



## Environmental Knowledge, Attitudes, and Behaviors among Secondary School Students in Al-Mafraq Governorate: Jordanian Descriptive Study

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### ABSTRACT

**Background:** To promote environmental awareness and pro-environmental practices in students, environmental education is essential. **Purpose:** This study aims to assess the environmental knowledge, attitudes, and behaviors of secondary school students in Jordan. **Methods:** A descriptive cross-sectional design was employed, targeting secondary school students in Jordan. Using convenience sampling, 461 students were recruited from 12 schools across three directorates, ensuring equal representation of both sexes. **Results:** Students' knowledge scores were high (M = 3.95 for males, M = 3.87 for females; M = 3.91 for 11<sup>th</sup> grade, M = 4.17 for 12<sup>th</sup> grade), with no significant differences due to sex or academic level. Attitudes were generally positive (overall M = 4.24 for recycling laws, lowest M = 3.15 for environmental awareness), with significant differences due to sex and academic level. Behaviors were moderate (overall M = 3.62), highest for avoiding harm to plants and animals (M = 4.30) and lowest for preferring canned food (M = 2.87), with sex and academic level both significantly influencing behaviors. **Conclusion:** The findings indicate that Jordanian secondary school students possess a moderate level of environmental knowledge and generally hold positive attitudes toward environmental issues. However, their actual engagement in environmentally responsible behaviors remains only moderate. Notably, these behaviors were significantly influenced by students' sex and academic level, underscoring the need for targeted educational interventions to foster stronger pro-environmental behaviors. **Implications for Nursing:** The study highlights the importance of integrating environmental health education into nursing practice and community outreach, particularly in Jordan, to promote eco-friendly practices and achieve sustainable development goals.

**Keywords:** Environmental knowledge, Environmental attitudes, Environmental behaviors, Secondary school students, Jordan.

### **What does this paper add?**

1. The persistence of environmental challenges can be attributed to a lack of understanding and responsible attitudes regarding the consequences of pollution and unsustainable resource use.
2. Addressing environmental issues necessitates addressing the underlying causes, such as insufficient comprehension, irresponsible behaviors, and poor human activities.
3. The overall level of environmental knowledge was intermediate (12.55 out of 18) with good attitudes toward the environment.
4. Sex and academic level showed a substantial variation in the environmental behaviors and attitudes of students, with males showing higher environmental knowledge scores.

### **Introduction**

It is imperative to preserve the Earth's capacity to sustain life for present and future generations and to stop harmful behaviors that deteriorate the environment; coordinated national, international, and local responses are required (Garg, 2023). The persistence of environmental challenges can be attributed to a lack of understanding and responsible attitudes regarding the consequences of pollution and unsustainable resource use (Solomon et al., 2017).

Addressing environmental issues necessitates addressing the underlying causes, such as insufficient comprehension, irresponsible behaviors, and poor human activities (Banihani et al., 2022; Reed et al., 2016). Building responsible societies that recognize the value of individual contributions to environmental preservation is critical (Piccolo et al., 2022). Environmental education emerges as an effective technique for instilling a sense of responsibility for both local and global surroundings (Sukma et al., 2020). Numerous studies have demonstrated the usefulness of environmental education in improving environmental knowledge, attitudes, imitative behaviors, readiness to act, critical thinking, and awareness (Bergman, 2016; Huang et al., 2022). These findings highlight the critical importance of environmental education in empowering citizens to actively contribute to tackling environmental problems (Al-Rabaani & Al-Shuili, 2020; Alvarado & Toledo, 2017; Desi et al., 2017).

Several studies emphasized that the impact of

environmental education on students is determined by sex (Del Rey et al., 2022) and grade/class level (De Silva & Pownall, 2014). A study performed by Ponmozhi and Krishnakumari (2017) focused on assessing the environmental attitudes of school students to determine the levels of environmental attitudes among students and investigate potential differences between selected sub-samples. The findings revealed that the majority of students exhibited high environmental attitudes, and no significant differences were observed between sub-samples. A scarcity of studies conducted in Jordan to assess underscored attitudes, and behaviors of students toward environmental issues, underscored the challenges and problems that affect the natural environment and human well-being. These include concerns, such as pollution (air, water, and soil), climate change, deforestation, loss of bio-diversity, improper waste management, and overuse of natural resources (Fayiah et al., 2020). Addressing these issues requires awareness, positive attitudes, and responsible behaviors in order to promote sustainability and protect ecosystems for future generations.

