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LUSAKA, ZAMBIA SCIENCE TEACHERS' OPINIONS ON BIODIVERSITY

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Abstract:
This study aims to examine the knowledge, attitudes, and opinions of secondary school science teachers working in Lusaka, Zambia, regarding biological diversity. The conservation of biodiversity is recognized as a fundamental component of sustainable environmental education, and teachers' competencies in this area are of critical importance for fostering public awareness. The research was conducted using a qualitative research design, and semi-structured interviews were carried out with 30 science teachers from eight different secondary schools in Lusaka. The data obtained were analyzed using content analysis. The findings revealed that while teachers possess limited knowledge of the scientific foundations of biodiversity, they exhibit a high level of awareness regarding its value and conservation. Furthermore, the teachers were able to identify both anthropogenic and natural threats to biodiversity and offered educational, legal, and societal recommendations for its preservation. In this context, the study is expected to contribute to the enhancement of biodiversity education and the development of teacher training programs.

Keywords: biodiversity, science teachers, environmental education, Zambia, teacher perspectives

1. Introduction

In the 21st century, one of the most pressing environmental crises faced by humanity is the loss of biodiversity. Biodiversity is a multi-layered concept that encompasses the

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diversity of all forms of life, from the genetic level to the ecosystem level (Wilson, 1988). This concept reflects not only the number of species but also the holistic expression of their genetic structures, habitats, and ecological functions. The World Economic Forum (2020), in its Global Risks Report, identified biodiversity loss as the second greatest environmental threat after climate change.

The decline in biodiversity not only disrupts the natural balance but also threatens humanity's basic life needs, such as food security, water resources, and health (UNEP, 2010). Factors such as habitat loss, deforestation, overhunting, environmental pollution, and climate change are causing irreversible damage to ecosystems worldwide (Rawat & Agarwal, 2015). Since the beginning of its existence, humankind has utilized the natural environment, cultivated the land, and, through accumulated knowledge and technological advancements, has steadily strengthened its dominance over nature. For centuries, the natural environment has been exploited without concern for the future, as if the Earth's resources were inexhaustible (Deniş, 2007; Deniş & Genç, 2010, p. 10). The unsustainable exploitation of resources has profoundly undermined biodiversity and disrupted the integrity of natural systems

Consequently, the preservation of biodiversity is no longer solely the concern of environmentalists or biologists; it has become a collective responsibility that demands the active engagement of all sectors of society.

These threats to biodiversity must be transformed into societal awareness not only through scientific research but also through education systems. Particularly, formal educational institutions play a critical role in instilling environmental awareness from an early age. Within environmental education, biodiversity education shapes not only students' level of knowledge but also their values, attitudes, and behavior (UNESCO-UNEP, 1990).

At this point, the role of teachers—especially science teachers—becomes prominent. Science teachers are the main actors in transmitting both scientific knowledge and environmental values to students. Their knowledge about biodiversity, classroom practices, and individual attitudes toward the environment directly influence how students perceive environmental issues (Ferreira, Ryan & Tilbury, 2007). Therefore, evaluating teachers' opinions on biodiversity is essential for the effectiveness of environmental education.

Zambia holds a significant position on the African continent in terms of its rich natural resources and biodiversity. However, recent deforestation, drought, and environmental degradation in the country have threatened the sustainability of its ecosystems (GRZ, 2015). Much of Zambia's population relies on subsistence agriculture, and the overuse of natural resources poses serious threats to biodiversity. In contrast, environmental education in the country is not structurally implemented, which further highlights the role of teachers.

In Zambia, ensuring the sustainability of biodiversity can be achieved not only through national policies but also through educational activities conducted at the local level. In this regard, science teachers' perspectives on biodiversity will be critical to the success of this process. A qualified environmental education is only possible by

improving teachers' mastery of the subject and their pedagogical approaches (Hasna, 2007). Research shows that teachers are generally knowledgeable about species diversity but lack understanding of genetic diversity and ecosystem-based approaches (Dikmenli, 2010; Fiebelkorn & Menzel, 2013).

Moreover, UNESCO's 2011–2020 Biodiversity Strategic Plan and the Aichi Targets recommend that countries restructure their teacher training programs based on the principles of environmental sustainability. However, as in many countries, Zambia needs to identify the training needs of teachers and develop relevant content to meet those needs (CBD, 2011).

