Challenging Environmental Clichés in the University Classroom: A Pilot Study Using Documentaries as Educational Tools

Alfonso Pardo – Universidad de Zaragoza 0000-0001-6356-1954
Eugenia Marqués-López – Universidad de Zaragoza 0000-0001-6832-8983
Carlos Rodríguez-Casals – Universidad de Zaragoza 0000-0002-8914-4929
Esther Cascarosa Salillas – Universidad de Zaragoza 0000-0002-3696-7673

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Correspondencia a través de **ORCID**: Alfonso Pardo **0000-0001-6356-1954**

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Abstract: Environmental sciences is a scientific discipline with many stereotypes. One of the challenges for teachers is to help students develop critical thinking skills to tackle deeply ingrained clichés. This competence is essential for their future professional development. This paper presents an educational experience developed with sophomore students of the Environmental Sciences Degree at the University of Zaragoza, jointly conducted between two subjects (Soil Degradation and Pollution and Atmospheric Pollution). The objective of this activity was to promote students' reflection and critical thinking using audiovisual material and argumentation on climate change and the role of anthropogenic CO_2 in global warming. To this end, two documentaries with opposing messages were screened ("An Inconvenient Truth" and "The Great Global Warming Swindle"), followed by a debate among the students on the theses and positions presented in both, and finally the writing of an individual critical essay. Overall, both teachers and students positively evaluated this teaching proposal.

Keyword: Critical Thinking

Introduction

Environmental Sciences and Critical Thinking

The emergence and development of the international environmental movement in the 1960s, starting with the publication of its seminal work “Silent Spring” (Carson, 1962), and the subsequent development of its activist agenda (e.g., Lee, 1962; Graham, 1970), has deeply influenced global environmental policies from the late 20th century into the early 21st century.

Environmental sciences (ES) are natural and applied scientific disciplines with significant political, social, and media influence. They are relatively recent additions to international university curricula, originating in the 1950s-60s[1]. Their interdisciplinary nature makes their academic development and social and political impact both deep and complex. Some of the topics covered in ES are also addressed in other academic fields, such as the natural, social, or political sciences.

For this reason, environmental science students need to cultivate skills that allow them to appropriately tackle the complexity of their field of study. Thus, it is essential for them to develop sound critical thinking competences to evaluate ideas and opinions from various areas, such as politics, lobbying groups, non-governmental organizations, the

[1] The *New York State College of Forestry* at *Syracuse University* established a bachelor’s degree in environmental studies and awarded its first degree in 1956. The Environmental Studies Program at Middlebury College, founded in 1965, is the oldest undergraduate program in the United States.

media, and society itself. As professionals, they must be able to distinguish between valid and biased information to make informed decisions based on scientific evidence.

Additionally, ES students must possess strong oral and written communication skills to effectively convey complex scientific concepts to audiences with different levels of knowledge and perspectives. This involves adapting their discourse to various contexts and audiences, whether presenting research findings to scientific peers, communicating environmental issues to the public, or arguing for environmental policies before legislators and government officials.

A good example of environmental issues that have transcended the scientific field is climate change—a term first used in 1975 in a Science article by Wallace Broecker—along with the role of anthropogenic CO_2 as a key contributor to global warming.

In recent decades, a disagreement has emerged between those who support the theory of global climate change caused by greenhouse gas emissions, such as CO_2, and those who question the impact of human emissions on the planet's climate. This debate has extended beyond the scientific realm into political, social, and educational spheres. As a result, it has become increasingly difficult to address environmental science topics related to climate dynamics without scientific explanations or concepts presented in class being filtered through the lens of ideological stances shaped by years of intense scientific, political, and social debate.

Today's ES students largely belong to generations (i.e., *millennials* born between 1981-1996 (Zelazko, 2024) and *zoomers* born between 1997-2012 (Chaney *et al.*, 2017; Eldridge, 2024; Jaeger, 1985) who have grown up under the paradigm of climate change caused by anthropogenic CO_2, and as such, they overwhelmingly accept it as a global problem (Pew Research Center, 2021; Sullivan, 2023) without a critical attitude. For these students, there are some unquestionable truths that, from a scientific perspective, could or should be challenged, as progress in science through the scientific method requires the questioning of ideas, hypotheses, or theories, no matter how obvious or evident they may seem from a social perspective.

As a result, classroom experience shows that many students hold onto stereotypical notions during their university training, which correspond to what Robert J. Lifton described as thought-terminating clichés (TTL). According to Lifton, these TTLs hinder or prevent critical thinking because "The most far-reaching and complex of human problems are compressed into brief, highly reductive, definitive-sounding phrases, easily memorized and easily expressed. These become the start and finish of any ideological analysis" (Lifton, 1989, p. 429).

