

The Impact of the Environmental Excellence Program on the Knowledge, Attitudes, and Behaviors of 4th Grade Students Towards Waste Management

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ABSTRACT

Environmental education is a key factor in helping individuals become eco-friendly, particularly in terms of how to deal with the waste they produce. Therefore, the main aim of the study is to examine the effectiveness of the environmental excellence program (EEP) in improving fourth-grade students' knowledge, attitudes, and behaviors towards waste management.

The EEP adopted a one-group quasi-experimental design using pre-post application. The study was performed with a sample of 187 students (83 males and 104 females) selected from three schools from one Educational Governorate in the Sultanate of Oman. The knowledge, attitudes, and behaviors of the students towards the waste management scale (SKABWMS) were used for data collection.

Study findings revealed that there are significant differences between pre and post applications of the SKABWMS in students' knowledge, attitudes, and behaviors in favor of post-application. In addition, the results showed that female students developed better behaviors than male students after taking part in the EEP. In light of these results, suggestions and recommendations were made in this study to improve the EEP implementation in schools, in its latest version.

Keywords: environmental excellence program, knowledge, attitudes, behaviors, 4th grade students, waste management

INTRODUCTION

Humans have always exploited natural resources to their own advantage with no respect for the environment. This led to the emergence of social, environmental, and economic impacts, such as increased deforestation; soil erosion; water, air, and soil pollution which poses a serious threat to biodiversity and causes devastating damage to many species; increased desertification; and the spread of various diseases among people, animals, and plants, ultimately putting a strain on environmental resources like water, air, and food. This is caused by the dramatic increase in population, especially in big cities (Ambusaidi & Al Mahrouqi, 2017). Our world has witnessed an enormous population explosion; the global population growth peaked in 1962 and 1963 with an annual growth rate of 2.2%; but since then, world population growth has halved (Roser et al., 2013). Consequently, humans began to worry about the quality of their life, as well as their survival

and existence on earth (Al-Sabarini & Al-Hamad, 1994), expressing concerns over securing a sustainable world for future generations and thinking of ways to reverse nature loss and climate changes, and meet other basic needs of food, water, and environment.

The negative impact of humans on one aspect of the environment has extended to other aspects as well. The contemporary environmental issues are complex and interrelated, such as overcrowding, accumulation of waste, energy shortage, underdevelopment, poverty, inequality, illiteracy, persecution, discrimination, racism, human trafficking, and threats to biodiversity. Therefore, environmental issues have multiplied with the expansion of life, as they are not specific to certain nations or peoples, but rather affect all peoples and nations (Ambusaidi, 2018).

There is no doubt that humans can enjoy the bounties of God, but the environment should be kept out of harm's way. As challenging as it may be, humans are trying to find ways to adopt more sustainable living and working practices. All

individuals should have access to the natural resources they need without threatening the environment, regardless of their religion, nationality, affiliation, race, and place of residence. Natural resources should be used without compromising the ability of future generations to meet their own needs, ensuring a peaceful and tranquil life for all (Ambusaidi, 2017).

As a key player in our environment and social and economic development, the human being is the trigger behind many environmental threats. Therefore, it is necessary to understand this development and the nature of the relationship between humans and the environment to find the right solutions. This understanding would allow us to identify the negative aspects of this relationship and address them accordingly. Change must begin with humans, being the main actors in our environment (Al-Hashemi, 2003; Al-Tobi, 1995). Humans take great responsibility towards the environment in which they live and in which their children will live in the future. This responsibility should be manifested in making a change in our behaviors, attitudes, lifestyles, and the way we interact with the environment (Ambusaidi, 2006).

Raising our children to properly interact with the environment is no mean feat. It requires tremendous effort by many institutions both nationally and globally. Our focus should not only be on making humans aware of the environment and development-related issues, but also on changing their behaviors and instilling into them a positive attitude towards these issues (Ambusaidi, 2018). For example, the qualitative study conducted by Oliveira (2019) targeted 400 students in grades (1-5) and evaluated behavioral changes toward the environment and waste management practices after consistent intervention educational programs. The results indicated a significant improvement in the children's knowledge but only a slight change in their behaviors and attitudes over one year. Moreover, the study suggested that their level of awareness will be reduced over time if no consistent interventions were implemented.