The extent to which science teachers in Zambia are informed about environmental education, how confident they are in classroom practices, and how comprehensively they evaluate environmental problems has not been sufficiently researched. Yet, teachers' views are not only indicators of their individual knowledge levels but also serve as a key data source for evaluating curriculum applicability, the effectiveness of educational policies, and the level of environmental awareness in society.

This study aims to fill that gap and analyze in depth the perspectives of science teachers working in Zambia on the issue of biodiversity. In this context, teachers' conceptual knowledge, value attributions, perceptions of threats, and proposed solutions related to biodiversity will be systematically examined. The data obtained is expected to contribute both to teacher training policies and the revision of environmental education programs.

In conclusion, biodiversity has become a focal point not only for environmental sciences but also for educational sciences. Increasing teachers' knowledge and promoting environmental values will contribute not only to the preservation of natural life but also to the protection of humanity's future. The findings of this study are expected to provide an important foundation for achieving environmental sustainability goals.

2. Method

This research was conducted using the case study design, one of the qualitative research approaches. Case studies aim to examine a specific event, individual, group, or process in depth (Yıldırım & Şimşek, 2018). The objective of this study is to explore the views of science teachers working in Lusaka Province, Zambia, on biodiversity. This design was chosen for its potential to provide original insights based on individual experiences (Stake, 1995).

The study group was determined using maximum variation sampling, a purposeful sampling method. Accordingly, a total of 30 science teachers working in eight different public secondary schools in Lusaka were included in the study. Care was taken to ensure diversity in terms of geographical location, socio-economic context, and school level. This diversity contributed to the comprehensiveness of the findings (Patton, 2002). Data were collected through a semi-structured interview form. The form was developed by drawing on similar studies in the literature (e.g., Dikmenli, 2010; Fiebelkorn & Menzel, 2013) and relevant international reports (CBD, 2011; UNEP, 2010). The questions aimed

to assess science teachers' views on the concept, value, threats, conservation strategies, and education related to biodiversity.

The interviews were conducted face-to-face and lasted approximately 30–40 minutes each. Written consent was obtained from the participants, and data confidentiality was ensured in line with ethical guidelines. The audio recordings obtained during the interviews were transcribed and analyzed.

The data were analyzed using the content analysis method. In the first stage, all interview transcripts were read in detail, and open coding was used to generate themes. The resulting codes were grouped according to thematic coherence and analyzed under each sub-problem heading (Miles & Huberman, 1994). To ensure the reliability of the coding, expert opinion was sought, and an 85% agreement rate was achieved.

The validity and reliability of the research were enhanced through techniques such as prolonged engagement, member checking, and peer review (Lincoln & Guba, 1985). Additionally, a brief summary of the participants' responses was presented at the end of each interview for their confirmation. This step played an important role in ensuring data accuracy.

The limitations of the study include the focus solely on science teachers working in public schools in Lusaka and the reliance on interview data. Nevertheless, the findings are believed to offer meaningful insights in the context of science and environmental education.

3. Findings

In this section, the views of 30 science teachers working in secondary schools in Lusaka, Zambia, regarding biodiversity have been analyzed under thematic headings. The data were collected through a semi-structured interview form and evaluated using content analysis.

3.1. Science Teachers' Views on the Concept of Biodiversity

The majority of the teachers defined biodiversity mainly in terms of species diversity. Some also addressed the concept at the genetic and ecosystem levels. However, it was observed that some teachers were unable to define the concept accurately or gave incorrect definitions.

Table 1: Science Teachers' Views on the Concept of Biodiversity

View Category	Number of Teachers
Defined biodiversity only as species diversity	18
Defined biodiversity at the ecosystem and genetic levels	8
Could not define or gave incorrect definitions	4

This finding indicates that science teachers tend to perceive the concept of biodiversity at a rather superficial level. Similarly, Fiebelkorn and Menzel (2013) found that pre-service

teachers often failed to address genetic diversity adequately. This shortcoming reveals the need to reassess the scope of environmental education programs.

3.2. Science Teachers' Views on the Value of Biodiversity

Most teachers recognized the ecological, economic, and cultural values of biodiversity. In addition, some teachers emphasized more abstract aspects, such as aesthetic and intrinsic values.

