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Statistical Analysis of Drivers of Environmental Education and Climate Resilience Through School-Based Environmental Clubs: A Case Study from Morocco

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ABSTRACT

Environmental education is gaining increasing recognition in Morocco as a fundamental pillar for achieving the Sustainable Development Goals (SDGs). Within this context, school-based environmental clubs play a crucial role in promoting awareness and building climate resilience among students at various educational levels. These clubs serve not only as platforms for ecological engagement but also as practical tools for embedding sustainability into everyday learning. This study explores the main factors that influence the creation, activation, and effectiveness of environmental clubs in Moroccan schools. Relying on a quantitative survey conducted with 42 respondents, including both teachers and school

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administrators, the research highlights several key enablers. Among the most significant are access to adequate training in environmental education, the presence of strong institutional support, and the availability of sufficient resources. The analysis uses descriptive statistics, chi-square testing, and a Weighted Average Index to better understand the relationships between these variables. Findings reveal a strong correlation between environmental training and the initiation of clubs, although this does not always translate into high levels of student engagement. The main obstacles identified include insufficient time, lack of funding, and a shortage of appropriate educational materials. In conclusion, the study emphasizes the importance of expanding training initiatives, dedicating specific time within school schedules, and improving access to materials. These steps are essential to fully integrate environmental clubs into the Moroccan educational system and to enhance their overall impact.

Keywords: Climate Change; Sustainable Development; Environmental Education; Environmental Clubs

1. Introduction

In the 1960s, the primary actors in Environmental Education (EE) were ecologists and naturalist scientists, each within their respective fields, working to promote a message of respect and protection for nature^[1,2]. The institutionalization of environmental issues strengthened with the creation of ministries of nature protection and environment in several countries, as well as the introduction of environmental studies as a new school subject^[3]. The joint efforts of naturalists, educators and nature protection organizations culminated in the organization of the first United Nations Conference on the Human Environment, held in Stockholm in 1972^[4].

The first United Nations Conference on the Human Environment represents the first official historical milestone of Environmental Education (EE) on an international scale. Among the recommendations of this conference, it was emphasized that an international framework should be established to develop EE, particularly in response to the global environmental crisis^[5,6]. This awareness sparked a wide international debate, leading to several regional meetings. The “Belgrade Charter” defined for the first time the goal of environmental education: “To educate a world population that is aware of environmental issues and capable of working both individually and collectively to solve current problems and prevent future challenges.” In 1977, the Tbilisi Conference expanded this perspective, focusing on the importance of the environment beyond its problematic aspects^[7].

At the Moroccan level, the integration of environmental education into school curricula was achieved following the directives of the National Charter for Education and Training in 1999^[8,9]. As a result, various themes and concepts

related to the environment have been addressed in the curricula of several disciplines, primarily History-Geography and Life and Earth Sciences, across different educational levels^[10]. Research conducted over the last decade by Moroccan scholars involved in environmental issues has shown that attempts have been made to integrate this dimension into the school programs^[11,12]. However, these efforts often remain theoretical, primarily leading to environmental knowledge that, although present in textbooks, is difficult to apply concretely^[13]. As a result, these lessons are limited to knowledge accumulation without effectively fostering the development of eco-responsible skills, behaviors, or attitudes^[14].

Other studies, based on an analysis of textbooks, revealed that environmental education, supposedly integrated into the Life and Earth Sciences curriculum at the secondary level, remains mainly focused on the subject of the environment. It relies on a passive transmission of knowledge about environmental realities, often presented from an ethical perspective^[15,16].

The strengthening of environmental integration in Morocco has also been achieved through extracurricular activities. These activities play an essential role in school life^[17]. Linked to education, they are implemented by schools to promote and develop students’ knowledge and skills^[18]. These activities cover various cognitive, emotional, and psychomotor aspects and take place within educational structures in the form of educational clubs, which are responsible for organizing and supervising extracurricular activities^[19]. These clubs provide a methodological framework to energize school life, involving various stakeholders: students, educational and administrative staff, and various partners. They become spaces

for the development of social and psychological skills, communication, teamwork, citizenship values, and civic behavior^[20]. Working within these educational clubs is an essential pedagogical approach, encouraging students to transfer and apply their school learning to their daily lives, while placing them at the center of reflection and pedagogical action^[21]. Environmental education finds its place in these extracurricular activities, particularly through environmental clubs. These clubs, managed by volunteer teachers who are committed to the importance of the environment, play a key role in transmitting ecological values and empowering students with respect to their environment^[22]. They promote the institutionalization of their activities into concrete actions, fostering cooperation among different school actors and allowing students to acquire contextualized knowledge about the environment^[23].