Al-Mafraq governorate was selected in this study, because it represents one of Jordan's largest and most demographically diverse regions, encompassing both urban and rural areas with varied socio-economic conditions. Its schools serve students from different cultural and environmental backgrounds, offering a representative context for examining environmental knowledge, attitudes, and behaviors. Furthermore, Al-Mafraq faces pressing environmental challenges, such as water scarcity, waste management issues, and population pressures due to its proximity to refugee-hosting communities, making it a particularly relevant location for assessing students' environmental awareness and practices.

The significance of this study lies in its ability to offer crucial insights into the efficacy of environmental education among Jordanian students. An in-depth understanding of how sex and grade-level differences impact the effectiveness of environmental education programs is one of the main aims of this study. The results of this study can be used to help Jordanian educators, curriculum developers, and educational authorities pinpoint the advantages of current environmental education initiatives as well as possible areas for improvement and development. To improve

the standard of environmental education, curriculum designers, instructors, and educational policymakers can all benefit from this understanding. Therefore, the current study aims to assess the levels of knowledge, attitudes, and behaviors of secondary school students in Jordan toward environmental issues.

This study will answer the following research questions:

1. What are the levels of knowledge, attitudes, and behaviors of secondary school students in Jordan toward environmental issues?
2. What is the impact of socio-demographics on the knowledge, attitudes, and behavior of secondary school students regarding environmental issues?

## **Materials and Methods**

### **Study Design**

A descriptive, cross-sectional design was used.

### **Sample and Settings**

A convenience sampling technique was used to recruit participants. The sample size was computed with the G\*Power 3.1.10 (Faul et al., 2009). The minimum sample size was 384 according to ( $\beta = 0.80$ ,  $\alpha = 0.05$ , and medium effect size = 0.15). Also, 20% was added to minimize incomplete questionnaire forms and participant withdrawals; the minimum expected sample size is 461 students.

A multistage sampling approach was adopted. First, the study was conducted in Al-Mafraq Governorate, which consists of three directorates: Al-Mafraq Qasaba District, Northwestern Badia District, and North Eastern Badia District. From each directorate, four secondary schools were purposively selected to ensure equal representation of sexes, with two male schools and two female schools included. In total, 12 schools were selected, covering the entire set of schools across the three directorates. Within each school, classes were then selected using convenience sampling, and all available students in the chosen classes were invited to participate. This process ensured a balanced and comprehensive representation of both male and female secondary school students in the study sample.

### **Instruments**

A self-administered questionnaire was used to collect data from secondary school students (11<sup>th</sup> and 12<sup>th</sup> grades). The instrument consisted of four sections.

Section I: Demographic variables, including sex and educational level. Section II: Environmental Knowledge, which consisted of 18 multiple-choice items designed to assess students' factual knowledge of environmental issues, such as pollution, conservation, and sustainability. Each knowledge item was scored on a 4-point scale (1 = least correct to 4 = most correct response). The total knowledge score (ranging from 0–18) was computed by summing the recoded item scores, where higher scores indicate greater environmental knowledge. Each correct response was scored as one, and incorrect responses as zero, with total scores ranging from 0 to 18. Cut-off points were determined as follows: excellent ( $\geq 90\%$ ), good (75%–< 90%), acceptable (50%–75%), and weak (< 50%). The tool was adapted from existing environmental knowledge assessments used in school-based research, with modifications to fit the local context. Section III: Environmental Attitude Scale. Students' attitudes were measured using a 20-item, 5-point Likert scale (strongly agree = 5 to strongly disagree = 1), with total scores ranging from 20 to 100. Higher scores indicated more positive attitudes toward environmental issues (Jackson et al., 2016). Cut-off points were defined as excellent ( $\geq 90\%$ ), good (75%–< 90%), acceptable (50%–75%), and weak (< 50%). Section IV: Environmental Behavior Scale. This scale included 20 items scored on a 4-point scale (Always = 4, Frequently = 3, Occasionally = 2, Rarely = 1), with scores ranging from 20 to 80. Higher scores reflected greater engagement in pro-environmental practices. Cut-off points followed the same classification as above: excellent ( $\geq 90\%$ ), good (75%–< 90%), acceptable (50%–75%), and weak (< 50%). The original items were adapted from established environmental behavior measures (Varoglu et al., 2017).

