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Enhancing Environmental Literacy in Palestine: Reflecting on Secondary School Students' Knowledge and Attitudes

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Abstract: In the past, since the first Earth Day, organizations have endorsed the development of well informed and environmentally literate citizen as the answer to our threatened environment. According to many Environmental Education (EE) experts, knowledge and attitudes are important components of environmental literacy (EL), especially if the goal of environmental education is to change behavior. In our study, a questionnaire with two parts was randomly distributed to 49 selected schools which included 942 10th grade students in Palestine, with a 100% response rate. Results showed that participants had favorable attitudes toward the environment which ranged from 57.5 to 74.8 out of 100 points. The environmental knowledge scores are topicality, fragmentary or incorrect, which range from 45.72 to 67.36. Significant differences were found in the level of EL scores by gender. Educational implications and recommendations are discussed.

Keywords: Environmental education; Environmental literacy; Environmental knowledge, Environmental attitudes; Palestine.

تعزيز الثقافة البيئية في فلسطين وفقا لمعارف واتجاهات طلبة المدارس الثانوية

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المستخلص: لأكثر من خمسة عقود مضت، ومنذ الاحتفال بيوم الأرض، أكدت العديد من المنظمات على إيجاد وتطوير المواطنين المثقفين بيئيا كأحد الحلول الفعالة لمواجهة الأخطار التي تهدد بيئتنا. ووفقا للعديد من خبراء التربية البيئية يعد اكتساب المعارف وتكوين الاتجاهات الإيجابية مكونان أساسيان من مكونات الثقافة البيئية وخاصة إذا كان الهدف منها هو تعديل السلوك البيئي لدى الأفراد وتغييره نحو الأفضل. في دراستنا تم توزيع استبانة مكونة من جزأين بشكل عشوائي على 49 مدرسة مختارة شملت 942 طالبًا وطالبة في الصف العاشر في فلسطين، بنسبة استجابة 100%. أظهرت النتائج أن المشاركين كان لديهم اتجاهات إيجابية تجاه البيئة والتي تراوحت بين 57.5 إلى 74.8 من أصل 100 نقطة. في حين كانت نتائج المعرفة البيئية مرتبطة بالموضوع البيئي، مجزأة أو غير صحيحة، وتراوحت من 45.72 إلى 67.36. أظهرت النتائج وجود فروق ذات دلالة إحصائية في مستوى الثقافة البيئة تعزى لمتغير الجنس ولصالح الذكور، وفي نهاية البحث تم مناقشة التطبيقات التعليمية والتوصيات.

الكلمات المفتاحية: التربية البيئية، الثقافة البيئية، المعرفة البيئية، الاتجاهات البيئية، فلسطين

1- INTRODUCTION

For centuries, Palestine has been known as The Holy Land which many consider as God's gift to the world. It is also considered as a sacred land to three of the world's great faiths (Islam, Christianity and Judaism). Archeologists have and are still discovering old art-effects, ruins and even coins in many parts of

the country, going back thousands of years and thus proving there once exist a number of thriving civilizations in this part of the world. These archeological findings do not only tell us information about the people who inhibited the land, but they are also considered as a rich source of information about the ecology of the Palestine's weather, plants, animals and other natural habitats that had been blooming there too. Even now, modern day Palestine has a rich and rare natural habitat, perhaps one of the most interesting in the world.

Today, Palestinians live in one of the developing, densely populated countries and yet strive to achieve sustainable economic and social development. In so doing, they face several environmental problems and a deteriorating quality of life. The relationship of human beings with the environment is one of the key balances and any influence from outside causes this balance to be negatively affected resulting in environmental problems (Genc, 2015).

One key problem is related to the level of environmental education (EE) and awareness of Palestinian people, as this is identified to quite low. Therefore, a major change in people's understanding of the environment and its implication on their lives is needed. It is understood that such a change can be achieved through an effective and efficient education of students at different learning levels from nursery to university. As future citizens, they are expected to develop a responsible attitude – in accordance with their newly acquired understandings and values related to environmental issues, (DeWaters et al., 2013; Erten ,2003).

