students in the first year of secondary school, it can be said that it was created taking into account the needs of students of that age, their previous knowledge and their context. The application of the program was successfully carried out in the two groups that participated, observing changes in their climate change mitigation practices and their attitude towards the subject, which allows reaffirming a relationship between the EpCC and the emission of GHGs.

The objectives related to describing mitigation practices and attitudes towards climate change and the evaluation of behavioral and attitudinal changes could be satisfactorily met. The

applied EpCC program shows a positive influence on the attitudes towards climate change and mitigation practices of the participating students.

An important finding to take into account in future plans is the importance of considering the context of the students and having the necessary flexibility to be able to change the plan as it is implemented in order to be able to start from the students' knowledge and their real needs, even if these are not always the same as those of the educator who implements the program. This does not mean that topics that students do not raise cannot be addressed, but it is important to relate them to the needs they raise as part of their community, within a specific context and an appropriate scientific framework.

Given the lack of systematized climate change education programs in Uruguay, this research is shown as a small initial step to be able to continue researching and developing a program that covers all schooling and can involve working groups (including teachers and specialists in the area of climate change) that aim to implement an EpCC program in the different stages of people's education, including elementary school, secondary school and also tertiary and university education, always with the aim of mitigating climate change. An important objective that can be added in future research is that of adaptation to climate change.

One limitation of the program that can be improved in future research is the involvement of the students' families. One of the limitations raised by students when it comes to changing habits is the family, so it would be important to involve families when implementing EpCC plans. Also, given the importance of the community and the context of the students, the programs would benefit from closer interaction between students and civil society movements and organizations fighting for environmental rights.

Given the nature and scope of this research, the program was created by one person and applied with a small population. Future lines of research would benefit from joint planning with professionals from different areas (education, environmental sciences, social sciences) and in larger populations that include students from different socioeconomic and territorial contexts. It would also be an improvement to the research to be able to measure attitudes and mitigation practices after a significant amount of time has passed since the program was implemented in order to see if the practices have become habits. Likewise, mixed research (qualitative and quantitative) would allow us to obtain accurate figures on the amount of GHG emitted before and after the program was implemented.

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