The content validity of the translated tools was assessed using the Content Validity Index (CVI). Three experts in community health and environmental education independently reviewed the items for clarity, relevance, and representativeness. Based on their feedback, minor revisions were made to ensure cultural appropriateness and comprehensibility. In addition, the instruments were reviewed by academic staff from Jordanian universities and social studies supervisors from the Ministry of Education. To establish reliability, a pilot study was conducted with 30 students from different schools. Cronbach's alpha values indicated satisfactory internal consistency: 0.76 for the

Environmental Knowledge Test, 0.93 for the Attitude Scale, and 0.86 for the Behavior Scale. The pilot study also confirmed the clarity of items and average completion time.

The original scales were translated into Arabic following a rigorous forward-backward translation process. First, two bilingual experts translated the instruments into Arabic. Then, a different bilingual translator independently back-translated them into English. Discrepancies were discussed and resolved to ensure semantic and conceptual equivalence. The final Arabic version was used for data collection.

### **Data Collection Procedure**

Data collection was conducted only after obtaining the required ethical approvals. School managers were first contacted by phone and formally notified about the purpose and procedures of the study. Following approval, a meeting was arranged with school managers and class teachers to identify eligible students who met the inclusion criteria. Inclusion criteria were: (a) being a secondary school student enrolled in 11<sup>th</sup> or 12<sup>th</sup> grade in one of the selected schools, (b) ability to read and understand Arabic, and (c) willingness to voluntarily participate in the study. However, students absent during the data collection period, and (b) those who declined or withdrew from participation were excluded from the study.

After eligibility was confirmed, prospective participants were approached during school hours and provided with detailed information about the study, including its goals, significance, potential benefits, and risks. Students were informed that participation was voluntary, their responses would be confidential, and their academic performance would not be affected by their decision to participate or decline. Survey packets were then distributed to students who agreed to participate. They were given the choice of completing the questionnaire during free time at school or at home. For those who opted to complete it at home, the questionnaire forms were collected by the researchers the following day. This approach allowed students flexibility while ensuring a high response rate.

### **Ethical Considerations**

Ethical approval for the study was obtained from the Institutional Review Board of Al al-Bayt University (Ref. #7/2726). Following approval, a formal cover

letter from Al al-Bayt University was provided to the heads of the Nursing Faculty departments, outlining the objectives and purpose of the study. Participants were reminded that they could leave the study at any time without facing any repercussions and were assured that their participation would be voluntary and uncompelled. By not requesting respondents to sign their names on the questionnaire and by assuring them that their responses would not be associated with them, respondents' confidentiality and privacy were safeguarded.

Regarding the participation of students (< 18 years) in the student survey, before involving any child in the survey, informed parental consent was obtained. This process ensured that parents or guardians were fully aware of the study's objectives, procedures, potential risks, benefits, and their child's role in the research. Parents were provided with detailed information and allowed to ask questions and provide their consent voluntarily.

Data was saved on the investigator's password-protected personal computer. The participants were also advised to ask questions or seek clarification if necessary, and they were given a connection to the investigator's e-mail account to correspond as required. All methods in this study will follow the Institutional Research Committee's ethical standards, the 1964 Helsinki Declaration, and its subsequent revisions or similar ethical standards.

### **Statistical Analysis**

The obtained data was analyzed using the Statistical Package for Social Sciences (SPSS), version 26. Descriptive statistics, including the mean, standard deviation, frequency, and percentage, were employed to summarize and explain the students' characteristics, perceived knowledge, attitudes, and behaviors toward environmental issues. To examine differences in knowledge, attitudes, and behaviors across various socio-demographic factors, a three-way ANOVA test was conducted. A p-value of less than 0.05 was considered statistically significant.

### **Results**

#### **Description of Study Sample**

A total of 500 questionnaire forms were distributed, of which 465 were completed and deemed valid for analysis, resulting in a response rate of 93%. The study

sample consists of 465 secondary school students from Al-Mafraq governorate. More than a half of the participants were males ( $n = 263$ , 56.6%) and were predominantly from the 11<sup>th</sup> grade ( $n = 271$ , 58.3%).