Thus, it is essential that Environmental Science graduates acquire solid scientific knowledge about environmental issues, as these are key pillars in the formulation and implementation of governmental policies with industrial, business, economic, and social implications. Their professional work may involve informing or educating various sectors with impartiality and accuracy. To achieve this, they must avoid dogmatic positions and ideological influences, ensuring an objective approach based on scientific evidence. The ability to argue with evidence is crucial, as argumentation is a key scientific practice for expressing and applying critical thinking.

Objectives of the Teaching Proposal

The main goal of this activity was to foster critical thinking in ES students by teaching them to evaluate information based on solid scientific and technical documentation.

Argumentation serves as a bridge between critical thinking and the audience, presenting and analyzing the evidence. Additionally, this teaching proposal helps to develop transversal skills such as communication abilities, information processing, analytical and synthesis skills, autonomous learning, adaptability, decision-making, personal commitment, environmental awareness, and motivation for quality and excellence.

Additionally, carrying out this joint activity had the potential to highlight the connection between the involved subjects, specifically regarding different types of environmental pollution, such as atmospheric and soil pollution. It was also expected to encourage greater coordination among the teachers participating in the two subjects.

This article presents and describes the educational activity, the methodology employed, and the results obtained in this teaching experience supported by audiovisual tools, conducted for the first time in a joint and coordinated manner between the two subjects of the Environmental Sciences degree at the University of Zaragoza (Spain).

Theoretical Framework

There is an implicit assumption that teachers share a common understanding of what critical thinking is, but this tacit notion is rarely articulated or compared (Donnelly & Fitzmaurice, 2011). Thus, critical thinking has been defined in various ways over the past few decades. Elder and Paul (1994) suggest that critical thinking should be understood as the ability to take control of one's own thinking (cf., Paul, 1994). Duron *et al.* (2006, p. 160) defines it as follows: "Critical thinking is, very simply stated, the ability to analyze and evaluate information," and they conclude that "Critical thinkers raise vital questions and problems, formulate them clearly, gather and assess relevant information, use abstract ideas, think open-mindedly, and communicate effectively with others."

Teachers from very different disciplines agree that critical thinking is one of the key outcomes in their students' education. From the perspective of scientific learning, "Critical thinking lessons learned in the science classroom also impact students' lives long after they have departed from formal education" (Chiras, 1992, p.464). In fact, there is consensus that the concepts and tools of critical thinking are the essential core of all well-conceived instruction (Donnelly & Fitzmaurice, 2011).

The principles of critical thinking are as follows (Chiras, 1992, p. 465):

- Gather complete information.
- Understand and define all terms.
- Question the methods by which facts are derived.
- Question conclusions.
- Look for hidden assumptions and biases.
- Question the source of facts.
- Don't expect all of the answers.
- Examine the big picture.
- Examine multiple causes and effects.
- Watch for thought stoppers.
- Understand your own biases and values.

However, although teachers may be able to articulate the critical thinking skills, they would like their students to develop, the stages between developing critical thinking and its manifestation are also something that must be worked on in the classroom.

Argumentation as a Tool for Developing Critical Thinking

Students pursuing a degree in Environmental Science, like all students in science-related fields, should engage with scientific thinking in the classroom. This teaching and learning methodology would facilitate the development of scientific practices in line with current definitions. Scientific practices can be described as the techniques employed by scientists to establish, expand, and refine their knowledge (NRC, 2012). These involve the development of scientific skills such as observation, question formulation, and critical thinking, which are essential for fostering scientific reasoning, promoting positive attitudes toward science, and building a solid scientific foundation, crucial for being a scientifically literate citizen (Cardemil & Román, 2014; Eshach & Fried, 2005; Spektor-Levy *et al.*, 2013). Mosquera Bargiela *et al.* (2018) identify three fundamental scientific practices, which can be addressed individually or integrated: inquiry, modeling, and argumentation. In particular, the practice of argumentation becomes evident when prior knowledge is used to draw conclusions that involve the creation, use, or revision of scientific models in the reasoning process (Martínez Bernat *et al.*, 2019).

An appealing and highly effective way to cultivate these scientific practices is through socio-scientific controversies. Given the environmental focus of these students' education, the controversy surrounding climate change can serve as a vehicle to develop these skills in the classroom.

Controversial issues approached through fundamental scientific practices, such as argumentation, allow students to appreciate the relevance of science in their daily lives, deepen their understanding of how people use science, and develop the ability to be critical consumers of scientific information (Kolsto, 2001). Specifically, we propose addressing argumentation through classroom debates. Previous research has shown that debate facilitates the development of argumentation skills, as observed in discussions about nuclear energy (Cascarosa *et al.*, 2018). In this study, we aim to determine whether climate change can also contribute to the development of these skills.

