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Alqawasmi, A., Shater, A., Hazaymeh, W. A., Almahdawi, A., Dweikat, F. F., Aburezeq, I. M., & Alsalhi, N. R. I. (2024). Ecological Teaching Knowledge Among Scholar-Educators Registered in the Professional Diploma Program (PPTD) in Teaching Program. *Espacio, Tiempo y Educación, 11*(1), pp. 25-37. doi: http://dx.doi.org/10.14516/ete.11102

Ecological Teaching Knowledge Among Scholar-Educators Registered in the Professional Diploma Program (PPTD) in Teaching Program

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Abstract: The primary aim of this study was to assess the environmental education awareness among students enrolled in the Postgraduate Professional Diploma (PPTD) teaching program at Al Ain University in the United Arab Emirates. This investigation employed a cross-sectional research design, incorporating a sample of 209 male and female scholar-educators. An analytical descriptive approach was utilized for data analysis, with research instruments including an Environmental Education Scale administered during the second semester of the 2022-2023 academic year. The findings indicate that

there was no statistically significant relationship between teaching experience, educational background, and the level of ecological consciousness exhibited by scholar-educators in the Professional Diploma program. These results are instrumental in developing strategies to integrate environmental education into future teacher training programs. Additionally, the study emphasizes that communal and advanced teaching institutions have a more pronounced impact on students' ecological teaching knowledge compared to private schools.

Keywords: ecological teaching; knowledge; scholar-educator; ecological consciousness; teaching experience.

Received: 08-02-2024
Accepted: 22-06-2024

1. Introduction

The quality of an educational system serves as a robust indicator of a country's developmental status. Teachers and the teaching profession play a crucial role in influencing individuals' lives. According to Narbutaev (2021a), the effectiveness of an educational institution is determined more by its educators than by its environment or curriculum. Murad, Othman and Kamarudin (2024) define professionals as individuals who possess a high level of expertise and specialized knowledge in their respective fields. Effective teachers consistently participate in professional development activities, including workshops and seminars (Sharifian et al., 2022). In alignment with the Sustainable Development Goals (SDGs), the government is actively promoting teacher professionalism. Progress toward the SDGs will be hindered unless individuals are empowered through education. Teaching for sustainable development aims to foster a just and environmentally responsible society.

The learning approach emphasizes the importance of developing students' skills, values, and perspectives (Wu & Yu, 2024). Education for Sustainable Development (ESD) encompasses a broad range of topics, focusing on ensuring the long-term health of the planet's ecological and environmental systems. Its objective is to help learners cultivate a "well-curved world," considering social factors, cultural interactions, local issues, and global citizenship. The absence of a coherent ESD curriculum poses a significant barrier to its widespread implementation (Acosta Castellanos & Queiruga-Dios, 2022). The use of implicit ESD instruction further complicates the situation. Additionally, Abulibdeh, Zaidan and Abulibdeh (2024) found that a lack of teacher knowledge in ESD has hindered its integration into schools. Nonetheless, initiatives aimed at incorporating ESD have spurred the development of new environmental education themes (Fischer et al., 2022).

Many environmental educators possess expertise in science education. However, a recent study by Stein et al. (2023) indicates that science teachers remain inadequately prepared to teach ESD. Therefore, it is essential to train more science instructors in ESD methodologies (Olsson, Gericke, & Boeve-de Pauw, 2022) to effectively cultivate responsible global citizens. Professional development through training is one strategy to enhance educators' skills and knowledge. Environmental education preparation is particularly critical for teachers in both science and environmental studies. According to Carroll et al. (2022), environmental education involves the systematic advancement of ecological awareness across all disciplines. Furthermore, Hanaysha, Shriedeh and In'airat (2023) report that educators engaged in environmental education may find it easier to incorporate their school's ecological contexts into their curricula. Numerous symposia and conferences have focused on environmental education as a key area of discussion.