Environmental education, particularly within school-based environmental clubs, plays a crucial role in raising awareness and engaging younger generations in the fight against environmental and climate-related challenges. In the Moroccan context, where the effects of climate change are already being felt through phenomena such as desertification, heatwaves, and prolonged droughts, the issue of climate resilience has become critical. Resilience refers to the ability of communities to anticipate, adapt to, and recover from the negative impacts of climate change. Environmental education (EE) is no longer limited to the mere dissemination of information but seeks to encourage in-depth reflection on the human causes of environmental crises, as highlighted by Smyth (1995)^[24]. This holistic approach goes beyond intellectual awareness, pushing for concrete actions to reduce the ecological footprint, as suggested by Fien^[25]. The study results confirm that encouraging responsible behavior is essential. Tilbury emphasizes the importance of EE for the responsible management of natural resources and for raising students' awareness of the interdependence of ecosystem elements^[26]. In this regard, EE should be transversal, integrated into all school curricula, and not limited to a single subject, as Sterling underscores^[27]. UNESCO adds that the ultimate goal of EE is to train responsible citizens, capable of making informed decisions to preserve the planet^[28].

Huckle & Sterling, argue that EE plays a key role in raising awareness of major environmental issues^[29], such as biodiversity loss and climate change, which is also sup-

ported by Lundholm, 2019.^[30], who see awareness as the first step before concrete action. However, the implementation of environmental initiatives, such as environmental clubs, faces obstacles such as a lack of resources, time, and funding, as noted by Rickinson et al.^[31]. The effectiveness of these projects also depends on teacher training and ongoing support, as emphasized by Palmer (1998) and Bengtsson & Östman (2013).^[32,33].

Environmental clubs, as informal educational structures, serve as key spaces for introducing students to environmental issues^[34]. These clubs provide a platform where young people can not only acquire knowledge about ecological challenges but also actively participate in practical projects aimed at improving their immediate environment^[35]. In our study, the involvement of teachers and students in such initiatives could become a significant driver of climate resilience by contributing to a better understanding of climate mechanisms and the adoption of ecological practices. However, to assess the effectiveness of these educational actions, it is essential to understand the activation factors that influence teachers' and students' engagement in environmental clubs. These factors can be numerous: teachers' motivations, students' perceptions, available resources, institutional support, and the clubs' ability to incorporate climate issues into their daily activities. A statistical analysis of the responses from 42 teachers, through a questionnaire designed for this purpose, would help identify the factors that either facilitate or hinder involvement in environmental education and, consequently, in building climate resilience. Thus, the central issue of this study is to understand how much the environmental education implemented by environmental clubs contributes to strengthening the climate resilience of students and the educational community, and what the key factors are that either activate or hinder this dynamic within the institution.

2. Research Methodology

2.1. Description of the Method Used

The sample selection method primarily relies on purposive sampling. The second category encompasses methods of sample selection based on informed choice. Unlike probabilistic methods, which aim to eliminate researcher subjectivity, purposive methods fundamentally depend on judgment.

They allow for precise selection of sample elements to more easily align with the criteria established by the researcher. The results of a sample selected through purposive choice may lend themselves to analytical generalization.

This study uses purposive sampling, selecting 42 participants (35 teachers and 7 administrators) actively involved or interested in environmental education. The selection was based on relevance to the research objectives and ensured representation from multiple academic disciplines and school settings. These individuals were chosen based on several criteria, including their willingness to engage in activities related to environmental education (EE) and their potential role in implementing such initiatives within the school. Teachers, as direct actors in education, play a key role in integrating environmental concepts into their curricula to raise students' awareness of ecological issues while imparting both practical and theoretical knowledge. As for administrators, their role is crucial for coordinating and supporting these activities at the organizational level, as well as for fostering a school environment conducive to environmental engagement.