As commonly known, education plays a major role in changing the behaviors of individuals towards the environment. Hence, environmental education has emerged globally as a recent trend that seeks to improve the knowledge of students in the areas of biophysical environment and its associated problems, making them aware of how to solve these problems and motivating them to work towards developing a solution (Gough & Gough, 2017). We can make change happen by giving students access to content and offering them experiences in curricular and extracurricular activities. This requires us to shift the attention from the traditional methods of teaching and learning to the daily student activities that are directly related to the environment. According to Erhabora and Don (2016), environmental education is seen as a process of infusing environmental content into the educational system in order to raise public awareness of environmental issues at all education levels. O'Donoghue et al. (2016) stated that environmental education encourages students to relate their personal lives and actions to environmental problems. It also provides young people with coherent insight into human behavior and its effects on other people and the environment (Stanišić & Maksić, 2014).

Savri et al. (2006) used interactive activities for grade 6 in a study group consisting of 121 male and female students. The

study aimed at evaluating the effectiveness of environmental education versus traditional ecological education. Findings revealed that the experimental group outperformed the control group for both genders. The experimental group also showed a deeper understanding of the covered topics. The study by Simsekli (2011) used various themes to enrich and expand the ecological knowledge amongst students, as well as to enhance their attitudes toward environmental issues during their daily routine. Findings indicated a significant change in knowledge and slight change in behaviors. Similarly, a study conducted by Edsand and Broich (2020) found some statistical evidence that environmental education can promote higher levels of environmental awareness.

The Sultanate of Oman is one of the countries that have given high priority to environmental issues. Since the dawn of the blessed renaissance in 1970, the Omani government recognized the environment sector as a priority in various plans and programs. This can be evidenced by the establishment of a ministry concerned with environmental problems. Further efforts were made by the Sultanate by developing several national strategies, such as the National Strategy for the Protection of the Omani Environment that was launched in 1986. Furthermore, a Royal Decree was issued in 1984 establishing the National Strategy and Action Plan for Biodiversity, the National Strategy for Adaptation and Mitigation of Climate Change, and the National Strategy for Waste Management. Another law was issued in 2003 (Law No. 6/2003) on Nature Reserves and Wildlife Conservation. These are but few of the many examples of strategies, laws, and agreements drafted regionally and internationally. As for general education, the Ministry of Education (MoE) has integrated environmental concepts into different school curricula, particularly science and social studies. This comes in addition to creating a roadmap that helps school curricula authors and designers introduce such concepts. MoE also encourages schools to celebrate environmental national and international events, such as the World Environment Day, International Year of Biodiversity, Omani Tree Day, and many more. The launch of the Sultan Qaboos Award for Sustainable Development in the School Environment was no doubt the culmination of MoE's efforts, which encourages schools to work on community and school projects aiming to increase environmental and health awareness among the youth and community members.

In the field of waste management, the various municipalities in the Governorates and Wilayats of the Sultanate had been handling the waste management before the issuance of the Royal Decree No. (46/2009), under which the management of this sector was awarded to Oman Environmental Service Holding Company S.A.O.C (be'ah). The company's main goal is to reduce the amount of waste going to traditional dumpsites, reform and rebuild the entire waste sector, and support the national economy. Be'ah launched its operations in different Sultanate governorates on December 31, 2015. It is currently extending this service to the other governorates while providing the necessary infrastructure and applying the best practices that ensure environmental protection and proper waste management. The company also focuses on increasing community engagement, raising environmental awareness, and instilling a culture of

responsible waste management in the society. Operating under the vision of “conserving the environment of our beautiful Oman for future generations”, the Company successfully handled operations covering 100% of the municipal waste management services and up to 99% of health care waste services by the end of 2019 and managed to complete building the required infrastructure to launch the industrial waste operations (Be’ah, 2019).