Environmental Education (EE) is different from other disciplines in the education field in that it can be taught to all students with different levels. Sanera (1998) mentioned that (EE) is a complex process that aims to attain several goals at the affective, cognitive, metacognitive, and behavioral levels. Moreover, Stevenson et al. (2013) said that (EE) can be used to inform the school-aged population as well as the general population. In addition, Mosothwane (1992) indicated that the introduction of (EE) early into schools induced positive attitudes towards a quality environment, that children learn, especially by observing adult behaviors. Moreover, Ramsey (1993) said that schools need to be involved so that students from a young age become aware of social and environmental issues in their local communities and around their 'world', and thus be motivated to take action to improve and maintain the environment.

Finally, how societies educate the next generation and what they learn about the world around them should be addressed seriously (Siraj-Blatchford ,2016; Hungerford et al.,1980)

There is a profound but remarkable distinction between (EE) and (EL). The environmental literacy components, which were recognized mostly in environmental education literature, have been defined by (Disinger & Roth, 1992), and used in some practical studies (Marcinkowski et al., 2008; McBeth & Volk, 2010; Meuth et al., 2010). Liu et al. (2015) used the term "environmental literacy" as one of the most important objectives for environmental education. Meanwhile, the (UNESCO–UNEP ,1991) international conventions declared that (EE) is the vehicle for developing environmental literacy, which is crucially

needed to prepare environmentally literate students who, as future citizens, would play an active role in protecting the environment through making informed decisions and taking environmentally friendly actions. Interestingly, Hollweg et al. (2011) indicated that (EL) was comprised of knowledge, attitudes, and competencies believed to equip people with what they need to effectively analyze and address important environmental problems. Likewise, Meuth (2010) mentioned that environmental literacy includes knowledge, skills and motivation to contribute to environmental needs and sustainable development. On the other hand, Genc & Akilli (2016) claimed that the attitude is an important component in environmental literacy. Further, Hsu & Roth (1998) listed the components of environmental literacy as knowledge, sensation, skill and behavior. Of equal importance, Barrett et al. (1997) stressed that environmental literacy is the understanding of the interactions between natural systems and human social systems. Further, Ambusaidi et al. (2012) said that there is a link between students' environmental beliefs and their willingness to act to save the environment. Stables (1998) argued that knowledgeable citizens are not necessarily environmentally literate, but knowledge is a critical component of literacy.

Referring to knowledge and attitude's as the main component of (EL) a number of studies have shown that accurate environmental knowledge and positive attitudes were needed to drive responsible environmental behavior, and that it is a prerequisite for action (Esa, 2010; Zecha, 2010; Tuncer et al.,2009; Makki et al.,2003; Pooley& O'Connor, 2000; Kuhlemeier et al.,1999). For example, Emilson & Johansson (2018) indicated that individuals need to ground knowledge in their own bodies and feelings. Also, Pothitou et al. (2016) mentioned that good knowledge will form a good attitude. Furthermore, Uitto et al. (2011) stated that demographic factors such as gender and years of education may have some influence on one's attitude and pro-environmental behaviors. Moreover, Pe'er et al. (2007) confirmed that knowledge is indeed critical but knowledge alone cannot adequately predict responsible environmental behavior. On the other hand, Morrone et al. (2001) stated that a literate person is someone who is equipped with knowledge and values that lead to actions. It was assumed by Arcury (1990) that increased knowledge about the environment promotes positive attitudes. Meanwhile, Hines et al (1987) stressed that the knowledge component is based on the idea that before an individual can act on an environmental problem, that individual must understand the environmental problem.

Finally, we can say that the environmental education is still an inadequate level in terms of curriculum presence, consistency, depth, and impact (Hungerford & Volk, 2003). One of the first to use the environmental education curricula to raise environmental literacy was (Hungerford et al., 1980). Such curriculum should be designed to develop three types of environmental literacy functional: basically, book knowledge about ecological concepts, cultural: which teaches why society values the environment and critical: which allows students to use functional and cultural environmental literacy to determine appropriate citizen action (Gambro & Switzky, 1999).