2.2. Sampling and Representativeness

In this article, the research objectives were taken into account, guiding the selection of research tools. First, document analysis was used to gather data on the research topic from sources such as articles, reports, books, and other relevant documents. This method facilitated the collection of reliable and readily accessible data without requiring direct interaction with study participants. Subsequently, a questionnaire was used to collect data from the participants. The questionnaire was distributed simultaneously to a targeted group, making it an efficient tool for gathering data in a systematic and effective manner.

A total of 42 questionnaires were distributed, and all 42 were returned. The questionnaire was conducted in French to ensure clarity and ease of understanding for the respondents, as it was distributed online using Google Forms. The questionnaire is divided into four sections and includes 26 questions addressing various aspects related to environmental education and the activation of environmental clubs.

2.3. Techniques Used for Data Collection

Two methods were used: (i) Document analysis of reports, curricula, and educational guidelines, and (ii) a structured online questionnaire distributed via Google Forms. The questionnaire was written in French and included 26 items, using a mix of closed-ended questions, 5-point Likert scales, and optional open comments. It was divided into five thematic parts:

- Part 1: Personal Data
- Part 2: Perceptions Regarding Environmental Clubs
- Part 3: Extracurricular Activities and Environmental Clubs
- Part 4: Respondents' Satisfaction
- Part 5: Barriers to the Activation of Environmental Clubs

2.4. Data Analysis

Descriptive statistics (frequency, percentage) were used to identify patterns. Chi-square tests assessed the significance of relationships between variables (e.g., training and club presence/engagement). The Weighted Average Index (WAI) was used to rank barriers in order of severity. Data were analyzed using SPSS v25. To analyze the collected data, various methods were used to ensure a comprehensive approach. Descriptive methods were applied to examine participants' perceptions of environmental education and environmental clubs, identifying trends and recurring themes in their responses. This helped clarify the social and pedagogical views on these practices. The activation of environmental clubs was analyzed using the chi-square test, assessing the relationship between the existence of these clubs and environmental education training. This statistical method helped determine the correlation between these variables. Participants' satisfaction with the activation of clubs was measured on a Likert scale, covering factors such as administrative support, stakeholder involvement, material availability, and student engagement. Additionally, the Weighted Average Index (WAI) was used to prioritize obstacles identified in the questionnaire, helping to assess the importance and severity of each challenge. This comprehensive approach provided

a clear understanding of the dynamics surrounding environmental clubs and education.

The WAI is calculated by

$$WAI_i = \sum (g_{ij} \times p_j) / N_i \quad (1)$$

- WAI_i is the weighted average index for barrier i
- g_{ij} is the severity assigned to barrier i by participant j
- p_j is the weight corresponding to the severity g_{ij}
- N_i is the total number of evaluations for barrier i

3. Results and Discussion

The analysis of the 42 survey responses revealed that teachers (83%) constituted the majority of participants, with 71% having over 10 years of teaching experience. Most participants (81%) held a Master's degree and came from diverse academic disciplines, with History-Geography, English, and Science being the most represented.

Regarding perceptions, 93% of respondents agreed that environmental education (EE) promotes environmental awareness, with many highlighting its role in fostering behavior change and sustainable resource use. A total of 64% associated climate change (CC) primarily with reduced rainfall, although fewer acknowledged rising temperatures as a key symptom. Nonetheless, 92.9% believed EE plays a significant role in climate change mitigation.

Environmental clubs were positively perceived: 71.4% of respondents reported active participation in environmental projects such as tree planting. However, logistical and pedagogical challenges were noted. A chi-square test indicated a significant relationship between training in EE and the existence of environmental clubs ($p = 0.003$), but not with their engagement levels ($p = 0.491$).

Regarding satisfaction, participants expressed high satisfaction with institutional support and teacher-student engagement. However, dissatisfaction was observed in terms of funding, material availability, and lack of recognition. Time constraints were also frequently mentioned as a major limitation to consistent participation.

Barriers to club activation were ranked using the Weighted Average Index (WAI): the most prominent were lack of time (4.79), insufficient resources (4.64), and inadequate funding (4.57). Other obstacles included lack of training (3.57), poor coordination (3.50), insufficient admin-

istrative support (3.07), and resistance to change (2.71).

3.1. Sample Processing

The results of processing of observations indicate that all the collected data (42 observations) are valid and no missing data has been recorded. This ensures the statistical reliability of the analyses conducted thereafter.