The Documentary as a Teaching Tool

The documentary genre has been described as “something that looked like a distinct filmmaking practice, cinematic tradition, and mode of audience reception, it remains, to this day, a practice without clear boundaries” (Nichols, 1997, p. XIV). Scottish documentarian John Grierson, in a critique of the famous film Moana, directed by Robert Flaherty and produced by Famous Players-Lasky in 1926, first used the term “documentary”: “Moana being a visual account of events [...] has documentary value” (Curthoys & Lake, 2004; Grierson, 1926; Rosenbaum, 1975). A documentary is an audiovisual work that aims to express, describe, or analyze some aspect of reality, but it inevitably carries a subjective and intentional component in the way the subject is presented and in the analysis of causes or meanings of the events narrated through the selection and editing of images and the information conveyed in the script (Breu, 2010).

Documentaries aim to educate viewers and sometimes influence their opinions on the subject at hand. For this reason, documentaries aligned with the objectives of an educational program can be useful as a teaching resource, exposing students to unknown or unfamiliar aspects of reality and facilitating the understanding of complex topics. Moreover, their viewing can spark spontaneous debates that, when guided by the teacher, activate students' critical thinking (Ambros & Breu, 2007). In the educational context, debate enriches students by fostering free expression, critical thinking, reflection, and respect for differing opinions, developing communicative, cognitive, and social skills that support critical thought (Cascarosa *et al.*, 2018).

Critical Interdisciplinary Knowledge in Environmental Sciences Through the Use of Documentaries

The implication is that education should foster both specialized and interdisciplinary knowledge. Interdisciplinary education should complement the specialized teaching and learning of each subject, allowing students to address challenges that transcend or involve multiple subjects or areas of convergence across various disciplines. This trains them to develop lines of work that do not fit within standard knowledge areas (Golding, 2009).

When engaging in interdisciplinary learning, students explore and integrate perspectives from different disciplines and fields of knowledge. This approach differs from a multidisciplinary one, which simply juxtaposes multiple perspectives on a topic without real integration. Interdisciplinarity involves synthesizing and integrating multiple viewpoints to produce a deeper understanding, a balanced assessment, a viable solution, or a product that creatively adapts to the various perspectives (Golding, 2009). Interdisciplinary understanding can thus be defined as "la capacidad de integrar conocimientos y modos de pensar en dos o más disciplinas o áreas establecidas de experiencia para producir un avance cognitivo –tales como la explicación de un fenómeno, la solución de un problema, o la creación de un producto– de maneras que habrían sido imposibles o poco probable a través de disciplinas individuales"[2] (Boix Mansilla & Duraising, 2007, p. 219).

In the Atmospheric Pollution (AP) and Soil Degradation and Pollution (SDP) courses, both taught in the second term of the second year of the Environmental Sciences degree at the University of Zaragoza (Appendix 1), the idea arose to jointly address climate change and the role of anthropogenic CO_2 in the process of global warming, considering recurring stereotypes among students in the program.

This activity aimed to reinforce the following learning outcomes for both subjects from a perspective that complements the purely academic:

- Understand and compare the dynamics and flows of various terrestrial systems as vectors affecting soil quality. (SDP)
- Be able to explain the environmental effects resulting from the presence of certain pollutants in the atmosphere. (AP)
- Identify the main atmospheric pollutants, both natural and anthropogenic, understand their behavior and evolution in the atmosphere, and recognize the main polluting activities. (AP)
- Be able to search for and manage bibliographic sources, evaluate their scientific-technical quality and rigor, work in a coordinated group on a topic related to a specific aspect of atmospheric pollution, and present the fundamental aspects of the work clearly and rigorously. (AP)

To achieve this, it was deemed most effective to use formats commonly employed by the media to disseminate the ideological viewpoints of opposing sides in the political, scientific, and social arenas.

This approach was suitable for two reasons: 1) Mass media is currently one of the most powerful vectors for creating or shaping public opinion in society, and 2) mass media

[2] The capacity to integrate knowledge and modes of thinking in two or more disciplines or established areas of expertise to produce a cognitive advance—such as explaining a phenomenon, solving a problem, or creating a product—that would have been unlikely or impossible through single disciplines.

itself is often influenced by certain political or ideological directives, leading to media polarization in scientific controversies (Pardo, 2006). Two highly influential documentaries (*The Great Global Warming Swindle* and *An Inconvenient Truth*, Appendix 2) were selected to spark a classroom debate based on the theses presented and defended in each. This would allow students to develop and apply their critical thinking by analyzing and contrasting the data and statements presented in each documentary.