### Knowledge Level of Secondary School Students in Al-Mafraq Governorate about Environmental Issues

It is noted that there is an apparent difference between the arithmetic mean of the sample members' responses to the environmental knowledge test as a

whole ( $M=12.55$ ,  $SD=3.95$ ), and the educationally acceptable mean of ( $M=13.5$ ), which represents a level of appropriate environmental knowledge of 75% of 18. Concerning question # 7, which is related to measuring the level of students' knowledge of the benefit of ozone in the Earth's upper atmosphere, ranked first with a mean of ( $M=3.42$ ,  $SD=0.860$ ). Question # 5, which is related to measuring the level of students' knowledge of electricity in Jordan , ranked last, with a mean of ( $M=2.77$ ,  $SD=0.858$ ). See Table 1.

**Table 1. Environmental Knowledge (N=465)**

No.	Questions	M (SD)
1	The ozone in the Earth's upper atmosphere helps protect us from what?	3.42 (0.860)
2	From 1963 to 2002, the human population growth rate decreased from 2.2% to 1.3%; however, the total population increased by 91% during this time because the population base grew from year to year. What type of population growth does this describe?	3.40 (0.817)
3	What is the current approximate population of humans on the Earth?	3.40 (0.838)
4	What is the primary environmental benefit of wetland areas?	3.34 (0.802)
5	Studies by many scientists suggest that the amount of water on the Earth is...	3.33 (1.039)
6	Which one of the following materials is considered hazardous waste?	3.30 (0.855)
7	There are many different kinds of animals and plants, and they live in many different types of environments. What word is used to describe this idea?	3.29 (0.893)
8	What is the most common reason that animal species can become extinct so quickly?	3.26 (0.919)
9	What is the most common source of pollution of streams, rivers, and oceans?	3.15 (0.955)
10	What does the following phrase describe: "The maximum average number of organisms that an environment can support?"	3.09 (0.580)
11	Which one of the following is a renewable resource?	2.97 (0.835)
12	What winter-weather phenomenon is responsible for increased smog accumulation in metropolitan areas?	2.98 (0.986)
13	How do we currently dispose of most high-level nuclear waste produced in Jordan?	2.93 (0.912)
14	What is the largest source of carbon monoxide in Jordan?	2.92 (0.978)
15	At the present rate of consumption, the world's supply of fossil fuel oil will last approximately.	2.88 (1.010)
16	Where do most household trash and garbage eventually end up once they leave your home?	2.83 (0.903)
17	Which of the following best describes the world's forests?	2.82 (1.030)
18	Most electricity in Jordan is generated from what source of power?	2.77 (0.858)
	<b>Environmental knowledge average score</b>	<b>12.55 (3.95)</b>

Notes: M= Mean, SD=Standard Deviation.

### Secondary School Students' Attitudes toward Environmental Issues in Al-Mafraq Governorate

Table 2 revealed that the overall attitude towards the environment among the sample members is notably positive ( $M=3.84$ ,  $SD=0.784$ ). This result underscores a strong general awareness and favorable disposition towards environmental issues within the sample population. Item No. 9, which stated "I believe that the state has to establish laws that make recycling mandatory," occupied the first rank with a mean of

( $M=4.24$ ,  $SD=0.712$ ). Item No. 3, which stated "I believe that awareness of environmental problems by all members of society is important", came in the last rank with a mean of ( $M=3.15$ ,  $SD=0.991$ ). This result suggests that while respondents generally acknowledge the importance of environmental awareness, there is less agreement or perhaps less perceived urgency about this aspect compared to the need for government intervention through legislation.