The cross-tabulations between "Professional Status," "Years of Experience," "Level of Education," and "Specialization" show a complete and balanced distribution, with no omissions.

The intersection of professional status and the number of years of experience presents the distribution of years of experience across two professional status categories: Administrator and Teacher. Of a total of 42 individuals, teachers are the majority (35 out of 42, or approximately 83%). Administrators are significantly fewer in number (7 out of 42, or approximately 17%).

Regarding professional experience, administrators have no individuals with 5 to 10 years of experience. Three administrators have less than 5 years of experience, while four have more than 10 years of experience. For teachers, an overwhelming majority, 25 out of 35 (71%), have more than 10 years of experience. Additionally, five teachers have less than 5 years of experience, and another five have between 5 and 10 years of experience.

Thus, in general, it can be said that the teacher population is experienced, with a focus on profiles with over 10 years of experience. Administrators, although fewer in number, show a more balanced distribution across experience levels.

The analysis of the intersection between specialty and level of education presents the distribution of participants based on their level of education: Doctorate, Master's, and Bachelor's. The majority of participants hold a Master's degree, representing 81% of the sample, or 34 out of 42. The Doctorate and Bachelor's degrees are equivalent in number, with 4 participants each, corresponding to 9.5% of the participants.

Regarding the distribution by specialty, in the field of English, all participants (8) hold a Master's degree. In Mathematics, all 4 participants are at the doctoral level. For History-Geography, 10 participants also hold a Master's degree. In Physics-Chemistry and Life and Earth Sciences, participants

(4 and 3, respectively) all hold a Master's degree. Pedagogical, social, or administrative specialists show a more heterogeneous distribution, with 2 holding a Bachelor's degree and 1 holding a Master's degree. Other specialties, such as Physical Education, Philosophy, French, and Computer Science, are underrepresented, with 1 or 2 participants in each field, mostly holding a Master's degree.

In conclusion, the Master's level dominates across all specialties, reflecting a highly qualified population overall, though concentrated in specific disciplines such as History-Geography, Physics-Chemistry, and English. The Doctorate is primarily associated with Mathematics, highlighting a high level of specialization in this field.

3.2. Perceptions Related to EE and CC

At the level of social perceptions, the results reveal a conception of environmental education (EE) that emphasizes several fundamental dimensions, reflecting the complexity and scope of this pedagogical approach.

Awareness of ecological issues: One of the responses refers to "teaching ecological issues," suggesting an approach focused on conveying knowledge related to contemporary environmental problems. In this view, EE aims to raise learners' awareness of global challenges such as climate change, pollution, and biodiversity loss. This involves not only a theoretical understanding of these issues but also critical reflection on the causes and consequences of environmental degradation.

Adopting an environmentally friendly lifestyle: The idea of encouraging the adoption of "a more environmentally friendly lifestyle" highlights a crucial aspect of EE: action. Education does not merely disseminate knowledge; it also seeks to influence individuals' behaviors. This behavioral change includes reducing the ecological footprint through everyday actions such as recycling, responsible consumption, and rational management of natural resources. This aspect portrays EE as an action-oriented education, involving the active participation of students in environmental preservation.

Raising awareness of environmental protection and sustainable resource management: The response referring to "raising students' awareness of environmental protection and sustainable resource management" highlights one of the core goals of EE: the responsible management of natural re-

sources. EE invites learners to understand not only the need to preserve the environment but also to adopt a systemic and sustainable approach to resource management, a key skill for future generations.

Integration of environmental practices into educational curricula: The integration of environmental concerns across all academic disciplines is essential for a comprehensive and coherent education. This point indicates that EE should not be an isolated subject but rather a cross-cutting theme throughout educational programs. It must permeate daily teaching practices and influence teaching methods, content, and educational objectives across various fields (sciences, geography, history, etc.), enabling a holistic approach to environmental issues.

Education for environmental protection: Finally, the notion that EE "aims to protect the environment" underscores its goal-oriented nature. It is an education that not only prepares individuals to understand and act but also seeks to instill a lasting commitment to the preservation of the planet. The ultimate objective of EE is to shape informed, responsible, and engaged citizens dedicated to safeguarding the environment through concrete and thoughtful actions.