In order to provide a long-term, continuous, and sustainable management, paramount importance should be granted to the role of individuals, as they are the ones producing the waste and contributing to its reduction and disposal. Shiner and Caspi (2003) described the personality differences between adolescents and children in acquiring and developing new traits and attitudes. Although temperament traits and attitudes are typically considered to make up most, if not all, of the personality in infancy, they merely form a subset of personality differences in later childhood and adulthood (Shiner & Caspi, 2003). The study indicated that children are likely to think, behave, and feel in specific consistent ways based on their upbringing. Therefore, individuals must be educated about the concept of waste management and disposal from early stages in their lives. This includes the knowledge, attitudes, and behaviors that will ultimately constitute the individual’s awareness of the concept of waste management. This individual awareness begins in childhood and continues during the school years through the curricular and extra-curricular activities. “be’ah”, Oman’s Environmental Services Holding Company, has been keen to spread awareness among students at basic education schools in the Sultanate of Oman about how to safely handle waste through introducing a new program called “The environmental excellence program (EEP).

ENVIRONMENTAL EXCELLENCE PROGRAM

EEP is a training program that relies on previous studies and experiences. It was launched by the Oman Environmental Services Holding Company “be’ah” and targeted fresh graduates from various universities and colleges. At the outset, those graduates were trained on social outreach and community engagement (SOCE), but soon began to spread the message of preserving the environment and establishing the proper means of waste disposal, as well as the many other environmental values, under the supervision of the SOCE team from be’ah. The program was implemented for a period of nine months and included visits to universities, schools, and local communities. Additionally, it supported community awareness activities and events. The program is aimed at:

1. Selecting 14 freshly graduated candidates from 11 governorates.
2. Training and developing the program’s trainees (ambassadors) for nine months in various fields.
3. Developing the talents of recent college and university graduates and employing their skills and knowledge to conduct awareness programs.
4. Implementing various awareness-raising activities for different groups across the Sultanate governorates.
5. Introducing school students at all educational levels to waste management concepts.
6. Advancing the role of student in preserving the Omani environment for the future generations.
7. Establishing a community partnership with many segments of the society.
8. Guiding the community through the process of reducing, reusing, and recycling waste.
9. Contributing to the achievement of the Company’s vision towards the realization of the Oman Vision 2040.

As for the program procedures within schools, they include five components, as follows.

Green School

The aim of establishing green schools around the Sultanate is to encourage a healthy and sustainable academic environment in a number of schools in the first cycle (1-4). Introducing this procedure or component will reduce the amount of waste generated by students. It will also raise awareness about waste management by involving students and the school community in the modern hierarchy of waste management. The amount of waste collected from each school is continuously evaluated. At the end of the school year, the winning school from each governorate is selected based on specific criteria and receives a prize. Green School Program is similar to the Ajiboye and Silo’ (2008) descriptive study that aimed to improve students’ environmental knowledge, practices, and attitudes by activating the school civic clubs, which included site visits. The data showed a significant change in the attitudes and understanding of civic club members who participated in various activities. There was a remarkable difference in the environmental knowledge between the two groups. The use of civic clubs in promoting children’s behaviors is a unique technique that delivers better results than traditional teaching practices.

Writing Marathon

This program is designed to allow students to think outside the box. Students are trained through a narrative technique that allows them to write a story about waste management topics. They build the story from the ground up while receiving step-by-step guidance from trainers or “be’ah ambassadors” who are trained by experts for this purpose. The program approach bears a resemblance to that of Mahasneh et al.’s (2017) study, which argued that the environmental, knowledge, attitudes, and behaviors, once formed, are not easily changed. The study used 12 fiction and non-fiction social stories focused on environmental issues. Students were split up into three age groups, and each group was assigned a story with different worksheets, workshops, and questions that simulate the kids’ critical thinking and feelings. Results showed that children’s knowledge increased following the narrative intervention program using storytelling; however, there was no significant difference in knowledge acquisition between males and females.