The literature reviews relevant to this study encompass environmental education in

Adiwiyata schools (Nurwaqidah, Suciati, & Ramli, 2020), ecological teaching for prospective educators (Edwards & Magill, 2023), and ecological education aimed at enhancing sustainability (Zidny, Sjöström, & Eilks, 2020). It is essential to evaluate the effectiveness of environmental knowledge and the creativity of educational practices. This research addresses the gaps between scholars and educators within specialized diploma curricula pertaining to environmental teaching. The study aims to revise existing information and identify best practices for integrating environmental education into teacher preparation programs. It examines the advantages and challenges associated with eco-education while focusing on the barriers to delivering environmental teaching in the United Arab Emirates (UAE). Additionally, the study investigates the obstacles to incorporating ecological teaching into educator training schedules, including the lack of standardized curricula and potential difficulties. It also highlights the opportunities for embedding ecological teaching, such as transformative pedagogical approaches and the promotion of educators skilled in addressing the challenges of an interconnected world. This investigation establishes a foundation for a comprehensive analysis of the current landscape and offers insights into refining and strengthening ecological teaching initiatives within educator preparation.

This study examines the advantages and disadvantages of eco-education in educator training programs in the UAE, focusing on strategies to overcome obstacles. It assesses environmental teaching knowledge among students in Al Ain University's Postgraduate Professional Diploma (PPTD) program and evaluates the effectiveness of eco-education initiatives. The objectives include measuring understanding of pollution, wildlife management, and sustainability, as well as proficiency in ecological teaching. The research also investigates differences in ecological teaching knowledge based on gender and educational background, comparing human sciences and physical sciences students. Finally, it explores how philosophical perspectives influence scholar-educators' ecological teaching knowledge and whether varying practices affect ecological concerns. This research examines the environmental teaching philosophy among students in the PPTD program at Al Ain University. It aims to contribute to the discourse on educator preparation for sustainability by highlighting the role of educators in promoting sustainable practices and identifying challenges in integrating ecological teaching. The study provides a comprehensive overview of the current state of ecological teaching in educator training. It specifically addresses the level of ecological teaching understanding among PPTD students and its relationship with various influencing factors.

RQ 1: What class of understanding do scholar educators have in the Postgraduate Professional Diploma in Teaching (PPTD) schedule in ecological teaching instruction? RQ2: Does the class of understanding of scholar-educators in the Postgraduate Professional Diploma in Teaching (PPTD) agenda in Ecological Instruction Schooling change based on their informative requirement and schooling involvement?

This study emphasizes the importance of integrating environmental education into teacher training programs. Teachers play a dual role in not only delivering subject-specific knowledge but also fostering environmental stewardship and cultivating a sense of global citizenship among students. The research highlights the need for the development of a cohort of educators equipped to address the pressing environmental challenges of our time, underscoring their critical role in shaping the values and perspectives of future generations. Additionally, this study aims to clarify the impact of incorporating environmental education into teacher training programs. The findings will also benefit educators by facilitating the integration of environmental education into school curricula.

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2. Review of Literature

Education about ecology is essential for fostering awareness among students regarding the importance of protecting the natural environment (Narbutaev, 2021b). It serves as a pathway toward achieving environmental sustainability. As future leaders, students must receive education about environmental issues to prepare them for their roles in society (Daniel Antonio & Orley Benedicto, 2022). When students are motivated to engage in environmental improvement initiatives, the ultimate goal is to safeguard the environment. Additionally, sharing knowledge related to environmental enhancement contributes to a more positive overall perception of environmental issues (Mykrä, 2023). However, it is crucial for educators to possess substantial knowledge about the environment (van de Wetering et al., 2022). This knowledge can be enhanced through various training programs and workshops.

The primary aim of environmental workshops is to equip teachers with the necessary knowledge (Pirchio et al., 2021). When teachers possess substantial knowledge, it can enhance their overall perception and behavior toward environmental issues. It is essential for educators to receive updated information about ecology, which will enable them to effectively teach students in the classroom (Timm & Barth, 2021). Motivated teachers who engage in learning about ecological concepts will be better prepared to impart this knowledge to their students, thereby improving students' overall behavior (Hanaysha et al., 2023; Reid et al., 2021). Additionally, the ecological consciousness of teachers is cultivated through appropriate training and the dissemination of relevant information.