In brief, we can say that the main purpose of environmental education is to educate individuals with respect to environmental literacy. The development of environmental literacy is a multi-step process that begins with knowledge and results in active citizen participation. Environmental Educators cannot assume that several years of formal education will ensure that students gain all the knowledge and skills needed for environmental literacy. Consequently, non-formal EE should play an important role in building environmental literacy of the whole population because it can reach various population groups and can offer varied opportunities for action upon the environment (UNESCO ,1980).

2- PURPOSE OF THIS STUDY

The Palestinian Ministry of Education identified different programs to develop all Palestinians intellectually, socially, physically, spiritually and emotionally, to become responsible citizens, able to participate in solving problems of their community, their country and the world, (First Palestinian Curriculum Plan, 1999). These programs, however, were developed without any solid research regarding Palestinian students' environmental knowledge and attitudes. Hence, the lack of comprehensive researches in Palestinian schools to assess environmental literacy and focusing on the direct and indirect effects among the variables forming environmental literacy calls for attention. Therefore, the purpose of this study is to identify the level of environmental literacy status (Knowledge & Attitudes) of 10th grade students in Palestine.

3- MOTIVATION FOR THIS STUDY

Based on the previous literature, it is clear that numerous studies have focused on measuring youths' environmental knowledge levels and their environmental responsible behavior (Karasar, 2017; Gambro & Switzky, 1996; Leeming et al.,1995). Few research using adults as participants have been conducted, (Goussia-Rizou & Abeliotis, 2004; Hsu& Roth, 1996). In Palestine, the level of environmental literacy (EL) has not been investigated in depth. It is assumed that a primary source for the development of environmental literacy will be the schools, particularly in terms of knowledge, attitudes, values, beliefs and skills .Thus, conducting a study on primary school students' environmental literacy is crucial as we will be able to gain better insights of how environmental knowledge, environmental attitudes are reflected in the minds of the students after undergoing a substantial number of years with EE programs. Students from grade 8th to 11^{th} appear to be the most appropriate targets for fostering ethical and ecological appreciation of the natural world (Kellert, 1985). Therefore, the motivation of this study has two different aspects:

- It is the first study in Palestine, as far as, the researcher knows about the status of environmental literacy among the Palestinian students.
- By examining not only students' environmental knowledge but also their attitudes we intended to supply the background information for primary educators as well as the curriculum designers

with necessary recommendations on real practices and experiences to reinforce positive aspects and overcome difficulties. To date, it has been difficult to guide and monitor some specific environmental education efforts in Palestine because of lack of data.

4- ASSUMPTIONS OF THE STUDY

During the last two decades, the trend for environmental protection has expanded in various areas, including the realm of education. The underlying assumptions of this study are that:

1. If students are aware of the need and the ways of protecting the environment, they will act to preserve it.
2. Developing (EE) in Palestinian schools should be based on surveying the status of (EE)in Palestine, and the international trends in (EE) curriculum and instruction.

5- RESEARCH METHODOLOGY

This is a descriptive study in the survey model. Karasar (2017) indicated that survey models, generally, are arrangements on a whole group or sample taken from the population in order to make a general judgment about the population. In addition, he states that the survey models are research approaches aimed at describing a situation that exists in the past or the present, as they exist. Proportional stratified sampling was used to generate a 5 % sample of the 978 eligible schools. Of the 49 selected schools, 942 10th grade students participated, 416 boys (44.2%) and 526 girls, (55.8%). A panel of experts ensures the content validity of the questionnaire. After the questionnaire was altered according to the comments of the experts; it was distributed among (61) 10^{th} grade students to test the reliability and validity indicators of the instrument. A few questions were dropped, some were altered to be more comprehensible and easier to administer. The questionnaire consists of two parts; the environmental knowledge part and the attitudes part. The knowledge part has 24 multiple-choice and 20 true-false items. Responses were coded "1" if the answer was correct and "0" if the answer was incorrect. The attitude part consisted of 35 items rated on a Likert-type scale. The five possible responses to each statement varied from 5 (strongly agree) to 1 (strongly disagree). Most of the questionnaire items were adapted from previously published instruments. Cronbach's alpha reliability coefficient taken on the two parts, environmental knowledge and attitudes, yielded values of 0.72 and 0.87, respectively. The questionnaires were distributed during the spring of 2019 in regular-period classes, and the time required to complete was approximately 35-40 minutes. The questionnaire survey enabled the collection of quantitative data from all the partnership schools, i.e.100% returns, which is a significant feature of this study. The analysis of the data was conducted using the SPSS statistical software program. The alpha level was set at 0.05 and 0.01.