Some questions used in the questionnaire:

- In your opinion, what are the main objectives of environmental education?
- In your opinion, what are the main objectives of climate change?
- Do you think environmental education can contribute to the fight against climate change?

At the level of EE objectives, the results of the study emphasize the importance of raising awareness about ecological issues, with a strong consensus on the need to inform students about major environmental challenges. Environmental education (EE) also aims to foster responsible behaviors and practical skills, encouraging students to take action for the environment. The theoretical understanding of ecosystems, though less emphasized, remains an essential foundation for addressing these issues comprehensively.

Regarding climate change (CC), the majority of respondents (64.3%) highlight the decrease in rainfall as a key aspect, linking it to impacts on water cycles. Fewer respondents recognized the rise in average temperatures, suggesting a gap in awareness of this fundamental climate change element. Despite this, many respondents understood CC's

connection to extreme weather events, emphasizing its immediate effects.

Most respondents (92.9%) agreed that EE is a powerful tool in combating climate change, though some (7.1%) expressed skepticism, suggesting that additional political and economic actions are needed alongside educational efforts.

Regarding environmental clubs in Moroccan schools, the responses highlight their importance in raising awareness and engaging students. However, challenges such as resource shortages, poor coordination, and lack of institutional support hinder their effectiveness. Long-term success will depend on addressing these challenges.

3.3. Extracurricular Activities and EC

Collaboration on climate change education:

The results (**Table 1**) show significant participation of teachers in educational projects related to climate change, reflecting a growing recognition of the importance of environmental education and sustainable development in school curricula. The majority of teachers seem to direct their projects towards concrete actions, such as tree planting or natural resource management, which not only raise awareness among students but also actively engage them in building a more sustainable future.

Table 1. Chi-Square Tests.

Test	Value	df	Asymptotic Significance (Bilateral)	Exact Sig. (Bilateral)	Exact Sig. (Unilateral)
Pearson Chi-Square	9.105	1	0.003		
Continuity Correction ^b	5.457	1	0.019		
Likelihood Ratio	8.724	1	0.003		
Fisher's Exact Test				0.014	0.014
Linear-by-Linear Association	8.888	1	0.003		
Number of Valid Cases	42				

On the other hand, the existence of 28.57% of negative responses suggests that there are still teachers or schools that have not integrated these themes into their educational projects. This could be due to logistical constraints, pedagogical challenges, or a lack of training in this specific area.

The chi-square test is a statistical test used to determine

if there is a significant association between two categorical variables. The result (**Table 1** and **Figure 1**) of 0.003 means that the p -value is below the typical threshold of 0.05, indicating a statistically significant relationship between the two variables (environmental clubs and training in environmental education).

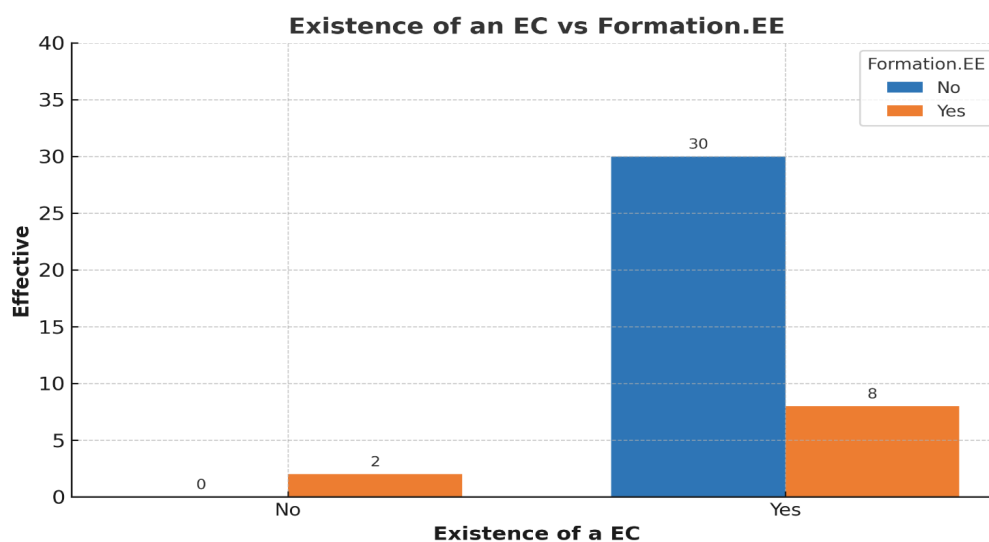


Figure 1. Graphical Representation of Chi-Square Results.