Teachers' prior knowledge is a crucial factor in enhancing the teaching experience (Muxtarova, 2021). Educators with strong educational backgrounds in ecology are better equipped to convey relevant ecological information to their students (Verlie et al., 2021). Conversely, a lack of significant commitment to ecological behavior among teachers can hinder their performance (Daly, Milton, & Langdon, 2022). Moreover, students tend to engage more effectively with lectures delivered by teachers who possess both a robust educational background and substantial teaching experience (Mykrä, 2023). The medium through which information is shared is also significant, as it can have a lasting impact on students' attitudes.

Moreover, environmental education is essential for promoting sustainability (Barrutia et al., 2022). When teachers prioritize enhancing student learning, it positively affects overall student performance (Johnson & Lee, 2019). This improvement relies on the quality of environmental education available to teachers and their methods of disseminating knowledge to students. Educators are encouraged to provide comprehensive information that fosters student learning and encourages environmentally responsible practices (Lo, Lai, & Hsu, 2021). A solid educational foundation is crucial for students to enhance their overall behavior (Donmez-Turan & Kiliclar, 2021). Therefore, it is imperative that environmental education be made accessible to teachers, enabling them to impart this knowledge to their students effectively.

The art of teaching plays a crucial role in disseminating environmental education (Smith & Green, 2020). Practical recommendations for improving the environment are essential for achieving sustainable development (Mukhtarova Lobar, 2021). Students must be encouraged to engage actively and focus on sustainable development initiatives (Andreotti, 2024). This engagement is vital for enhancing the overall environment in alignment with the SDGs. Consequently, educational institutions share

a responsibility for environmental stewardship while promoting education (Zidny et al., 2020). Moreover, effective collaboration between teachers and students is necessary to influence behaviors that support sustainable development (Zikargae, Woldearegay, & Skjerdal, 2022). Thus, ecological advancement can be realized through a shared commitment to responsibility.

3. Materials and Methodology

3.1. Study Strategy

The study employed an analytical descriptive methodology characterized by a cross-sectional design, facilitating the examination, evaluation, comparison, and quantification of phenomena (McNabb, 2020). It focused on the current PPTD students at Al Ain University, assessing their environmental awareness and exploring its relationship with various factors.

3.2. Study Participants

The study included students who enrolled in the PPTD program during the spring semester of the 2022/23 academic year at Al Ain University. A detailed list of participants is provided in Table 1.

Table 1: Demographic Characteristics of Applicants.

Aspects		Frequency	Percentage
Sex	Male	24	7.8
	Female	285	92.2
	Total	**309**	**100.0**
Criterion	Human Sciences	222	71.8
	Natural Science	87	28.2
	Total	**309**	**100.0**
Practice	Not Working Yet	238	77.0
	Less than 5 Years	30	9.7
	5 Years and More	41	13.3
	Total	**309**	**100.0**

3.3. Measures

The study employed the Environmental Education Scale developed by Hassan and Salman (2020), which features 30 items rated on a five-point Likert scale ranging from “strongly agree” to “strongly disagree,” with a maximum score of 150. The scale’s face validity was assessed by a panel of education and psychology experts, and items with an agreement rate of 80% or higher were selected for further analysis. The reliability of the scale was confirmed, and the Pearson correlation coefficient was used to evaluate the relationship between individual items and the overall score, with statistical significance determined at the 0.05 level. To assess the discriminant validity of the Environmental Education Scale, 153 fourth-year students were randomly selected from colleges and universities utilizing the scale. The highest and lowest-scoring responses in the sample each received a score of 27%. A t-test comparison of items across the two samples indicated that all items were effective in making accurate classifications, with t-values exceeding 2.00 at a significance level of 0.05,

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based on a total of 96 degrees of freedom. To further evaluate the scale's reliability, a test-retest method was employed. Eighty students were randomly chosen from the participating universities and asked to complete the survey. Two weeks later, the same group was reassessed. Pearson's correlation coefficient was used to examine the relationship between the two administrations, yielding a reliability coefficient of 0.89, thus confirming the scale's reliability.