Table 2: Science Teachers' Views on the Value of Biodiversity

View Category	Number of Teachers
Emphasized ecological and economic value	15
Emphasized aesthetic and cultural value	9
Emphasized intrinsic value	3
Did not express an opinion on value	3

It appears that while teachers acknowledge the tangible benefits of nature through direct experience, they often lack knowledge about the intrinsic or moral values of biodiversity. As Kögel-Knabner et al. (2008) note, environmental education should not only be utilitarian but also ethically grounded.

3.3. Science Teachers' Views on Factors Contributing to Biodiversity Loss

The participating teachers categorized the causes of biodiversity loss into human-induced and natural factors. Human activities were more frequently emphasized as negative contributors.

Table 3: Science Teachers' Views on Factors Contributing to Biodiversity Loss

View Category	Number of Teachers
Mentioned human-induced threats (deforestation, pollution, hunting)	14
Mentioned natural factors (drought, natural disasters)	6
Mentioned both categories	10

The vast majority of teachers were able to correctly identify the primary causes of biodiversity loss. Rawat and Agarwal (2015) highlight habitat destruction and anthropogenic activities as key environmental threats of the 21st century. In this respect, teachers' awareness appears to be at a relatively high level.

3.4. Science Teachers' Suggestions for the Conservation of Biodiversity

In their suggestions for biodiversity conservation, teachers primarily emphasized education, legal regulations, and approaches based on raising public awareness. The use of media and support from civil society were also noted among the proposed strategies.

Table 4: Science Teachers' Suggestions for Biodiversity Conservation

Conservation Strategy	Number of Teachers
Proposed education-based solutions	13
Emphasized legal regulations and enforcement	9
Suggested raising public awareness and using media	6
Did not express an opinion	2

UNESCO (1990) places the role of teachers at the center of environmental education. In this study, teachers proposed multidimensional conservation strategies, pointing to both individual and systemic solutions. Education-based proposals are seen as the key to long-term sustainability.

4. Discussion and Conclusion

This study aimed to present a comprehensive framework regarding the current state of environmental education by analyzing the knowledge, awareness, and attitudes of science teachers working in the Lusaka region of Zambia concerning biodiversity. The findings revealed that while teachers had deficiencies in some fundamental biodiversity concepts, they demonstrated a higher level of awareness regarding the value dimension of the subject. These results point to the need for pedagogical deepening in biodiversity education.

In particular, the fact that most teachers defined biodiversity primarily through "species diversity" (see Table 1) indicates a conceptual narrowing in this area. This issue has been frequently addressed in the literature as well. Fiebelkorn and Menzel (2013) noted that a large portion of teacher candidates lacked knowledge at the genetic and ecosystem levels; similarly, Dikmenli (2010) found that Turkish teachers tended to define biodiversity merely in terms of "number of living beings." These findings clearly demonstrate the necessity of integrating the concept of biodiversity holistically into teacher education.

The research results showed that teachers strongly reflected their knowledge regarding the ecological and economic values of biodiversity (see Table 2). This indicates that teachers evaluate the natural environment through a utilitarian lens. However, the relatively limited emphasis on intrinsic and aesthetic values, which require a deeper understanding of environmental ethics, reveals a shortcoming in ethics-based environmental education. Kögel-Knabner et al. (2008) stress that environmental awareness should be based not only on self-interest but also on ethical foundations.

In the analysis of the causes of biodiversity loss, it was found that the majority of teachers correctly identified human-induced threats (see Table 3). This indicates that teachers are able to analyze environmental problems at the societal level and seek responsibility not only in nature but also in human activities. Rawat and Agarwal (2015) emphasize that habitat destruction, urbanization, and mining are among the primary human activities that threaten biodiversity. Thus, teachers' views largely align with the academic literature.

Nevertheless, the fact that some teachers also highlighted nature-related threats such as natural disasters and drought demonstrates that they approach environmental issues with a multidimensional perspective. This shows that teachers possess systemic thinking skills within environmental education and do not treat problems in a one-dimensional manner. However, how these approaches are reflected in classroom practices is beyond the scope of this study and may provide a basis for future action research.

When examining the strategies proposed for biodiversity conservation, it was found that most teachers suggested education-based solutions (see Table 4). This indicates that teachers are aware of their professional roles and believe that environmental education can only be sustained through conscious generations. UNESCO-UNEP (1990) and Ferreira et al. (2007) place teachers at the center of achieving sustainable development goals. In this context, the findings of this study parallel this global perspective.