Puppetry

Naiseh (2015) expressed the role of theater in improving environmental education among kindergarten kids (4-5 years old). Study analysis results indicated an increased environmental awareness and ecological knowledge among children. The theatre plot, characters, themes, and rhythm influenced the targeted group to interact positively. Thus, the initiative of “be’ah” was designed to present the stories written by the students in a live show. The different environmental messages included in these stories are communicated through puppetry. Ten short stories written by children are brought to life in a puppet show. This show addresses the issue of the random disposal of waste, sustainability, and the conservation of the environment for future generations, which could influence the students’ attitudes and behaviors.

Doodling

In this procedure, two puppetry videos are played, focusing on positive and negative habits towards the environment. Four characters are included in these videos: the main character, Maymoun, and the three other supporting characters, Nasooh, Shorook, and Shagoof. It is necessary to transfer environmental messages through a medium that kids find captivating. As expressed by Luigi, ‘Kids are visual in nature and love cartoons and cartoon characters’ (Petito, 2018). An experimental study was carried out across five countries to engage with children through cartoon videos. The project demonstrated successful changes in kids’ thoughts and attitudes, translated into virtues such as solidary, volunteering, and protecting the earth from harmful practices.

Discovering “be’ah”

This initiative is implemented through field visits to allow students to gain full knowledge about the “be’ah” facilities located in their governorate by closely examining the duties of “be’ah”. In this procedure, all selected schools visit the Company infrastructures according to a set schedule and learn about the waste management processes in “be’ah”. Precautions are in place to ensure safety when visiting the Company’s facilities, such as the Engineered Landfill and Transfer Station. Exposure to outdoor activities enhances the students’ interactions. Through these visits, students experience a different atmosphere from the standard classroom setting. Hong et al. (2020) investigated the impact of outdoor activities in developing students’ knowledge and attitudes. Findings from both quantitative and qualitative data agreed that such activities contributed significantly to increasing the students’ perceptions and awareness about renewable energy and environmental matters.

Enabling students to engage in such activities at an early age can enhance their knowledge, behaviors, and attitudes towards the environment in general, and in particular waste management. Therefore, the MoE is continually providing such opportunities to school students by exposing them to environmental activities, noting that some are held in collaboration with environmental entities in Oman, such as the Oman Environmental Services Holding Company “be’ah”. However, a program like the EEP should undergo an evaluation for two main reasons. First, the need to determine its

effectiveness in enabling students to acquire the required knowledge, attitudes, and behaviors towards waste management. Secondly, the need to help Oman Environmental Services Holding Company “be’ah” (EEP’s sponsor) to decide on the best way forward, whether to simply continue or stop the implementation of the program, or even to make improvements to the program before proceeding with the implementation. Hence, this study seeks to answer the following questions:

1. How effective is EEP in enhancing the knowledge, attitudes, and behaviors of basic education students towards waste management in the Sultanate of Oman?
2. Is the performance of basic education students in Oman - who participated in EEP-different according to their gender in terms of their knowledge, attitudes, and behaviors towards waste management?

RESEARCH METHODOLOGY

The study follows a quasi-experimental methodology using the pre-post application of students’ knowledge, attitudes, and behaviors towards the waste management scale (SKABWMS).

Study Sample

The sample of the study consisted of 187 fourth-grade students, of which 83 are males and 104 are females. Three schools from one educational governorate were selected after applying to the program. Therefore, the purposive sampling method was used. These schools were almost identical in terms of student age (9-10 years), social and cultural context (middle class), and gender (male and female). In each school, the program was delivered by one person, called the “environment ambassador”. In cycle one school, where the study was applied, both male and female students are studied in the same class and taught by female teachers. Thus, the ambassador, who conducted the EEP in these schools was female.

Study Material and Tools

A variety of study materials and tools have been adopted for the purpose of this study, as follows:

Study Materials

The material used in this study is the EEP for school students (cycle 1-4) that was launched by Oman Environmental Services Holding Company “be’ah” and targets basic education students in the Sultanate of Oman, particularly grade 4 students. The program aims to train a group of graduates from different universities and colleges to spread the message of environmental conservation and lay down the basic principles of proper and safe disposal of waste, as well as to transmit environmental values to the target groups. These trainees are called “environment ambassadors”. In order to be able to implement the program in schools correctly and consistently, these ambassadors participated in a four-week training program focused on both theory and practice. The academic materials included specialized information related to waste management, such as sustainability, circular economy, and operational aspects of

Table 1. Reliability value by sub-scale

Sub-scale	Reliability value	Example
Knowledge	0.75	Waste cannot give us electrical energy.
Attitudes	0.70	I would like to participate with my schoolmates in collecting school garbage.
Behaviors	0.71	Cleaners are responsible for collecting the school waste (garbage).