Methodology

Proposed Educational Activity: Seminar-Debate on "Global Warming – Climate Change"

Students often tend to maintain compartmentalized conceptions and perspectives shaped by different subjects and disciplines, which may become incompatible with one another. For instance, they might express an explicit viewpoint in exams or when questioned by a professor within a specific subject, while holding a different, implicit attitude that contradicts the former when they are outside the educational context. In many cases, when students' academic knowledge is confronted with an interdisciplinary topic, it is simply "overlaid" onto their pre-existing beliefs, resulting in "inert" knowledge, which has no real impact on their decisions outside the classroom (Paul, 1994; Gardner, 1989).

Overall, it is recognized that students in any degree program face difficulties in connecting the various subjects they study, and this challenge extends to the professors, who may struggle to coordinate effectively. Good teaching practices in this regard would help avoid content overlaps or gaps and facilitate better interrelationships among the subjects for the students.

To provide an appropriate setting for this, a teaching innovation project was proposed in the context of the course "Teaching Innovation Projects as a Tool to Improve Teaching Quality" (January 2014), offered by the *Instituto de Ciencias de la Educación de la Universidad de Zaragoza*. The resulting project, described and analyzed in this article, was implemented as a pilot experience in the 2013-14 academic year, proposing a series of joint activities between two compulsory subjects from the Environmental Evaluation module of the Environmental Sciences degree at the University of Zaragoza (Spain), which are taught in the same term: Atmospheric Pollution (AP) and Soil Degradation and Pollution (SDP; Appendix 1).

The 35 participating sophomore students were enrolled in the Environmental Sciences degree. They had all completed the courses from the first year of the degree and, for the most part, the subjects from the first term of the second year. This does not mean that all of them had passed all these subjects, and some had not enrolled in specific courses from the first semester of the second year. Broadly speaking, the students had knowledge of geology, biology, environmental chemistry, environmental physics, soil science, botany, zoology, and applied economics. Many of them —those who had enrolled and attended the courses in the first semester of the second year— also had knowledge of meteorology and climatology, and ecology, all of which were relevant to the proposed activity.

Description and Discussion of the Experience

The educational experience was divided into four phases:

- Screening of *The Great Global Warming Swindle* (75 minutes) on Wednesday, February 26, 2014, from 5 to 7 p.m., during the SDP class time.
- Screening of *An Inconvenient Truth* (96 minutes) on Thursday, February 27, 2014, from 4 to 6 p.m., during the AP class time.
- A guided debate on the content and messages of both documentaries (cf. Appendix 3), as described below.
- Writing a brief individual critical essay (1200-1500 words) in which each student had to synthesize the theses presented and defended in each documentary, contrast them with the knowledge acquired in the courses and their university studies, and conclude by reasoning their opinions and reactions to each documentary. The essay's value in each subject is described later.

Thus, the activity consisted of watching and then discussing the documentaries in two 2-hour sessions. One of these films supports the existence of climate change caused by human activities (*An Inconvenient Truth*), while the other disputes that humans are the main cause of global warming (*The Great Global Warming Swindle*).

The students' prior knowledge of both documentaries varied widely. Almost all of them were familiar with *An Inconvenient Truth*, and many had seen it. When asked about its content, they generally had a vague idea of its plot, and the different theses presented and defended. They remembered that it was presented by Al Gore, with some even identifying him as a "former U.S. vice president." They also understood it as a documentary about the problems caused by climate change and the CO_2 emissions produced by humans. Generally, their initial opinion was in full agreement with their recollection of the documentary and the theses presented, and they did not question the rigor or validity of its arguments.

In contrast, none of the students had heard of *The Great Global Warming Swindle* or the controversy it sparked when aired on the UK's Channel 4, months after the global release of *An Inconvenient Truth*. When informed that it was a documentary challenging Al Gore's movie thesis, the students were largely surprised to learn that something they considered an undisputed truth could be questioned.

This prompted the decision to have students first watch The Great Global Warming Swindle. The version used in class was the original English version with Spanish subtitles, which initially could have posed a challenge for students who were not accustomed to doing academic work in English. However, after the first few minutes of adjustment, the subject matter and development of the documentary captured the students' interest.

After watching the first documentary, several groups (6 groups of 5-7 students) were established in the classroom, and each group had to debate the main ideas extracted from the film. Two groups focused on scientific aspects, two on political aspects, and two on social and future implications. In the final 15 minutes, a spokesperson from each group presented their group's consensual conclusions to all participants, forming the basis for an open debate among the students, with the instructors acting as moderators. Following the viewing of the second documentary the next day, a similar dynamic took place, with the added task of comparing both films, again focusing on scientific, political, social, and future aspects.