6- RESULTS AND DISCUSSIONS

6.1. Students' Environmental Knowledge

Table 1 presents the total knowledge and subtopics mean scores (M) and standard deviations (SD) for 10th grade students in Palestine. The mean total knowledge scores, which range from 45.72 to 67.36 percentage points reflect that environmental knowledge which students already possess is likely to be determined by topicality, fragmentary or incorrect, or both. After examining questions about each sub scale, it is interesting to note that Palestinian students appear to be more knowledgeable about local environmental protection issues (M=67.36) than issues that have more global relevance such as Ozone subtopics (M=45.72) and Green –house (M=46.62). Palestinian students were also relatively uninformed about Acid rain subscale (M=53.04). This is especially the case given that the questionnaire assessed students' knowledge of basic environmental concepts covering different areas in the primary school textbooks. The relatively large standard deviations represent a noteworthy aspect of the results shown in Table 1. These deviations, which ranged from 17.07 to 29.65 points, indicate that the total and topical knowledge scores were widely spread. Such spread indicates that student's environmental knowledge was disparate. In other words, participants lacked a common knowledge base of the target environmental concepts and related issues.

Table (1) Means and Standard Deviations on the Total Knowledge Scale and Subtopics

Knowledge- part	Sub – topics	No of items	Mean	S.D
Multiple-choice	E. protection	9	67.36	17.07
	E. problems	15	50.70	18.11
	Total of the subscale 1	24	56.95	15.31
True-False	Acid rain	3	53.04	28.70
	Green -house	6	46.62	21.29
	general	2	46.10	29.65
	Ozone	9	45.72	18.57
	Total of the sub scale2	20	47.14	14.51
Total scale		44	52.49	12.39

These results are compatible with previous studies conducted in the US (Roper Starch Worldwide 1994, Gambro & Switzky,1996), Australia (Clarke,1996 & Connell et al., 1998), Netherlands (Kuhlemeier et al., 1999) and UK (Lyons & Breakwell, 1994). In the US, for example, among their sample of over 1800 high school students, only approximately one third (36.3%) answered correctly five or more of the [seven] items' and only 61% of the 10th grade, students were aware that the burning of fossil fuels is the primary source of energy in the United States today (Gambro & Switzky 1996). In another study, Gambro & Switzky (1999) reported that the environmental knowledge was desired, particularly in light of the high

proportion of students that selected the response `I really do not know', suggesting that `many [¼] were uncertain whether or not the statements on environmental topics presented to them were correct'. However, (Rahmawati et al., 2020; Sontay et al., 2015; Chan, 1998; Ivy et al., 1998) reported contrasting findings in their results by having high or good environmental knowledge scores. Not with standing this point, the general message stemming from these results is that factual environmental knowledge among school age students is lower than might be expected. As well as, several of the studies also suggest that students' environmental factual knowledge can vary considerably depending upon the topic under consideration. Another study in Hong Kong by Chan (1998) showed that students were more aware of certain issues (such as wildlife issues and air pollution), and less aware of others (such as world population, rainforest destruction). Another study in Greece reports that student's factual knowledge is better developed in relation to larger animals, especially pets and mammals, than in relation to smaller non-domestic animals and plants (Paraskevopoulos et al, 1998). In addition, Güler (2013) also stated that the 8th grade primary school had medium level of environmental literacy. Erdoğan (2009) determined that the 5th grade students in the primary school have medium level of environmental literacy. Moreover, Yavetz, et al. (2009) concluded that students' environmental literacy is insufficient