The chi-square test suggests that the presence of environmental clubs and training in environmental education are significantly related (Table 2 and Figure 2). This could

imply that training in environmental education influences the existence or development of environmental clubs, or that there are common factors explaining this association.

Table 2. Chi-Square Tests.

Test	Value	df	Asymptotic Significance (Bilateral)	Exact Sig. (Bilateral)	Exact Sig. (Unilateral)
Pearson Chi-Square	0.474*	1	0.491	0.491	
Continuity Correction ^b	0.113	1	0.737	0.737	
Likelihood Ratio	0.479	1	0.489	0.489	
Fisher's Exact Test					0.726
Linear-by-Linear Association	0.463	1	0.496	0.496	
Number of Valid Cases	42				

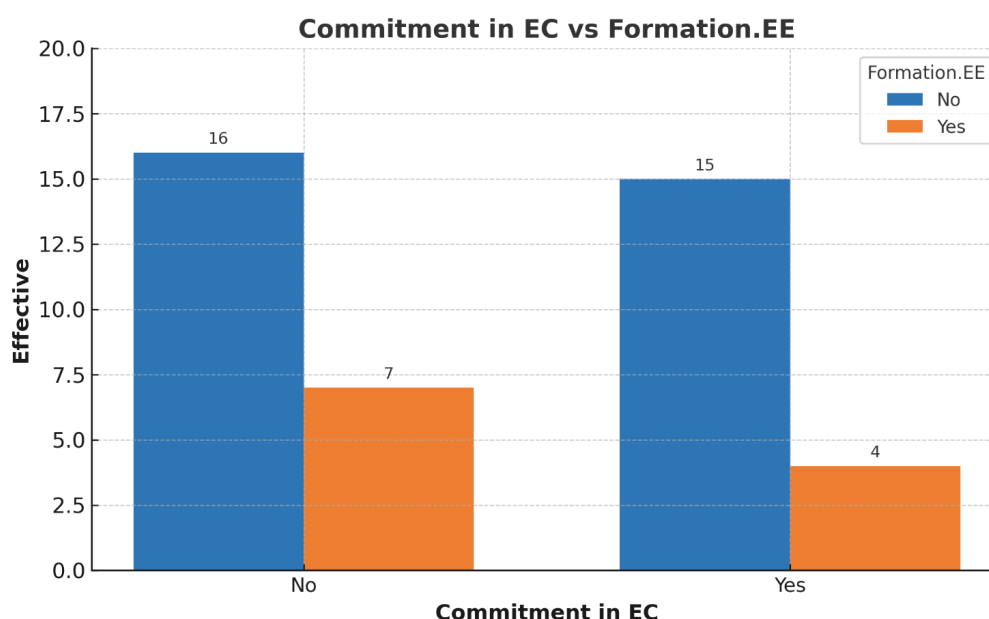


Figure 2. Graphical Representation of Chi-Square Results.

The results obtained from the chi-square test in this context, with a p -value of 0.491, suggest that there is no significant association between the engagement of environmental clubs and training in environmental education. This could indicate that, in our context, training in environmental education does not appear to have an influence or direct link with the level of engagement of environmental clubs.

3.4. Satisfaction of Participation Related to the Activation Variables of the EC

The results highlight both strengths and weaknesses that can inform future improvements. Regarding administrative support, most participants report being fairly or fully satisfied, indicating positive institutional guidance. However,

some express dissatisfaction, suggesting room for improvement.

Satisfaction with general support is mostly high, but a few participants remain slightly dissatisfied, pointing to the need for further adjustments. A major issue is the availability of resources, with significant dissatisfaction noted. This suggests that material and financial resources are insufficient, limiting the clubs' ability to effectively carry out their activities.

Recognition of efforts also emerges as a critical area, with participants expressing dissatisfaction over the lack of acknowledgment for their contributions. Financial support is another area of concern, as participants feel the clubs lack adequate funding, which hampers their sustainability and

impact.