**Table 2. Secondary school attitudes toward environmental issues**

No.	Items	Mean (SD)
9	I believe that the state has to establish laws that make recycling mandatory	4.24 (0.712)
6	It bothers me to convert agricultural lands into buildings and paved streets.	4.18 (0.880)
11	I believe that solving environmental problems requires a change in individuals' beliefs and values.	4.17 (0.714)
10	I believe that the resources of the environment are sufficient if we learn how to develop them.	4.14 (0.618)
19	I believe that protecting the environment is the responsibility of the state, not private individuals.	4.12 (0.578)
13	I am happy to ban the use of unleaded gasoline in car engines.	4.09 (0.677)
4	I encourage imposing fines on citizens who throw waste in inappropriate places	4.05 (0.624)
7	I believe that changing consumption patterns contributes to solving environmental problems	4.01 (0.775)
2	I believe that solving environmental problems is a collective responsibility	4.00 (0.775)
14	I think we are approaching the upper limit of the population that the Earth can support	3.97 (0.714)
18	I believe that environmental education is unnecessary in societies that do not suffer from environmental problems.	3.94 (1.022)
1	I encourage the existence of environmental education programs at all levels of education	3.91 (0.772)
20	I see that killing predators is a necessity to preserve pets.	3.86 (0.880)
8	I feel annoyed by people who cut down trees to use for heating in the winter	3.72 (0.925)
16	I believe that the intensive use of fertilizers is necessary to improve soil quality and increase production	3.63 (1.156)
15	I believe that farmers have the right to use water for agricultural purposes in an appropriate way.	3.57 (0.826)
5	I believe that the state must regulate land use to protect the environment	3.40 (0.868)
17	I think scientists are overestimating the environmental crises that are coming.	3.35 (1.012)
12	I support the use of herbicides to eliminate weeds.	3.33 (0.784)
3	I believe that awareness of environmental problems by all members of society is important.	3.15 (0.991)
	<b>The attitude average score</b>	<b>3.84 (0.784)</b>

### Secondary School Students' Behaviors Toward Environmental Issues in Al-Mafraq Governorate

It is noted from Table 3 that the mean of the responses of the sample members on the scale of behaviors toward environmental issues as a whole is ( $M=3.62$ ,  $SD=0.908$ ) with a moderate degree. This suggests that, on average, the participants show a reasonable degree of engagement in activities that support environmental conservation, although there is certainly room for improvement. Item No. 7, which stated "I refrain from engaging in activities that harm plants and animals," occupied the first rank with a mean of ( $M=4.30$ ,  $SD=0.718$ ). This high score reflects a strong commitment among survey respondents to avoiding behavior harmful to wildlife and plants. Item No. 17, which stated "I prefer to use canned foods because they are easier and less expensive than

preparing food at home", came in the last rank with a mean of ( $M=2.87$ ,  $SD=0.990$ ).

### Impact of Socio-demographic Variables on the Knowledge, Attitudes, and Behaviors of Secondary School Students Regarding Environmental Issues

It is noted from Table 4 that there are apparent differences between the arithmetic averages of the responses, resulting from the different levels of the study variables sex and academic level. As for the sex variable, the arithmetic mean for males was ( $M=3.95$ ,  $SD=0.701$ ) and for females ( $M=3.87$ ,  $SD=0.866$ ). Regarding the educational level variable, the mean for the 11<sup>th</sup> grade was ( $M=3.91$ ,  $SD=0.799$ ), and for the 12<sup>th</sup> grade was ( $M=4.17$ ,  $SD=0.389$ ). Three-way ANOVA was conducted according to the study variables: sex and academic level.

**Table 3. Secondary school students' behaviors toward environmental issues**

No.	Item	M (SD)
7	I refrain from engaging in activities that harm plants and animals	4.30 (0.718)
5	I refrain from throwing garbage out of the car windows	4.21(0.712)
1	I make sure to leave entertainment places clean when you visit them.	4.12 (0.622)
6	I turn off lights and electrical appliances immediately after using them	3.97 (0.980)
8	I make sure to use public transportation (buses)	3.93 (1.113)
9	I encourage the establishment of private waste recycling factories	3.85 (1.021)
10	I stay away from wasteful consumption habits	3.84 (0.839)
3	I maintain the aesthetic appearance of public places	3.75 (0.909)
12	I participate in making people aware not to cut trees to use them as fuel	3.75 (0.906)
11	When I buy a new electrical device, I make sure that its energy consumption is low	3.67 (0.801)
18	I commit to throwing waste in designated places.	3.55 (0.934)
19	I commit to applying sound health rules in my life.	3.51 (0.965)
2	I make sure not to harm people when I use my cell phone.	3.43 (0.989)
4	I use garbage bags when I go on trips	3.40 (1.092)
15	I make sure to use the recalled bottles when you want to drink juices and soft drinks	3.38 (0.916)
13	I would like to participate in planting trees on Arbor Day	3.35 (0.967)
16	I participate through social media in educating people about environmental issues	3.28 (.0925)
20	I keep water use moderate	3.22 (0.889)
14	I make sure to follow television programs that deal with the environment and its problems	3.07 (0.889)
17	I prefer to use canned foods because they are easier and less expensive than preparing food in home	2.87 (0.990)
	<b>The behavior average score</b>	<b>3.62 (0.908)</b>