Before the sessions in which the documentaries were shown and the discussions took place, students were given information about the activity through the Moodle platforms of the courses involved, along with a debate guide containing questions for personal and group reflection (Appendix 3).

Finally, students were required to submit an individual critical essay of 1200-1500 words, which was graded in SDP as a report on a practical session and in AP as a voluntary activity. The essay required them to compare both documentaries and argue their points of view. While these types of essays are commonly known in the Anglophone academic world as reaction papers, we preferred to call it a critical essay given the varied uses of the term reaction paper in different educational contexts (cf. Mio & Barker-Hackett, 2003; Rockowitz & Rockowitz, 2024). The professors graded the essays as "pass," "fail," or "exceeds expectations," providing appropriate feedback. According to Baddeley (2009), quality academic writing should always be an exercise in critical and reflective thinking.

Evaluation of the Educational Activity

The evaluation of the activity was conducted from two perspectives: student learning and the assessment of teaching performance.

Self-assessment in any teaching practice should serve as a tool for educators to reflect on their educational approach, as well as to evaluate, supervise, and guide the teaching staff and the management team.

Agirre *et al.* (2013) define teaching practice as the work a teacher carries out in the classroom to foster learning, which includes teaching processes. According to Díaz (2007), teaching practice involves aspects such as interaction with students, organization of instruction, classroom climate, attention to diversity, lesson planning, methodology, and the evaluation of the teaching-learning process.

Based on this perspective, any evaluation tool used to assess teaching performance must meet basic requirements such as validity, reliability, and feasibility, and should include sections for improvement proposals (Nando Rosales, 2014).

Table 1 presents a series of mechanisms for reviewing, evaluating, and modifying the teaching activity in relation to academic outcomes and improvement processes. The items in the table have been developed based on the following key areas:

- Diversity and appropriateness
- Lesson planning
- Effort and results assessment
- Classroom activities
- Evaluation

Each entry in the table should be rated on a scale from inadequate to excellent, defined as:

- **Inadequate**: Little or no consistency. Minimum acceptable standards are not met, and substantial improvement is needed.
- **Insufficient**: Fundamental elements of the established indicator are omitted.
- **Basic**: Sufficient compliance with the established indicator is evident.
- **Competent**: Solid practices are evident. Clear evidence of competence and technical mastery of the indicator.
- **Excellent**: Exceptional and exemplary practices are demonstrated, serving as models of best practices. Willingness to serve as a reference for other institutions.

Additionally, it is important to consider an external evaluation, which could be carried out by the students who participated in the activity. For this purpose, a specific questionnaire

was provided to them through the Moodle platform of the two subjects involved in the activity.

Results

As an example, let's consider a couple of quotes taken from the critical essays submitted by students. These quotes clearly express the surprise they experienced when realizing that there are divergent perspectives on ideas they had previously believed to be irrefutable, as well as the shift in mindset following the process of comparison, analysis, and reflection encouraged by the activity:

> "Antes de ver el documental "El gran timo del calentamiento global" estaba un poco escéptica al mismo, ya que desde todos los medios se nos ha bombardeado durante años con la idea de que es el dióxido de carbono que producimos el que provoca el calentamiento global. Pero tras haber visto […] no creo que sea el CO_2 el único causante del calentamiento."[3]

> "[…] esta vez he podido alimentar mi espíritu crítico y demostrar que porque un dato salga en pantalla no hay porqué creérselo y asumirlo sin haberlo discutido en tu mente, preguntándote ¿esto es lo que quiero defender en una discusión sobre el tema a tratar? Esto ha sido gracias a la visualización y reflexión de dos posturas totalmente diferentes sobre el mismo tema […]"[4]

The evaluation of the results, according to Table 1, is presented below.

TABLE 1. SELF-ASSESSMENT OF THE ACTIVITY (MODIFIED FROM: GOVERNMENT OF ARAGÓN, 2013).

ASPECTS SUBJECT TO ANALYSIS AS PART OF THE REVIEW, EVALUATION, AND MODIFICATION OF THE LEARNING ACTIVITY	Inadequate	Insufficient	Basic	Competent	Excelent
EVALUATION CRITERIA				X	
ESSENTIAL PERFORMANCE INDICATORS			X		
INITIAL ASSESSMENT AND TREATMENT OF RESULTS				X	
SPECIFIC DIVERSITY SUPPORT MEASURES FOR THE CLASS GROUP			X		
RELATIONSHIP BETWEEN EFFORT EXPENDED AND RESULTS OBTAINED				X	
SUITABILITY OF THE ACTIVITY TO THE TARGET AUDIENCE					X
STUDENT PARTICIPATION					X
STRATEGIES TO ENCOURAGE READING, INDIVIDUAL RESEARCH, AND THE DEVELOPMENT OF ORAL AND WRITTEN COMPREHENSION AND EXPRESSION				X	
EVALUATION OF THE QUALITY OF INDIVIDUAL WORK COMPLETED BY STUDENT					X
EVALUATION OF THE QUALITY OF INDIVIDUAL WORK COMPLETED BY STUDENTS				X	
APPLICATION OF THE AGREED TEACHING METHODOLOGY REGARDING ORGANIZATION, TEACHING RESOURCES, GROUPINGS, ETC..					X
TREATMENT OF CROSS-CURRICULAR ELEMENTS				X	
TRANSFERABILITY TO OTHER PROGRAMS AND EDUCATIONAL LEVELS.					X
SUSTAINABILITY					X