4. Data Analysis and Findings

The primary objective of this study was to assess the level of environmental education awareness among current students enrolled in the PPTD program at Al Ain University. Specifically, the initial research question addressed was: What level of knowledge do student educators possess regarding ecological education within the PPTD curriculum? To calculate the average level of awareness, the mean score of 2.33 was combined with the low level of 1.33, resulting in a total of 3.66. The low level score of 4.99 was then added to this total to determine the overall mathematical mean. The value of 1.33 was derived by dividing the mathematical range of 4 (5 - 1) by the number of steps. The components were categorized as presented in Table 2 and further illustrated in Table 3. The data reflects the significance, mean, and standard deviation of the variables, demonstrating the impact of various factors on environmental education awareness.

Table 2: Arithmetic Averages.

No.	Mean	Class
1	1.00 – 2.33	Low
2	2.34 – 3.66	Intermediate
3	3.67 – 5.00	High

The primary recommendation outlined in Table 3 is to mitigate the risk of disease transmission by avoiding areas heavily contaminated with waste. The data indicated an average score of 3.974, with a standard deviation of 0.159. To assess support for the conservation of rare plant and animal species, question 26 of the survey asked respondents whether they favor the establishment of nature reserves. This item received the second-highest average score of 3.968 and the second-lowest standard deviation of 0.177 among all responses. Responses to Question 24 yielded a standard deviation of 0.211, placing it third in the survey rankings. Additionally, the findings suggest that pollution significantly contributes to the decline of fish populations.

In the fifth assessment question, five respondents assigned a mean score of 3.589 (with a standard deviation of 0.736) to the potential benefits of categorizing water and energy bills based on usage, making it the 28th most favored item in the survey. A majority of participants selected option (14), which discourages the use of potable water for agricultural irrigation; this item received an average score of 3.547 and a standard deviation of 0.867, ranking it 29th overall. The survey question regarding the necessity of keeping pets in households ranked 30th, with an average score of 3.427 and a standard deviation of 0.867. All items, except for the final four (18, 5, 14, and 25), demonstrated a high level of support. To address the second inquiry—whether the knowledge level of scholar-educators in the PPTD program on Ecological Schooling

Instruction varies based on their educational needs and cognitive practices—Table 3 presents the weighted average (arithmetic mean) of the scale's components, revealing a value of 3.853. The data indicates a standard deviation of 0.414. This information, in conjunction with the data in Table 2, suggests that knowledge enhancement is a primary focus in environmental education.

Table 3: A Statistical Analysis of Environmental Education's Mean, Standard Deviation, and Level of Significance.

Item No.	Item	Mean	SD	Level	Order
21	To avoid getting sick, avoiding garbage dumps is a good idea.	3.974	0.159	High	1
26	I support natural reserves for endangered plants and animals.	3.968	0.177	High	2
24	Fish mortality is proportional to pollution levels.	3.968	0.211	High	3
2	Injurious to others, littering pollutes public spaces.	3.961	0.276	High	4
22	Trees not only add to the aesthetic appeal of a landscape, but also to its oxygen supply.	3.955	0.287	High	5
27	Educating kids about environmental issues across a variety of disciplines is essential.	3.948	0.274	High	6
8	The curriculum needs to include environmental education.	3.948	0.347	High	7
16	To protect the environment, a Ministry of the Environment is necessary.	3.948	0.274	High	8
19	Waste management strategies need to be prioritized during the building phase of industrial projects.	3.942	0.261	High	9
7	Vehicle and industrial smoke must be addressed.	3.942	0.261	High	10
17	Building factories on farmland is unacceptable.	3.935	0.316	High	11
10	Plastics recycling is very important.	3.922	0.419	High	12
11	A fine should be given to anyone who cuts down a street tree.	3.916	0.341	High	13
Item No.	**Item**	**Mean**	**SD**	**Level**	**Order**
28	Environmentally conscious films and television series should be seen by all.	3.909	0.349	High	14
30	Many countries are losing their forests because no regulations have been put in place to protect them.	3.903	0.374	High	15
12	There needs to be less reliance on chemical pesticides in farming.	3.903	0.318	High	16
20	Garbage and industrial trash must be recycled for this purpose.	3.896	0.345	High	17
9	Electric lighting is superior to more archaic methods of lighting, such as lanterns powered by fossil fuels.	3.883	0.410	High	18
4	In my opinion, paper bags are preferable to plastic ones.	3.877	0.431	High	19
3	To maximize output, environmental concerns must be met using technological solutions.	3.871	0.444	High	20
6	I help with community clean-ups when I can.	3.864	0.412	High	21
29	Dust storms are mitigated by the green belt that surrounds the city.	3.858	0.402	High	22
1	Human consumption behaviours contribute to environmental resource depletion.	3.851	0.500	High	23
23	The state is not the only entity responsible for protecting water supplies.	3.819	0.586	High	24
15	Instead of employing insecticides, window nets are preferable.	3.718	0.599	High	25
13	A traffic ticket should be given to drivers whose vehicles produce too heavy emissions.	3.702	0.636	High	26
Item No.	**Item**	**Mean**	**SD**	**Level**	**Order**
18	The practice of loud voice speakers inside institutions should be forbidden.	3.657	0.628	Intermediate	27
5	For the purpose of justifying their benefit, it is useful to allocate the water and power invoices into groups that boost in value with operation.	3.589	0.736	Intermediate	28
14	Drinking water should not be utilized for wetting harvests.	3.547	0.782	Intermediate	29
25	Retaining animals in homes is not required.	3.427	0.867	Intermediate	30
Total Means		3.853	0.414	High	