A three-way ANOVA was conducted to examine the effect of sex and educational level on students' environmental knowledge, attitudes, and behaviors (Table 4). Results showed statistically significant differences in environmental behaviors due to sex ( $F = 8.33, p < 0.001$ ) and educational level ( $F = 5.72, p =$

0.017). Similarly, a significant difference was observed in environmental attitudes due to sex ( $F = 6.99, p < 0.001$ ) and educational level ( $F = 6.11, p = 0.014$ ). No significant differences were found in knowledge scores across the groups ( $p > 0.05$ ).

**Table 4. Three-way analyses of variance in knowledge, attitudes, and behaviors regarding environmental issues**

Variable	Category	M (SD) Behavior	N (%)	Knowledge	Attitudes	Behaviors
				<i>F</i> (Mean Square), <i>p</i> -value	<i>F</i> (Mean Square), <i>p</i> -value	<i>F</i> (Mean Square), <i>p</i> -value
Sex	Male	3.95 (0.69)	263 (56.6)	0.79 (0.472), $p = 0.000^*$	6.99 (8.43), $p = 0.000^*$	8.33 (6.44), $p < 0.001^*$
	Female	3.87 (0.87)	202 (43.4)	—	—	—
Educational Level	11 <sup>th</sup>	3.91 (0.78)	271 (58.3)	1.02 (0.608), $p = 0.313$	6.11 (7.36), $p = 0.014^*$	5.72 (4.42), $p = 0.017^*$
	12 <sup>th</sup>	4.17 (0.39)	194 (41.7)	—	—	—

M = Mean; SD = Standard Deviation;  $p < 0.05$  indicates statistical significance. Behavioral mean scores (M (SD)) are presented in the third column.

## Discussion

This study highlights the overall knowledge, attitudes, and behaviors of secondary school students regarding environmental issues. The findings show that there appears to be a gap between the educationally acceptable mean, which indicates a level of proper environmental knowledge, and the arithmetic mean of

the sample members' responses to the environmental knowledge exam as a whole. There is an urgent need for better environmental education, as evidenced by the difference between the mean score of the sample members and the educationally acceptable mean. When our findings are compared to those of other studies, it is clear that incorporating experiential learning activities,

encouraging a connection to the natural world, and addressing curricular and socio-economic gaps are crucial steps in improving students' environmental knowledge and encouraging sustainable behaviors. For instance, a study performed by Anggraini and Karyanto (2018) indicated potential deficiencies in the curriculum and teaching methods that need to be addressed. Integrating essential environmental competencies and adopting more active and contextual learning approaches could improve students' environmental knowledge. The observed differences may be attributed to the lack of systematically integrated environmental competencies within the school curriculum, as well as deficiencies in active and contextual teaching and learning processes that would foster deeper engagement with environmental issues. These findings are consistent with Abilo and Linaugo (2019), who reported that students generally demonstrated an average level of environmental knowledge and sensitivity.

While environmental knowledge is essential, fostering a connection to nature might be even more critical in promoting ecological behavior (Otto & Pensini, 2017). The lower average score in the current study suggests that the current environmental education methods might not be effectively enhancing students' environmental knowledge or their connectedness to nature, as highlighted by Otto and Pensini (2017), who pointed out the impact of nature-based environmental education on enhancing ecological behaviors, mediated by environmental knowledge and connectedness to nature.

Besides, a study conducted by Liu et al. (2020) highlighted that general environmental knowledge significantly influences environmental attitudes, thereby affecting behavioral intentions and pro-environmental behaviors. Their study underscored the mediating role of environmental attitudes in translating knowledge into behaviors. The high mean score in the current study supports Liu et al.'s findings, suggesting that the participants' positive attitudes may be rooted in their environmental knowledge.