[3] Before watching "The Great Global Warming Swindle", I was somewhat skeptical, as for years we've been bombarded by the media with the idea that it's the carbon dioxide we produce that causes global warming. But after watching it […] I no longer believe that CO_2 is the sole cause of warming.

[4] […] this time I was able to nourish my critical thinking and prove that just because a fact appears on screen doesn't mean you have to believe and accept it without questioning it in your mind, asking yourself, 'Is this what I want to defend in a discussion on this topic?' This has been possible thanks to viewing and reflecting on two completely different positions on the same subject […]

Overall, the aspects subjected to self-assessment in Table 1 were rated with the two highest possible scores – *i.e.*, competent and excellent. Only two entries (Essential performance indicators and Specific diversity support measures for the class group) were given a basic rating, as they were not explicitly implemented due to the characteristics of the group and the activity. However, their development is considered necessary for transferability. It is noted that the activity's designers and implementers acknowledge areas for improvement, although a high level of optimization already exists.

Regarding the specific questionnaire administered through the Moodle platform for the two subjects involved in the activity, no responses were received from the students. This may be attributed to the fact that, by the end of the semester, students are busy with final assignments and exam preparation, in addition to completing official evaluations for all their courses.

At the end of each semester, the University of Zaragoza presents students with two types of surveys related to course evaluation: Evaluation of Teaching Activity (Instructor) and Evaluation of Instruction (Course). In the first, the questions aim to assess the professors involved in teaching the course, and in the second, the course structure itself is evaluated.

Since we do not have specific survey data directly linked to the teaching proposal described here, it is relevant to present the results from certain sections of the questionnaires that could be related to it (Table 2). Specifically, we will compare the data from the year the activity was jointly implemented (2013-14) with the previous academic year (2012-13), when the activity was only conducted in the SDP course and not in AP. Additionally, data from AP in the subsequent year (2014-15), when the activity was not carried out, are included. Data from SDP for 2014-15 are not provided, as a change in the instructor for this course occurred, making the results non-comparable.

TABLE 2. RESULTS OF SELECTED QUESTIONS FROM THE STUDENT SATISFACTION SURVEYS FOR CA.

SURVEY TYPE	QUESTION	Atmospheric Pollution [a,b]		
		2012-13	2013-14[c]	2014-15
INSTRUCTOR	9. Promotes interest in the subject.	3.77 (58)	4.00 (55)	3.76 (37)
INSTRUCTOR	12. Connects different topics within the subject.	3.96 (58)	4.38 (55)	4.05 (37)
INSTRUCTOR	13. Relates the subject's concepts to their applications.	3.89 (58)	4.43 (55)	4.14 (37)
INSTRUCTOR	16. Encourages student participation.	3.96 (58)	4.17 (55)	3.90 (37)
COURSE	6. Coordination among teachers, avoiding overlap or repetition.		4.14 (53)	4.05 (39)
COURSE	10. Uses teaching resources (audiovisuals, laboratory, fieldwork, etc.) to facilitate learning.		4.25 (53)	4.05 (39)
COURSE	11. The provided resources are adequate (guides, bibliography, support websites, materials, etc.).	3.36 (51)		

[A] AVERAGE OF RESPONSES ON A SCALE OF 1 TO 5 (TOTAL DISAGREEMENT -- COMPLETE AGREEMENT).
[B] THE VALUES IN PARENTHESES REFER TO THE RESPONSE RATE PERCENTAGE.
[C] YEAR IN WHICH THE ACTIVITY WAS CONDUCTED JOINTLY BETWEEN THE TWO COURSES.
[D] STARTING FROM THE 2013-14 ACADEMIC YEAR, THE COURSE SURVEY QUESTIONS WERE CHANGED. QUESTION 11 FROM THE PREVIOUS QUESTIONNAIRE CORRESPONDS TO QUESTION 10 IN THE NEW QUESTIONNAIRE.