To address the second research question, which sought to examine potential differences in ecological teaching knowledge among scholar-educators enrolled in the PPTD program, statistical measures of central tendency and dispersion were calculated for the scholars' scores on the ecological teaching scale. The collected data is presented in Table 4. Furthermore, Table 4 indicates that students majoring in Natural Sciences tend to achieve higher mean scores on the Environmental Education scale, whereas those in the Humanities exhibit lower mean scores. Table 5 displays the results of a t-test conducted to assess the significance of the differences observed between the

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samples. The analysis revealed no statistically significant difference ($p > 0.05$) in the mean scores of the Environmental Education scale for students categorized by their academic backgrounds in Natural Sciences and Human Sciences, as shown in Table 5. The recorded arithmetic means were 115.22 for Natural Sciences and 115.75 for Human Sciences. Additionally, the obtained t-value of 0.793 further confirmed the absence of a statistically significant difference between the two groups.

Table 4: Students' Mean and Standard Deviation Grades on an Ecological Teaching Measure.

Requirement	F	Mean	Std. Deviation
Human Science	222	115.75	5.32
Natural Science	87	115.22	5.34

Table 5: Independent Sample T-Test to Determine Whether Scholars' Ecological Teaching Measure Scores Vary By Educational Requirement.

Requirement	F	Mean	Std. Deviation	t	df	Sig
Human Science	5.32	115.75	5.32	.793	307	.428
Natural Science	5.34	115.22	5.34			

The results indicate that environmental education awareness is similar among students in Natural Sciences and Humanities. The mean scores and standard deviations of the Environmental Education scale were calculated based on teachers' years of experience (less than five years, five years, or more). As shown in Table 6, students' evaluations of environmental education positively correlate with the number of years educators have been in the profession. To assess whether the differences among the groups of educators with no experience, those with less than five years of experience, and those with five years or more were statistically significant, a ANOVA was conducted on the mean values of these three groups. The calculated means for the groups were 115.64, 113.87, and 116.66, respectively. The results, presented in Table 7, indicate a statistical value (F) of 2.432. This value demonstrates that the observed differences did not achieve statistical significance at the conventional threshold of $p < 0.05$. Consequently, these findings suggest that all preservice teachers possess a similar level of understanding regarding environmental education.

Table 6: Means and Standard Deviations of Students' Environmental Education Scale Scores by Teaching Experience.

Practice	F	Mean	Std. Deviation
Not Working Yet	238	115.64	4.46
Less than 5 Years	30	113.87	10.85
5 Years and More	41	116.66	3.35

Table 7: One-Way ANOVA Test Outcomes for the Arithmetic Averages of Students' Environmental Education Measure Grades by Education Practice.