Regarding secondary school students' attitudes about environmental issues, the current study revealed notably positive attitudes among students. This finding is consistent with several studies that emphasized the importance of environmental education and its impact on students' attitudes. For example, Sultana et al. (2017) performed a study that found high levels of

environmental knowledge and positive attitudes among secondary-level students in Tangail district, Bangladesh. The high mean score suggests that the sample members have been influenced by similar factors, such as family upbringing, teacher influence, and media exposure. The similarity in results across different studies and contexts highlights the pervasive positive attitudes towards the environment among students, irrespective of sex or urban-rural divide. The high mean score in the results aligns with Ponmozhi and Ranjitha (2017), suggesting that a majority of students exhibit strong pro-environmental attitudes. The consistency across various studies indicates that environmental attitudes among students are generally high, which could be influenced by similar educational and contextual factors.

Factors such as family upbringing, teacher influence, media exposure, and contextual learning experiences contribute significantly to shaping these attitudes. The consistency of positive attitudes across different studies and demographic groups underscores the universal nature of environmental attitudes among students and highlights the potential for fostering pro-environmental behaviors through continued and holistic environmental education initiatives.

Concerning behavioral context toward environmental issues, the results showed that the arithmetic mean of the responses of the sample members on the scale of behaviors toward environmental issues as a whole is 3.62, with a moderate degree. The moderate degree of pro-environmental behaviors observed in our study suggests that while students have generally positive attitudes towards the environment, various barriers prevent them from engaging more fully in pro-environmental actions, such as a lack of awareness and education, economic constraints, social and cultural influences, and convenience and habits. This aligns with the findings of Shafiei and Maleksaeidi (2020) and Díaz et al. (2020), who highlighted the importance of self-efficacy, perceived costs and rewards, and comprehensive educational strategies. To foster higher levels of pro-environmental behavior, it is essential to address these barriers through targeted interventions that empower students, enhance their self-efficacy, and make pro-environmental actions more rewarding and less costly.

The results of the current study showed that there is no significant difference between the arithmetic means for environmental knowledge, due to sex, or academic



level. The results align with Abilo and Linaugo (2019), who showed that students had an average level of environmental knowledge with significant differences based on academic strands, but not due to sex. The results of the current study suggest that there might be similar variations in environmental knowledge based on academic strands or other demographic factors. The lack of significant gender differences in both studies indicates a broad-based positive attitude towards the environment across different demographics. Understanding these variations could help tailor educational interventions to address specific gaps and enhance overall environmental knowledge.

In addition, the results showed that there is a significant difference with statistical significance between the arithmetic means for environmental attitudes, due to the sex variable in favor of males compared to females, and due to the academic level variable in favor of the 12<sup>th</sup>-grade compared to the 11<sup>th</sup>-grade students. The results were inconsistent with Sultana et al. (2017), who revealed that no statistically significant sex differences were observed.

Also, the results revealed that there is a significant difference between the arithmetic means for environmental behaviors, due to the sex variable in favor of males compared to females, and due to the academic level variable in favor of the 12<sup>th</sup>- grade compared to the 11<sup>th</sup>- grade students. In the context of the study by Shafiei and Maleksaeidi (2020), which utilized the Protection Motivation Theory (PMT) to explore pro-environmental behaviors, sex differences in pro-environmental behaviors may be explained by variations in self-efficacy and perceived response efficacy between males and females. PMT posits that individuals are more likely to engage in protective behaviors when they believe that they are capable of effectively carrying out these behaviors (self-efficacy) and when they perceive that their actions will mitigate the threat (response efficacy).

The difference in environmental behaviors between 11<sup>th</sup> and 12<sup>th</sup> graders can also be contextualized within the framework provided by Díaz et al. (2020). Their study highlighted the significant role of environmental knowledge, attitudes, self-efficacy, and trust in environmental information sources in promoting pro-environmental behaviors. As students' progress academically, their exposure to environmental education and related activities typically increases,

enhancing their knowledge and shaping more positive attitudes toward environmental issues. 12<sup>th</sup>-grade students, having had more extensive educational experiences and likely more opportunities for engagement in environmental projects, would have developed a stronger sense of efficacy and responsibility towards environmental behaviors compared to their 11<sup>th</sup>-grade counterparts. This increased exposure and engagement can lead to more pronounced pro-environmental behaviors as students near the end of their secondary education and prepare for future roles as responsible citizens.