Table 2. SKBAWMS pre-post test results

Sub-scale	Application	Mean value	Standard deviation	t-value at df=187	Sig. level	Effect
Knowledge	Pre	4.99	1.35	1.37	0.01	0.009
	Post	6.36	1.36			
Attitudes	Pre	2.68	.284	2.70	0.01	0.038
	Post	2.75	.219			
Behaviors	Pre	1.94	.324	3.61	0.01	0.065
	Post	2.05	.248			

waste management (engineered landfill, transfer station, healthcare facility, and Leachate Treatment Plant). From an educational side, the training equips trainees with the skills required to interact with students, particularly with regards to teaching methods and classroom management, as well as strategies on how to manage their relationship with school administrations.

The program implemented for school students is organized around five basic components: green school, writing marathon, puppetry, doodling, and discovering “be’ah” through site visits to the landfills located in the students’ governorates. The program was put in action through extracurricular activities, where a class is required to present three components every two weeks, as follows: writing marathon, puppetry, and doodling. As for the green school, it is applied for a full semester by asking students at each school to form an internal committee, allowing them to circulate waste management information and reduce waste production. Then, the environment ambassador evaluated several initiatives carried out by the committee at the end of the semester and selected the winning school. The last component is “discovering “be’ah”, where students visit the nearest facility managed by Oman Environmental Services Holding Company “be’ah”. During these visits, students learn more about how to safely handle different types of waste.

Study Instrument

An assessment study instrument was used to assess the SKBAWMS. This scale is designed to measure the level of knowledge, attitudes, and behaviors of basic education students by trainees before and after the implementation of EEP. The scale was designed after a thorough literature review (e.g., Ambusaidi et al., 2018, 2019; Murphy et al., 2006), including previous reports and publications issued by “be’ah”. The scale consisted of 10 items that measure the students’ knowledge (true or false questions, worth 10 points), 12 items that measure students’ attitudes and seven items that measure students’ behaviors. True/false questions were used to measure students’ knowledge because students are more familiar with these type of questions as they are often used in grades 1-4, especially in science classes.

The three-point Likert scale was used to measure their attitudes (agree, neutral, disagree) and their behaviors (always, sometimes, never). Based on previous studies, researchers found that using the three-point Likert scale is

best suited for working with young students (Royeen, 1985). Then, the results entered in the SPSS, version 22, are assigned a numerical value: 3=agree, 2=neutral, 1=disagree for positive attitude statements, and the opposite for negative attitude statements, as well as 3=always, 2=sometimes, 1=never for behavior statements. The face validity of the scale was assessed by peer reviewers (total of 10 reviewers) from “be’ah” and other educational institutions to ensure its validity. The reliability of the scale as a whole and of each sub-scale was verified using the test-retest Pearson’s correlation coefficient. The recorded value was 0.72 for the scale as a whole, which is considered acceptable for the purpose of the study (Table 1).

Furthermore, researchers calculated Pearson’s correlation coefficient between each item of the sub-score and the total score of each sub-scale to check the discriminate validity. The values of the correlation coefficient of the knowledge sub-scale ranged from 281* to 403**. For the attitudes sub-scale, values ranged from 273 * to 550**. Finally, for the behaviors sub-scale, values ranged from 0.239* to 0.591**. All these values are significant at $p \leq 0.05$.

FINDINGS

The results of the study will be discussed according to the research questions and objectives, as follows.

The effectiveness of the EEP for improving the knowledge, attitudes, and behaviors of basic education students towards waste management. To find out the effectiveness of the program, mean values and standard deviations were calculated for the pre and post applications of each sub-scale. A paired t-test was then used to test the difference between these two applications. Table 2 illustrates the results of the analysis.