In terms of member engagement, the feedback is generally positive, with most members feeling satisfied with their involvement. However, collective participation is seen as an area for improvement, as strengthening collaboration could maximize the clubs' impact.

Finally, the time required for activities is a major source of dissatisfaction, as some members feel the demands are too high. Addressing these issues while capitalizing on strengths like engagement and support will help improve the clubs' overall effectiveness.

3.5. Barriers to the Activation of Environmental Clubs

The results in **Table 3** show that the main barriers to the activation of environmental clubs in schools are primarily related to issues of time, teaching resources, and funding, closely followed by a lack of training, coordination, and administrative support. A lack of interest and resistance to change are perceived as less significant obstacles, though still noteworthy. These findings suggest that in order for environmental clubs to be truly effective, it is necessary to invest in material resources, ensure strong institutional support, develop specific skills in facilitators, and reorganize school time to promote their growth. Additionally, efforts to raise awareness about the importance of these clubs, along with reinforced administrative support, are essential to ensuring the sustainability and effectiveness of environmental initiatives in schools.

Table 3. Ranking of Barriers to the Activation of Environmental Clubs.

Barrière	WAI
Lack of time	4.79
Limited educational resources	4.64
Lack of funding	4.57
Lack of training	3.57
Coordination issues	3.50
Lack of administrative support	3.07
Resistance to change and lack of interest	2.71

3.6. Analysis and Discussion of Results

The results of our study reveal a conception of Environmental Education (EE) that is multifaceted, emphasizing awareness-raising, behavioral change, resource management, and curriculum integration. The first key finding is the em-

phasis on ecological issues, particularly climate change, pollution, and biodiversity loss. This aligns with Smyth, who argue that EE should do more than convey facts; it should foster deep reflection on the human contributions to ecological crises. Our study reflects this, showing that the awareness raised in EE extends beyond theoretical knowledge, encouraging critical thinking about the causes and consequences of environmental degradation.

Another prominent theme is the promotion of an environmentally friendly lifestyle, a core principle of action-oriented EE. This finding resonates with Fien, who highlights that EE should not be merely about intellectual awareness but should lead to tangible actions. In this study, students are encouraged to engage in practical behaviors like recycling and responsible consumption, which is consistent with the idea that EE should cultivate habits that minimize ecological footprints. The importance of sustainable resource management, also emphasized in our study, is consistent with Tilbury, who states that EE should promote a systemic understanding of ecosystems and encourage responsible management. Our findings demonstrate that EE should help students recognize the interconnectedness of environmental systems, preparing them for sustainable resource management in the future.

The study also supports Sterling's argument that EE should be integrated across subjects rather than treated as an isolated topic. The results highlight the need for a holistic approach, suggesting that environmental issues should be embedded in various academic disciplines, such as science, geography, and history, to provide students with a comprehensive understanding of the environment.

Regarding the ultimate goal of EE protecting the planet our findings align with UNESCO, which stresses that EE should aim to inspire active engagement in environmental protection. By focusing on both knowledge and action, EE cultivates informed, responsible citizens capable of making decisions that contribute to environmental preservation.

In terms of social perceptions of EE's objectives, the study reveals a strong consensus on the need to raise awareness about global ecological issues, such as climate change and biodiversity loss. This aligns with Huckle & Sterling, who argue that EE is key to developing an ecological conscience, which is the first step toward proactive environmental action. The relatively limited mention of theoretical understanding of ecosystems, while still present, suggests

that more emphasis is placed on immediate environmental issues.

Our study also reveals that respondents most commonly associate climate change with decreased rainfall, highlighting concerns over water availability, particularly in drought-prone regions. This aligns with Bennett et al., who note that the impacts of climate change on the water cycle are often most visible at the local level. However, fewer respondents connected climate change to rising temperatures, indicating a gap in understanding one of the most fundamental aspects of climate change. Gifford notes that temperature changes are harder to grasp because they occur over longer time periods, which may explain this gap.

When considering the effectiveness of EE in combating climate change, the study finds overwhelming support (92.9%) for the idea that EE can drive behavior change and raise awareness. This finding is consistent with the research by Huckle & Sterling, who argue that EE is a crucial tool in addressing environmental challenges. However, the 7.1% who expressed skepticism highlight the need for complementary political and economic actions alongside educational efforts to make a real impact, echoing the views of Huckle & Sterling.