The findings also showed that teachers emphasized not only individual but also structural solutions. Suggestions such as more effective implementation of environmental laws, increased monitoring, and raising public awareness through media demonstrate that teachers evaluate the problem holistically. This approach indicates that educators do not see environmental issues as limited to classroom content, but also consider them within the context of policy and societal transformation.

The data obtained reveal that teachers' knowledge levels on the subject are heterogeneous—while some had limited knowledge, others were able to provide in-depth evaluations. This suggests that teacher training programs are not equally distributed in terms of content and standards and that curricula vary by region and pedagogical approach. Hasna (2007) emphasizes that teachers exhibit different levels of competence in environmental issues and that this depends on the quality of their training. Overall, this study has revealed the need to increase educational awareness regarding biodiversity, particularly by strengthening teachers in scientific, value-oriented, and practice-based environmental education. It concludes that conservation strategies based on education, legislation, and media should be structured in a complementary manner, and that an interdisciplinary approach in environmental education is essential.

Finally, in developing countries like Zambia, environmental problems are directly linked not only to nature-based issues but also to structural factors such as socio-economic inequality, public policies, and inadequate education. Therefore, understanding science teachers' views on biodiversity is not only important for raising environmental awareness but also for addressing broader themes such as social change, sustainability, and intergenerational responsibility.

5. Recommendations

The findings of the study revealed that science teachers in Lusaka experienced significant conceptual deficiencies regarding biodiversity and mostly possessed experiential, surface-level environmental knowledge. Therefore, the primary recommendation is to

increase the time allocated to environmental and biodiversity-related content in teacher training programs and to update the curriculum. Topics such as genetic diversity, ecosystem processes, and environmental ethics should be taught not only theoretically but also through practical approaches to improve teachers' conceptual competence.

Secondly, although many science teachers based their conservation suggestions on education, they also highlighted the inadequacy of the existing curriculum. In this regard, environmental education outcomes should be made more visible and structured within science courses. The environment-related objectives in national education programs should not remain at a formal level but must be integrated into everyday life through textbooks, experiments, and student projects. Additionally, incorporating these topics into assessment and evaluation systems will promote more lasting learning among students.

Many teachers also stated that legal regulations and public awareness are effective in conserving biodiversity. This points to the need for environmental education to be expanded beyond the classroom to the broader society. Therefore, community-based education models should be developed in cooperation with public education centers, municipalities, and non-governmental organizations. Biodiversity awareness campaigns, out-of-school learning environments, and media-based projects can contribute significantly to this process.

Some teachers emphasized that media and technology could be powerful tools for enhancing environmental awareness. Accordingly, integrating digital tools into environmental education will enrich knowledge transfer for teachers and raise students' awareness. Especially through the use of augmented reality (AR), digital posters, ecological web platforms, and animated content, the environmental aspects of science lessons can be presented more effectively. This approach has the potential to merge Generation Z's connection with technology and environmental awareness.

Another recommendation of this research is to restructure in-service training programs with a focus on environmental education. It was observed that most currently employed science teachers did not adequately focus on biodiversity during their university studies. To fill this gap, the Zambian Ministry of Education should organize continuous professional development programs and offer seminars and workshops on topics such as environmental literacy, sustainability education, and bioethics. This process could be supported by case analyses involving local environmental issues to enhance regional sensitivity.

Lastly, as the scope of this study was limited to secondary schools in Lusaka, future studies should include comparative analyses of science teachers in different cities. Furthermore, not only teachers but also students' perceptions and knowledge of environmental issues should be investigated. Holistic environmental education models should be developed through teacher-student pairings. Such studies would provide a scientific foundation for the development of national environmental education policies.

Conflict of Interest Statement
The authors declare no conflicts of interest.

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References

Berry, D., 2007. *Health communication: Theory and practice*. Open University Press. Retrieved from http://ndl.ethernet.edu.et/bitstream/123456789/54781/1/28.pdf.pdf

CBD, 2011. Incentive measures for the conservation and sustainable use of biological diversity: Case studies and lessons learned. CBD Technical Series No.56. pp 64. Retrieved from https://www.cbd.int/doc/publications/cbd-ts-56-en.pdf

Deniş, H, 2007. Investigating 8th class students' attitudes towards the national parks in their immediate environment (The case of Isparta province) (Master's thesis, Süleyman Demirel University, Fen Bilimleri Enstitüsü, Isparta).