Table 2 shows that there are statistically significant differences between the mean value of the pre and post application of the scale of knowledge, attitudes and behaviors of students towards waste management, in favor of the post application. This means that the EEP, in which students participated, was effective in providing them with an adequate knowledge of waste management concepts and changed their attitudes and behaviors towards waste management. It also had more positive effect on student behavior.

Table 3. Mean values and standard deviations of both genders in the SKABWMS pre-application

Sub-scale	Gender	Application	Mean value	Standard deviation	t-value at df=187	Sig. level
Knowledge	Male	Pre	5.04	1.36	0.373	0.709
	Female	Pre	4.96	1.35		
Attitudes	Male	Pre	2.69	0.269	0.354	0.723
	Female	Pre	2.67	0.297		
Behaviors	Male	Pre	1.91	0.297	1.349	0.179
	Female	Pre	1.97	0.343		

Table 4. Mean values and standard deviations of both genders in the SKABWMS post-application

Sub-scale	Gender	Application	Mean value	Standard deviation	t-value at df=187	Sig. level
Knowledge	Male	Post	6.38	1.35	0.126	0.900
	Female	Post	6.36	1.36		
Attitudes	Male	Post	2.75	0.207	0.197	0.844
	Female	Post	2.75	0.231		
Behaviors	Male	Post	2.01	0.226	2.062	0.041
	Female	Post	2.08	0.263		

The Effect of Gender on Students' Knowledge, Attitudes, and Behaviors Towards Waste Management

To find out the effect of gender on students' knowledge, attitudes, and behaviors towards waste management after the implementation of the EEP, an independent t-test was used, and the results are shown in **Table 3**.

As shown in **Table 3**, there are no significant differences in the mean values between the performance of male and female students in the three sub-scales prior to the implementation of EEP. This means that both genders acquired almost the same knowledge, attitudes, and behaviors towards waste management. However, to test the effect of EEP on knowledge, attitudes, and behaviors towards waste management on gender variables, an independent t-test was used, and the results are presented in **Table 4**.

As seen from **Table 4**, there are statistically significant differences in behaviors sub-scale at a level of 0.05 between male and female students, only in favor of female students, while no differences were found in other two sub-scales. This means that EEP only had an effect on the behaviors sub-scale.

DISCUSSION

The results of the study showed that there are statistically significant differences between the mean value of the pre- and post-application of the knowledge, attitudes, and behavior of students towards the waste management scale, in favor of the post-application. This means that the environmental activities in which students participated through EEP contribute significantly to enabling students to acquire the knowledge, attitudes, and behaviors they need towards waste management. As Erhabora and Don (2016) asserted, environmental education is an approach that can "bring some solutions to the deteriorating relationship between man and the environment". The results of this study aligned with those of the Oliveira (2019) study, which emphasized the ability of students to acquire new environmental concepts, ideas, and information after engaging in environmental activities.

Although the results showed a good impact of the EEP activities conducted inside the school, there is, however, a

need for activities that can be implemented outside the schools (at home or in place) under the supervision of parents or schoolteachers. In the current program, students were, unfortunately, unable to go on-site visits for many reasons, most notably the high-temperature weather during the implementation of EEP.

The site-visit approach will enhance the students' acquired knowledge of waste management and develop their attitudes and behaviors. Ark et al. (2020) pointed out that powerful learning has always been an active process that is connected to a place. Moreover, Edsand and Broich (2019) concluded that strengthening environmental education in school curricula is a necessary yet insufficient condition for improving environmental awareness among the youth. They asserted that parents play a crucial role in building their child's awareness of environmental issues because children spend much time with their parents in a particular socio-economic environment.

In this study, researchers suggested that some EEP procedures must be revisited and further developed in order to move from merely knowledge acquisition to the attitude and behaviour development of students. This shift will enable students to deliver better and multiple environmental projects that reflect their understanding of waste management concepts. This includes, but is not limited to, recycling, reusing, and reducing waste, as well as reshaping ideas that are beneficial for the school community. This will also lead to sustainable attitude and behaviour changes among students as it requires students to engage in more activities and dedicate more time to tackling environmental issues.