	Source	Sum of Squares	df	Mean Square	F	Sig.
Practice	Between Groups	136.428	2	68.214	2.432	.090
	Within Groups	8581.611	306	28.044		
	Total	8718.039	308			

5. Discussion

The study identified several factors that significantly influence the environmental education awareness of future educators. Key elements in this context include understanding the relationship between pollution and mortality rates, advocating for the establishment of wildlife preserves, and avoiding landfills to mitigate health risks. Survey results highlighted various strategies emphasized by student educators, such as preventing the accumulation of waste to reduce disease transmission, promoting the preservation of physical resources to protect native flora and fauna, and recognizing the connection between pollution and species extinction.

The research also revealed additional factors that student educators considered insignificant, such as the absence of dogs in the household, refraining from using potable water for gardening, and allocating utility expenses by purpose. Consistent with the findings of Al-Azab et al. (2021), which examined the awareness of environmental education among teacher-students, this study found that student instructors exhibited a substantial level of environmental education consciousness. In contrast, Ardoin, Bowers and Gaillard (2020) reported a moderate level of awareness, while Debrah, Vidal and Dinis (2021) identified a significantly lower level of awareness regarding environmental education.

The conclusion aligns with the substantial emphasis on environmental issues within the public and higher education sectors in the United Arab Emirates, reflecting a broader awakening in the Gulf Cooperation Council, of which the UAE is a prominent member. Furthermore, it is consistent with the pedagogical approaches employed, ongoing initiatives to raise awareness through diverse media channels, and the integration of environmental education programs and modules across elementary, secondary, and higher education institutions. Notably, educator-scholars in the Professional Diploma in Teaching program exhibited no statistically significant differences in environmental consciousness, regardless of variations in teaching experience or academic qualifications.

The study conducted by Al-Azab et al. (2021) revealed that prospective educators exhibited varying levels of knowledge regarding environmental instruction, with a pronounced preference for subjects related to the humanities. In contrast, the findings of the current study suggest a different trend. Garcia and Cobar-Garcia (2022) investigated the incorporation of environmental learning components into various primary and higher education curricula, and their results indicate the existence of a notable gap in this area. Moreover, the emphasis on topics such as climate change and environmental education within teacher training curricula is highlighted as a critical consideration, as noted by Karim et al. (2022). Furthermore, Sharifian et al. (2022) observed that factors beyond the educational institutions may influence the dissemination of environmental education to pre-service teachers.

6. Conclusion

Each awareness item within the realm of environmental education possesses a distinct emphasis rooted in its specific environmental context. Thus far, awareness initiatives have predominantly focused on disseminating environmental knowledge without effectively promoting sustainable practices or significantly enhancing public understanding. To ensure the maintenance of sustainability, new initiatives that foster learning, awareness, and engagement through education are essential. It is critical to evaluate the impact of student-teacher interactions in a professional context both

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during and after the implementation of environmental education awareness and training programs. Stakeholders must consistently and actively support teacher training initiatives designed to educate and prepare students for the global nature of education while simultaneously raising awareness about the importance of environmental conservation.

6.1. Limitations and Recommendations

Many educators are eager to enhance their qualifications by enrolling in certificate or degree programs. However, greater emphasis must be placed on raising awareness and improving its effectiveness. While acquiring new knowledge is currently prioritized, the application of this knowledge—which necessitates assessment and record-keeping—receives comparatively less attention. Participants' increased awareness of the significance of environmental education has led them to prioritize the practical application of their learning in real-world contexts. However, the existing literature lacks comprehensive guidance on how to effectively implement this knowledge in the classroom. Consequently, educators will require additional time for preparation to better support students before, during, and after class. Modern methods in environmental education are vital for helping students understand the planet's importance. Once equipped with the necessary knowledge, students are expected to actively conserve the environment and promote sustainability. It is essential to integrate the program's findings into both formal and informal educational settings. Assigning teachers time-bound projects is an effective way to implement teacher preparation and assess its success. The primary goal of this initiative is to cultivate in students a deep appreciation for, awareness of, and proactive approach to environmental protection. By developing long-term competencies, students can enhance their future capabilities. Effective teacher preparation requires careful planning and collaboration between schools and community members. Institutional financial and moral support is essential for the successful implementation of training activities. Ongoing backing from stakeholders is crucial for teacher training programs that prepare students for globalization while promoting environmental conservation.

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