6.2. Students' Environmental Attitudes

Attitudes can serve as the focal point between knowledge and action. For the environmental attitudes, Table 2 presents the total attitude and subtopics mean scores and standard deviations for 10th grade students in Palestine. The relatively moderate to high total attitude mean scores, which range from 57.54 to 74.83 out of 100 points, indicate that students' attitudes toward the environment were favorable. Moreover, student's scores on the emotion subscale (M 74.83) were relatively higher than their scores on the behaviors, and belief subtopics. Additionally, relative to what was observed in the case of knowledge scores, the standard deviations of the total and subtopics attitude scores shown in Table.2 are relatively small. These deviations, which range from 9.78 to 11.51 points, indicate that students' attitudes toward the environment were relatively consistent and more uniform than their level of environmental knowledge.

Table (2) Total attitudes and sub topics mean scores and Stander Deviation for 10th grad student

Attitudes- part	Sub – topics	No of items	Mean	S. D
	Emotions	9	74.83	11.51
	Behaviors	13	69.77	10.02
	Beliefs	13	57.54	9.78
	Total scale	35	66.74	6.92

The results of the 10th grade students' attitude in Palestine are consistent with most of the studies in the world. The evidence generated by these studies shows that the young people appear to hold generally positive environmental attitudes. For example, within a sample of 5688 students from two major Australian cities, 82% were found to hold beliefs that aligned with an environmental (62%) or a strongly environmental orientation, (Connell et al., 1998). A study of 1256 Singaporeans aged 14 and 16 years found that generally the students had a moderately positive attitude towards the environment, (Erdogan, 2009).

6.3. Relationship between the levels of environmental literacy and gender

To investigate possible differences in environmental literacy (knowledge and attitudes), T-test carried out. The dependent variable was the student's environmental literacy (knowledge and attitude measures) and the independent variable was gender. Regarding the gender independent variable with the knowledge part, Results of t-test analyses revealed that the males had a significantly higher mean knowledge score than females in the total knowledge scores, ozone sub topic, and total knowledge sub topic 2 as shown in Table 3. The mean of the total knowledge was significantly different ($t = 2.24$, $df = 940$, $p<0.05$). This also was the case in ozone sub scale were ($t = 4.97$, $df = 940$, $p<0.05$) and finally for Total sub topic 2 were significantly different ($t = 3.94$, $df = 940$, $p<0.05$).

TABLE (3) The Mean and Stander Deviation of The knowledge sub topics and total scale related to their Gender

	Gender	Male		Female		Paired sample T-Test		
		n=(416)		n=(526)				
Domain	Sub domain	M	S.D	M	S.D	T	D.F	Sig. (2-tail)
Multiple-Choice	E. protection	67.97	17.71	66.87	16.55	0.97	940	0.328
	E. problems	50.54	17.50	50.83	18.60	-0.245	940	0.806
	Total subscale 1	57.08	15.12	56.85	15.48	0.228	940	0.820
True-False	Green -house	48.07	21.31	45.46	21.23	1.869	940	0.062
	Ozone	49.06	18.33	43.08	18.35	4.971	940	0.000*
	Acid rain	53.20	29.64	52.91	27.96	0.154	940	0.878
	General	47.99	30.45	44.61	28.94	1.741	940	0.082
	Total sub scale 2	49.23	14.80	45.50	14.07	3.944	940	0.000*
Scale - Total		53.51	12.41	51.69	12.33	2.242	940	0.025*

* The mean difference is significant at the $p< 0.05$ level.

As far as attitude scores are concerned, significant differences were found between the mean of both Beliefs and Behaviors subtopics attitude scores Table 4. Females scored significantly higher than

males on the Behaviors subscale (t = -1.97, df =765, p<0.05). This result was reversed in the case of the belief sub topics, where the mean attitudes score for males was significantly higher than that for females (t =2.20, df=728, p<0.05).