Largely, there is a high evaluation from the students across all assessed questions. Notably, there is an increase in the scores obtained during the 2013-14 academic year, when this joint activity was implemented in both courses. These scores are consistently higher compared to those of the previous and subsequent years, when the activity was not conducted. This increase could be partly attributed to the positive reception of the activity by the students.

Transferability and Sustainability of the Learning Activity

It is important to emphasize the potential transferability of the educational proposal presented here. The screening of the two selected documentaries on climate change effectively invites deep debate and reflection on this issue.

The activity described herein was carried out within the context of two subjects in the Environmental Science degree program. However, due to its topic, along with its social and media relevance, and the nature of the audiovisual materials (both documentaries are designed for a general audience), this activity can easily and effectively be transferred to other subjects within the same degree program or to other disciplines, whether in science or the humanities. Additionally, with slight adjustments appropriate to the educational level, it could also be suitable for both secondary education and postgraduate studies.

In terms of group size, it may be more comfortable to work with groups of no more than 30 students. However, this number is flexible and can easily be adapted to both smaller and larger groups. This can be achieved by dividing students into subgroups to discuss specific aspects of the documentaries. The discussion is then broadened to the full group, with this final stage facilitated primarily through designated spokespeople.

Finally, this activity can be considered sustainable, meaning it is feasible with the resources available at any educational institution, whether at the university level or in secondary education. Regarding material resources, no special needs are anticipated for carrying out the activity adequately. It can be adapted to any type of classroom, though it would be ideal to have access to resources such as a computer, projector, speakers, and an internet connection. Copies of the documentaries can be obtained either for free by educational institutions or through a modest payment (in the case of *An Inconvenient Truth*) for streaming purposes.

In this regard, the key lies mainly in the availability and motivation of the teaching staff to coordinate the activity across the subjects involved. However, it is also possible to carry out the activity within the scope of a single subject. Additionally, it is expected that the activity will be well received by students, as evidenced by the positive feedback provided by participants in their written essays, as highlighted in this study.

Conclusions

As argued in this paper, the use of documentaries related to the objectives of specific subjects can be a valuable tool for improving the understanding of complex concepts, complementing theoretical sessions in the curriculum. Moreover, these documentaries have the potential to create an environment conducive to student debate, contributing to the development of essential transversal skills across a wide range of academic disciplines and educational levels. These skills include communication abilities, information processing, analysis and synthesis, and reflective decision-making (Cascarosa *et al.*, 2018). Ultimately, this involves designing an interdisciplinary activity

that enhances critical thinking using scientific argumentation (Martínez Bernat *et al.*, 2019).

Global warming and climate change as topics of debate generate significant interest in a broad audience. Its content and wide social reach make it a relevant topic for activities that can be incorporated into a variety of educational programs. This versatility highlights the activity's transferability to different educational contexts. It is particularly relevant in the field of Environmental Sciences, though not exclusively, as it can be used in various educational settings within both the natural and social sciences. In this regard, the high level of participation, interest generated, and strong student engagement in the activity described in this paper should be emphasized.

Integrating audiovisual formats disseminated by mass media on socially and politically relevant environmental issues as a teaching tool, alongside guided student debates and the individual development of critical synthesis reports, constitutes an effective pedagogical strategy that promotes various educational objectives. These include:

- Recognizing the impact of mass media on shaping and transforming opinions in society.
- Encouraging the critical analysis of information and opinions disseminated by the media.
- Understanding media polarization in the context of scientific controversies.
- Enhancing critical thinking by analyzing and contrasting data with primary scientific sources.
- Developing skills to articulate one's own discourse and arguments regarding deeply ingrained environmental stereotypes in society.

Furthermore, the collaboration between two subjects in the degree program to carry out this activity has strengthened coordination among the involved instructors and has encouraged students to adopt a more interdisciplinary perspective on the content of both subjects, as well as their social and media implications. This integration has allowed students to establish connections between the content of both subjects, thereby enriching their understanding of the topics discussed. The joint initiative has been positively received by students, as it has provided them with a broader and more coherent perspective on the topics covered, fostering their critical thinking and their ability to integrate knowledge from different disciplines.

Finally, it is important to emphasize that exposing students to divergent perspectives on important scientific topics, far from confusing them, offers an opportunity to develop critical skills. This allows them to question and contrast the data and arguments presented, using the knowledge they have already acquired during their studies as a guide. This intellectual process serves as a foundation for reflection and critical thinking, fostering meaningful learning and enabling students to deepen their understanding of the topics and develop a more comprehensive and informed perspective on the subject.

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Appendix 1: Basic Information on the Subjects Involved in the Teaching Proposal

Both subjects are compulsory and part of the "Environmental Assessment" module of the Environmental Sciences degree at the University of Zaragoza, taught at the Higher Polytechnic School of Huesca.