Despite modest behavioral consequences, the sample's positive environmental sentiments support the idea that attitudes by themselves are insufficient to predict conduct. This highlights the necessity for thorough theoretical models and supports current theories that offer multi-faceted models where attitudes, self-efficacy, and perceived barriers all work together to influence behaviors.

The results of the study suggest that the relationship between environmental information and actual behavior is mediated by behavioral goals. This is consistent with theories that emphasize the need to focus intentions in environmental education and interventions and contend that knowledge alone does not result in behavior change without the mediation of intentions.

### **Strengths and Limitations**

This study exhibits multiple features that enhance its strength and significance in comprehending the attitudes and knowledge of Jordanian secondary school students regarding environmental issues. First, large sample sizes improve the findings' generalizability and dependability. The diversity of participants further strengthens the results, making them more reflective of the broader student population. Additionally, applying a well-established framework, such as the Protection Motivation Theory, provides a robust theoretical basis for interpreting the findings. This foundation ensures consistency with previous research and enriches scholarly discussions on pro-environmental actions. Moreover, by incorporating multiple sociodemographic variables, the study adopts a comprehensive approach to data collection. Examining both environmental attitudes and behaviors offers a nuanced understanding of the factors influencing pro-environmental engagement and highlights potential gaps between knowledge, attitudes,

and behaviors. The conclusions also carry practical value, emphasizing the role of self-efficacy, perceived costs, and rewards in shaping environmental education strategies and policies.

Despite these strengths, the study has several limitations. The cross-sectional design restricts the ability to establish causal relationships, as only associations between variables can be inferred. In addition, reliance on self-reported measures introduces potential biases, such as social desirability bias, which may result in participants overstating their pro-environmental behaviors or attitudes. Another limitation is that the study was conducted in a single governorate utilizing the convenience sampling method, which may limit the generalizability of the findings to students in other regions of Jordan. Finally, the use of quantitative methods alone may not fully capture the depth of students' perceptions and lived experiences, suggesting that future studies could benefit from incorporating qualitative approaches for richer insights.

### **Implications for Nursing**

The findings of this study highlight the importance of integrating environmental health education into nursing practice, education, and community outreach. Nurses, as key advocates for public health, can play a critical role in promoting environmental awareness among students, families, and communities. By incorporating evidence-based interventions and school-based educational programs, nurses can foster positive attitudes and sustainable behaviors that protect both human and environmental health.

In the context of Al-Mafraq Governorate, where environmental challenges may directly influence community well-being, school health nurses can collaborate with educators and policymakers to design health promotion initiatives targeting youth. These initiatives can enhance students' understanding of the links between environmental factors and health outcomes, empowering them to make informed decisions and adopt eco-friendly practices. By addressing students' knowledge, attitudes, and behaviors, nurses can help build resilient communities, reduce health risks associated with environmental degradation, and strengthen the role of nursing in advancing environmental and public health priorities.

Future research should aim to include a more representative sample that encompasses secondary school students from all governorates in Jordan. Expanding the study population beyond a single governorate would enhance the generalizability of the findings and allow for meaningful comparisons across different regions. Such an approach would also capture the diversity of environmental challenges and educational contexts across the country, providing stronger evidence to guide national-level policies and environmental education initiatives.

### **Conclusion**

The study explores the factors influencing environmental attitudes among secondary school students, emphasizing the need for comprehensive environmental education programs that incorporate experiential learning, address perceived costs and rewards, and build self-efficacy. It highlights the complex interplay between knowledge, attitudes, and behaviors in shaping pro-environmental actions.

The study reveals significant variations in environmental attitudes and behaviors across sociodemographic groups, highlighting the need for tailored educational and policy approaches. Empowering individuals with knowledge and confidence in pro-environmental behaviors is crucial for a more responsible society. Future research should address limitations through longitudinal designs and improved measurement accuracy.

### **Author Contributions**

Study Design: **NAH, AMB**. Data Collection: **AFA, KAS, ZAL**. Data Analysis: **MAL, SBH, OK, AAL**. Study Supervision: **MAL, ASA, DHM**. Manuscript Writing: **SBH, ZAL, KAM**. Critical Revision for Important: **NAH, AMB, AFA, KAS, ZAL, MAL, SBH, OK, AAL, ASA, DHM, KAM**.

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### **Ethical Considerations**

Ethical approval was obtained from IRB of Al-al Bayt University, Al-Mafraq, Jordan.

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