Regarding the effect of EEP on knowledge, attitudes, and behaviors towards waste management due to gender difference, results showed that only the behaviour sub-scale was impacted, in favor of female students. This may be because female students, whether students or teachers, are known to care about achieving the best outcomes and making their schools tidier and eco-friendlier. Many studies conducted on academic achievement and other educational and learning variables in the Sultanate have demonstrated the outperformance of female students and teachers, such as the study conducted by Al-Shaqsi and Ambusaidi (2018). In their study, Al-Shaqsi and Ambusaidi, (2018) found that female



Figure 1. Illustration examples of student stories

science teachers were better than their male peers at leading classroom dialogue and encouraging students to think during dialogues. Ambusaidi (2013) conducted another study revealing that students found that Omani female teachers have more effective teacher characteristics than male teachers. Al-Saadi (2012) study investigated the knowledge, attitudes, and behaviors of science teachers towards sustainable development issues, only to find out that female teachers had a better performance compared to their male peers. Finally, Al-Hadrami's (2011) aimed at investigating the grade 12 students' understanding of genetic concepts and how they relate to their logical thinking and alternative conceptions. Findings indicated that female students had a better understanding of these concepts compared to male students.

Moreover, the ambassadors implementing the program noticed that female students had higher engagement and interaction rates with the EEP. For example, during the Writing Marathon honoring ceremony for students with the best ten stories, it was noticed that female students tend to write conclusions by exploring the story characters and adding a meaningful purpose that differs from the original purposes. The stories were also diverse in term of characters, narrative structures, and context (see **Figure 1** for some examples).

As for the knowledge sub-scale, the questions seemed very simple and did not require too much cognitive load. For this reason, researchers did not notice any significant difference between male and female students. Regarding the attitude sub-scale, change does not happen overnight, so no significant changes were noted in the attitudes of students, as this would have required more activities and more time.

CONCLUSION AND RECOMMENDATIONS

In light of these findings, the study emphasizes the vital role of the EEP in developing students' knowledge, attitudes, and behaviors towards waste management. However, to further develop students' knowledge, attitudes, and behaviors towards waste management specifically and the environment as a whole, there may be a need to integrate this program with other bodies concerned with the environment in Oman, such

as the Oman Environment Society, Environmental Authority, the Diwan of Royal Court, the Ministry of Health. Moreover, some EEP activities require reconsideration and further development in order to shift the impact from merely knowledge acquisition to attitude and behaviour development of students.

Researchers also recommended implementing the EEP during the first semester (September to January) of the school year, as its current implementation in the second semester (February-May) poses great challenges, including the short duration of the second semester and the heat that is difficult for students to endure during field visits to the landfills.

Regarding the program implementation period, there is a need to increase the amount of time allocated for the implementation of the program in each school, which should be continued for a certain period of time. It is currently implemented once a week, a frequency deemed insufficient for the development of the students' attitudes. This requires better coordination and cooperation with the Ministry of Education. In this regard, Petito (2018) highlighted that a lot of time and effort is needed to make a change in human environmental actions and ultimately achieve the environmental goals.

As for the interactive student activities in the program, there is a need to increase painting and drawing activities, as well as to introduce new innovative activities in order to better engage students and foster their active participation. Moreover, it is recommended to plan different activities for each gender (male and female) students, taking gender differences into consideration, provided that the activities offered to both genders aim to achieve the same goals.

There is also a need to raise awareness among school principals and administrative staff about EEP before implementing this program in their schools. This can easily be made once a program coordinator is appointed in each educational governorate. Further collaboration between "be'ah" and the Omani Ministry of Education is needed to continuously monitor and evaluate the schools during the program implementation.

Finally, more research is certainly needed on this EEP through, for example, carrying out a comparative study about

the performance of EEP student participants and non-participants in terms of their knowledge, attitudes, and behaviors towards waste management. A qualitative study could also be conducted to analyze the content of each EEP activity and assess its suitability for the level of the students targeted by the program.

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