TABLE (4) The Mean and Stander Deviation of The attitudes sub topics and total scale related to their Gender

Attitudes topics	Gender						Paired sample T-Test		
	Male			Female					
	n	M	S.D	n	M	S.D	T	D.F	Sig. (2-tail)
Beliefs	318	58.44	9.90	412	56.84	9.63	2.205	728	0.028*
Emotions	363	73.99	11.95	464	75.49	11.13	-1.861	825	0.063
Behaviors	340	68.98	11.13	427	70.41	9.00	-1.970	765	0.049*
Total scale	260	66.71	7.44	339	66.76	6.51	-0.073	597	0.942

* The mean difference is significant at the p< 0.05 level.

There is conflicting evidence with respect to the influence of gender on young people's environmental factual knowledge and attitudes. Steel (1996) noticed gender differences in all dimensions of environmental awareness. Dopelt et al. (2019) did not find differences between genders in the level of knowledge, but nevertheless significant differences between genders were found for attitudes and behavior. The present finding that grade 10 males had significantly higher knowledge than females supported by different studies. Male students were significantly more likely to have higher levels of environmental knowledge when compared with female students (Gambro, & Switzky 1999). According to research conducted by Zimmerman (1996), blacks and women are generally less knowledgeable about ecological concepts than Whites and men. In contrast, (Makki et al 2003; Connell et al.,1998) found that female students had stronger conceptual knowledge than male students. Further investigations that explored this issue reported finding no significant relationship between gender and environmental knowledge levels (Clarke, 1996). There is some evidence to suggest that boys and girls display understanding of different aspects of environmental issues. Girls were more aware of immediate, local problems relating to human health, while boys focused more on longer-term, more abstract issues (Roper Starch Worldwide ,1994). Additionally, and Consistent with this study the findings emerging from many studies (Makki et al., 2003; Chan,1998; Dietz et al. 1998; Clarke, 1996; Stern et al., 1993) reported similar findings that women expressed more positive attitudes towards environmental quality, stronger intentions regarding the need for pro-environmental behavior, and stronger opinions about the destructive consequences of deteriorating environmental quality, than men.

In contrast, Barrett (1997) found no gender differences in the level of environmental concern as indexed by respondents' attitudes towards either controlling industrial pollution or towards banning CFS aerosol sprays. At the end of this study we able to conclude that the Palestinian 10th grade school students held relatively uniform and favorable attitudes toward the environment, but had inadequate knowledge of basic environmental concepts and issues. Thus, participants seemed willing to take necessary actions to protect the environment, but lacked the knowledge base necessary to make informed decisions.

7- CONCLUSIONS

While our schools play a major role, cultivating environmental literacy is a task that neither begins nor ends with formal education. Many parts of our society shape attitudes toward and knowledge about the environment, family, peers, religion, community, interest groups, government, the media, etc. Apparently, acquisition of environmental literacy is a developmental process taking place over a life time, starting with what's simpler to what's more complex through a variety of education venues that would make students more concerned about the total environment and its associated problems, and who have the knowledge, attitudes and motivations, commitments and skills to work individually and collectively instead of being just advocates of environmental issues. With sophisticated insight and practical knowledge and sound awareness, environmental education leads to actions. That is, environmentally literate individuals make informed choices and take day to day actions that will conserve and enhance the ability to sustain functioning ecosystems and meet human needs now and for generations yet to come. Therefore, special teaching approaches and techniques, such as values-based, community-based instruction, and child centered approaches, are needed to develop teaching practices and to promote EE curriculum and instruction in Palestinian schools. Therefore, an assessment of environmental knowledge and attitudes of a target population can provide basic information for use by environmental educators in deciding what content should be included in programs.

8- RECOMMENDATIONS

The suggestions or recommendations to improve the implementation of EE in Palestinian schools could be summarized as:

1. Both formal and non-formal institutions should be effectively tapped to improve people's environmental knowledge and attitudes, environmental organizations, national parks, and schools should examine their environmental education programs.
2. Further experimental research could investigate the cause-effect relationships between environmental knowledge, attitudes, and various independent variables. We believe that the results of this study, and studies that follow, will help transform research findings into methodological proposals for EE in Palestine.
3. Projects with environmental subjects should be concentrated at schools and the students should be ensured to adopt responsible behaviors towards the environment by participating in these projects.

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