25218 - Soil Degradation and Pollution

- Year: 2nd Semester: 2 ECTS: 6.0 Enrolled Students (2013-14): 66
- URL of the subject's syllabus for the 2013-14 academic year: http://titulaciones.unizar.es/guias13/25218_2013_spa.pdf

25219 - Atmospheric Pollution

- Year: 2nd Semester: 2 ECTS: 6.0 Enrolled Students (2013-14): 55
- URL of the subject's syllabus for the 2013-14 academic year: http://titulaciones.unizar.es/guias13/25219_2013_spa.pdf

Appendix 2: Technical Data Sheets for the Documentaries

TITLE	AN INCONVENIENT TRUTH	THE GREAT GLOBAL WARMING SWINDLE
YEAR	2006	2007
DIRECTION	Davis Guggenheim	Martin Durkin
PRODUCTION	Lawrence Bender, Scott Z. Burns, Laurie David	Martin Durkin
SCREENPLAY	Al Gore	Martin Durkin
MUSIC	Michael Brook	
CINEMATOGRAPHY	Davis Guggenheim, Bob Richman Craig Hastings	Craig Hastings
EDITING	Jay Cassidy, Dan Swietlik	Alex Fry
PRODUCTION COMPANY	Lawrence Bender Productions, Participant Productions	Channel 4, WAGtv
DISTRIBUTION	Paramount Classics	Channel 4 Television Corporation
COUNTRY	United States	United Kingdom
RELEASE	May 24, 2006 (Worldwide) November 3, 2006 (Spain))	March 8, 2007 (Broadcast on Channel 4)
GENRE	Documentary	Documentary
RUNNING TIME	96 minutes (feature film)	75 minutes (feature film)
ASPECT RATIO	1.85 : 1	1.78 : 1
SOUND	Dolby Digital	Estéreo
COLOR/B&W	Color	Color
LANGUAGE	English	English
AWARDS	2006: Academy Awards (Oscars): Best Documentary, Best Original Song (Melissa Etheridge) 2006: National Board of Review (NBR): Best Documentary 2006: Los Angeles Film Critics Association: Best Documentary 2006: Critics' Choice Awards: Best Documentary, 2 Nominations 2006: Chicago Film Critics Association: Best Documentary	
SYNOPSIS	A documentary on the devastating effects of climate change. Former U.S. Vice President Al Gore presents a compelling and alarming portrait of the planet's condition, threatened by global warming caused by the massive CO_2 emissions from human activities. (source: FILMAFFINITY)	A controversial documentary that challenges the human role in climate change. It has been described as the counterpoint to "An Inconvenient Truth," the successful documentary by Al Gore. (source: FILMAFFINITY)

Appendix 3: Debate Guide

Preliminary Questions

- What is the greenhouse effect?
- What is "global warming"?
- Is CO_2 the only greenhouse gas? Do you know of other greenhouse gases? Why is CO_2 considered the primary driver of "global warming" today?
- What environmental implications are associated with "global warming"?
- What is the IPCC?
- What is the Kyoto Protocol? How does Spain participate?

Questions for Personal Reflection

- How do you perceive the presentation, structure, and visual style of each documentary?
- What is the main thesis of each documentary?
- What are the key scientific arguments presented?
- What drives the Earth's climate?
- Has the climate on Earth been stable throughout its history? Why or why not?
- What is your opinion on these issues based on your knowledge from your degree program?
- What is the origin of the "global warming" theory?
- What is the role of the IPCC?
- What role do environmental groups play in this issue?
- What social consequences might arise from the strict implementation of a policy banning the use of fossil fuels in the future?
- What political implications are evident in both documentaries regarding "global warming"?
- Have these documentaries prompted you to consider climate change in a different way? If so, how and why?

Day 1: Screening of the Documentary "The Great Global Warming Swindle"
Group Work Questions:

1. Summarize and critique the main scientific arguments presented in the documentary.
2. Summarize and critique the main political arguments presented in the documentary.
3. Summarize and critique the main social and future-related arguments presented in the documentary.

Day 2: Screening of the Documentary "An Inconvenient Truth"
After Viewing Both Documentaries:
Personal Reflection Questions:

- What are the main differences between the two documentaries?
    - From a scientific perspective?
    - From a political and social viewpoint?
- What is your opinion on the differing treatment of the same data in both documentaries based on your knowledge from your degree program?
- What is your final assessment of the impact of CO_2 on climate based on your knowledge and what was presented in both documentaries?

Debate Questions:
Analyze and reflect on the main differences between the two documentaries, considering:

- Scientific arguments
- Political and social arguments
- What are the main connections between "global warming" and atmospheric pollution as well as soil contamination?
- Why do you think the issue of CO_2 is currently so significant in media, political, and social discussions?