Finally, the study underscores the significant role of environmental clubs in raising awareness and engaging students, while also identifying challenges such as insufficient resources and lack of institutional support. These challenges are consistent with prior research, which stresses the importance of adequate institutional support and resource allocation for the success of environmental programs. To overcome these obstacles, schools must invest in training, infrastructure, and better coordination between teachers, administrators, and external partners, which could significantly improve the effectiveness of environmental clubs and education programs.

In conclusion, the results of this study are consistent with key literature, underscoring the importance of EE in raising awareness, promoting sustainable practices, and fostering long-term engagement with environmental issues. However, they also point to areas for improvement, particularly in addressing the practical challenges faced by environmental clubs and ensuring that EE is fully integrated into educational practices.

3.7. Role of Earth Science in EE

Earth Sciences are central to environmental education, offering a scientific basis for understanding climate systems, natural resource management, and environmental degradation. In Moroccan schools, integrating Earth Science into environmental club activities can help students connect theoretical knowledge with real-world climate issues like desertification, droughts, and soil erosion. Through geoscience-based learning, students gain insights into the long-term impacts of human activities on planetary systems, fostering a deeper sense of responsibility and stewardship.

4. Conclusions

This study confirms the importance of school-based environmental clubs in promoting environmental awareness and climate resilience among students in Morocco. Despite their potential, the clubs face substantial challenges. Key recommendations include: (1) enhancing teacher and facilitator training; (2) improving funding and material support; (3) integrating environmental clubs within school schedules; and (4) establishing partnerships with external institutions. Strengthening these areas will ensure that ECs can serve as effective platforms for environmental education and sustainable development. Environmental education is a fundamental pillar of sustainable development, and its integration into educational systems is vital to achieving the Sustainable Development Goals. In Morocco, while notable efforts have been made to promote environmental education particularly through the establishment of environmental clubs in schools numerous challenges continue to hinder their effectiveness. These clubs are intended to serve as platforms for raising awareness and fostering student engagement with climate change issues. However, their potential remains underutilized due to persistent obstacles such as insufficient resources, limited funding, inadequate training, low motivation among stakeholders, and time constraints. The findings of this study underscore the major barriers impeding the activation and success of school-based environmental clubs. Addressing these challenges requires a comprehensive strategy that prioritizes the enhancement of training programs, ensures the allocation of adequate financial and material resources, and

promotes the motivation and engagement of those involved. Increased financial investment and more effective management structures are also necessary to enhance the visibility, sustainability, and overall impact of these clubs in addressing climate-related issues. Several areas for improvement have emerged as essential to ensuring the long-term success and effectiveness of environmental clubs. First, building partnerships with public and private institutions could secure stable and sustainable funding. Second, expanding and diversifying training opportunities for teachers and club coordinators would better equip them to lead and manage environmental initiatives. Furthermore, the development of rigorous monitoring and evaluation mechanisms would allow for ongoing assessment, feedback, and refinement of club activities. Time management is another critical factor. Allocating dedicated time slots within the school schedule for club activities and reducing time pressures on teachers and students would encourage consistent participation. Additionally, addressing the lack of suitable materials such as gardening tools, workshop equipment, and educational resources is crucial for enabling hands-on learning and making club activities more engaging and impactful. Ultimately, to enable environmental clubs to fulfill their educational mission and play a meaningful role in combating climate change, a more systematic and sustained approach is required. This approach must focus on strengthening training, securing adequate funding, ensuring access to essential materials, and providing sufficient time for active participation. In doing so, these clubs can become powerful tools for cultivating a lasting environmental consciousness within schools and among future generations.

Author Contributions

Conceptualization, A.H. and R.K.; methodology, A.H.; software, A.H.; validation, A.H., R.K. and Z.B.; formal analysis, A.H.; investigation, A.H.; resources, A.H.; data curation, A.H.; writing—original draft preparation, A.H.; writing—review and editing, A.H.; visualization, A.H.; supervision, A.H.; project administration, A.H.; funding acquisition, Y.F., R.K., F.E.M., O.K. and E.K.E.M. All authors have read and agreed to the published version of the manuscript.

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All data generated during this study are included in this article.

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Conflicts of Interest

The authors declare no conflict of interest.

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