Deniş, H., & Genç, H, 2010. Investigating 8th class students' attitudes towards the national parks in their immediate environment into the same variables (the case of Isparta province). The Journal of Graduate School of Natural and Applied Sciences of Mehmet Akif Ersoy University, 1, 9-25.

Dikmenli, M, 2010. Biology student teachers' ideas about the environment. *Educational Research and Reviews*, *5*(8), 431–439. Retrieved from https://www.researchgate.net/publication/327981606_Science_Student_Teachers'_Ideas_About_Biological_Diversity

Ferreira J. A, Ryan, L. & Tilbury, D, 2007. Mainstreaming education for sustainable development in initial teacher education in Australia: A review of existing

professional development models. Journal of Education for Teaching, 33(2), 225-239. Retrieved from https://doi.org/10.1080/02607470701259515

Fiebelkorn F & Menzel S, 2013. Student teachers' understanding of the terminology, distribution, and loss of biodiversity. *Education Sciences, 3*(1), 32–44. http://dx.doi.org/10.1007/s11165-012-9323-0

GRZ, 2015. Report of the Auditor General on Sustainable Management of Fish Resources in Natural Waters. Lusaka, Zambia: Government of the Republic of Zambia. Retrieved from https://www.parliament.gov.zm/sites/default/files/documents/committee_reports/Report%20of%20the%20Committee%20on%20Agriculture%20-%20Fisheries.pdf

Hasna, A. M, 2007. Dimensions of sustainability. Journal of Engineering for Sustainable Development: Energy, environment, and health 2(1):47–57. Retrieved from https://acquire.cqu.edu.au/articles/journal_contribution/Dimensions_of_sustainability/13420691

Kögel-Knabner, I, Guggenberger, G, Kleber, M, Kandeler, E, Kalbitz, K, Scheu, S, & Leinweber, P, 2008. Biological diversity: Meaning and significance. *Ecological Studies, 200*, 1–17.

Lincoln, Y. S., & Guba, E. G, 1985. *Naturalistic inquiry*. Sage Publications. Retrieved from https://us.sagepub.com/en-us/nam/book/naturalistic-inquiry

Miles, M, B. & Huberman, A. M, 1994. Qualitative data analysis: An expanded Sourcebook. (2nd ed). Thousand Oaks, CA: Sage. Retrieved from https://books.google.ro/books/about/Qualitative_Data_Analysis.html?id=U4lU_-wJ5QEC&redir_esc=y

Patton, M. Q., 2002. *Qualitative research and evaluation methods* (3rd ed.). Thousand Oaks, CA: Sage Publications. Retrieved from https://aulasvirtuales.wordpress.com/wp-content/uploads/2014/02/qualitative-research-evaluation-methods-by-michael-patton.pdf

Rawat, M., & Agarwal, R., 2015. Biodiversity: Concept, threats and conservation. *Environment and Ecology, 33*(1A), 307–312. Retrieved from https://journal.environcj.in/index.php/ecj/article/view/418

Stake, R. E, 1995. *The art of case study research*. Thousand Oaks, CA: Sage Publications. Retrieved from https://www.researchgate.net/publication/273635929_The_Art_of_Case_Study_Research_by_Robert_Stake_1995

UNEP, 2010. Study on mercury sources and emissions, and analysis of cost and effectiveness of control measures. UNEP. Retrieved from https://nilu.no/publikasjon/24738/

UNESCO-UNEP, 1990. *Environmental education in the light of the Tbilisi Conference*. UNESCO Publications. Retrieved from https://unesdoc.unesco.org/ark:/48223/pf0000038550/PDF/038550engb.pdf.multi

Wilson, E. O, 1988. *Biodiversity*. National Academy Press. Retrieved from https://nap.nationalacademies.org/catalog/989/biodiversity

World Economic Forum, 2020. *The Global Risks Report 2020* (15th ed.). World Economic Forum. Retrieved from https://www.weforum.org/reports/the-global-risks-report-2020

Yıldırım, A., & Şimşek, H, 2018. *Sosyal bilimlerde nitel araştırma yöntemleri* (11. baskı). Seçkin Yayıncılık. Retrieved from https://www.seckin.com.tr/kitap/sosyal-bilimlerde-nitel-arastirma-yontemleri-ali-yildirim-hasan-simsek-s-p-116659534?srsltid=AfmBOorrlEwjHvtg2iGu7lrrhiZLd34g1Mt7hXHqaYxpdFDrFA5iva4A