

Sustainable Water Use Practices: Behavior and Knowledge Awareness of Applied Science Private University-Students

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Abstract: - Jordan is facing a significant challenge with its water resources. Conserving water has become an urgent need. This study aims to provide new evidence on the behavior and knowledge awareness of water conservation for Applied Science Private University ASU students and how it affects water-saving behaviors. This study was applied to a stratified random sample from the ASU that included 134 students. A special questionnaire was distributed to the study sample, including the various study variables: gender, age, place of residence, and income. The questionnaire also included questions about behavior and knowledge awareness toward water conservation conviction about the reality of the water scarcity problem. Students showed good knowledge of sustainable Jordanian water sources and realized the limitations of these resources. ASU students practice water-saving behaviors in households, gardening, and swimming pools. They also adopt tools and practices to save water in their communities. This was evidenced by their concern about purchasing water-saving tools and interacting with posts related to water conservation on various social media platforms. Results showed that ASU students are concerned about water-saving education. The results revealed no significant differences in behavior and knowledge awareness towards water conservation attributed to gender, age, and level of study for father and mother, faculty, governorates, and average family income. The implementation of water waste reduction measures is expected to save about 10 million cubic meters of water, thereby improving water services for the people of Jordan, and contributing to strengthening resilience to climate change. Moreover, the project will contribute to reducing electricity consumption.

Key-Words: - Water conservation, Sustainable water, Knowledge awareness, Behavior Awareness, Applied science private university, Water-waste reduction.

Received: August 21, 2023. Revised: May 27, 2024. Accepted: June 29, 2024. Published: August 6, 2024.

1 Introduction

Water is one of the most important natural resources for the health and well-being of all humankind, [1]. Water, especially potable water, is currently facing a

main problem worldwide. On one hand, there is increased pressure due to water scarcity in general, compared to the high demand, [2]. On the other hand, there is a variation in water distribution on

Earth's surface, [3]. The amount of water that falls on the surface of the Earth varies from one country to another and from one region to another, [4]. The rapid growth of the population and the improvement of the individual's standard of living have led to the expansion of cities horizontally and vertically, as well as the flourishing of industry and agriculture, [5], [6].

Water security is becoming one of the greatest issues of concern in many countries like Egypt, Morocco, Saudi Arabia, and Malaysia, [7], [8] and [9].

The multiple uses of water, pollution, and leakages in public and private networks contribute to the complexity of the problem [1], [2], [10]. Wasting water through improper use creates significant pressure. Water depletion and contamination are among the main environmental problems faced worldwide in the 21st century, [11]. Jordan, for example, faces increasing pressure on its water resources with its booming economy and growing population. The impact of accelerating climate change also compounds these pressures. As a result, there is a growing realization of the urgent need to conserve water, [12]. Water resources in Jordan are critically limited, and the problem of water scarcity and quality represents a challenge for decision-makers. Water scarcity is due to fluctuations in rainfall, increasing population growth, the extension of urbanization, the effects of global warming, and the low level of water awareness, [13].

Water awareness is crucial for effective management to be realized, [14]. The water crisis is not an unusual occurrence. The water crisis arises from a lack of awareness and irresponsible behavior toward water use, which makes one think that he is the only owner of water, [15]. These behaviors have devastating effects, and man has realized that he needs to change his actions to save his aquatic environment and himself, [16].

This study aims to provide new evidence on the behavior and knowledge awareness of water conservation for ASU students and how it affects water-saving. This study seeks to achieve differences in the level of behavior and knowledge about water awareness among students according to gender, age, level of study for father and mother, faculty, governorates, and average family income. This study reflects the extent to which Jordanian youth are aware of water scarcity in Jordan.

2 Methods

The results were compared according to demographic characteristics using an independent sample t-test, one-way analysis of variance [ANOVA], and Chi-square test. The Pearson correlation coefficient was also calculated between the questionnaire axes. Data analysis was performed using SPSS, version 22. The level of statistical significance was set at $p < 0.05$ [two-sided]. The level of statistical significance in calculating the correlation coefficient was set at $p < 0.01$ [two-sided].

3 Results

3.1 Demographic Profile

The study sample consisted of 134 students from the Applied Science Private University. The percentage of students from humanities colleges was 19.4%, and 80.6% from science colleges. The percentage of female students was 59%, the percentage of male students was 41%, and most of them were from the age group older than 20 years, at a rate of 66.4%. The percentage of students who live in the capital, Amman, was 94.8%, and the percentage of students whose average family income exceeded 500 dinars was 80.6%. Nearly half of the parents of the sample students had a bachelor's degree, and one-third of the parents of the sample students had a high school education. Table 1 shows the demographic profile of respondents.

3.2 Knowledge of Water Supply and Conservation

Table 2 shows the students' responses regarding the presence of sufficient information about methods of rationalizing water consumption, belief in water scarcity, and prior knowledge of the source of water used daily were 77.4%, 87.2%, and 60.2%, respectively. These percentages indicate good knowledge among our university students in this part. There are no statistically significant differences regarding the demographic variables, as the significance values are more than 0.05 based on the Chi-square test.

Table 1. Respondent’s demographic profile

Construct		Frequency	Percent
Gender	Male	55	41.0
	Female	79	59.0
Age	Less Than 20	45	33.6
	Greater Than or Equal 20	89	66.4
Faculty	Humanities	26	19.4
	Scientific	108	80.6
Governorates	North	2	1.5
	Middle	127	94.8
	South	5	3.7
Average family income	Less Than 500	26	19.4
	500-1000	64	47.8
	Greater Than 1000	44	32.8
Level of study for father	Secondary	41	30.6
	Bachelor's	71	53.0
	Postgraduate Studies, Master’s, or Doctorate	22	16.4
Level of study for mother	Secondary	53	39.6
	Bachelor's	69	51.5
	Postgraduate Studies, Master’s, or Doctorate	12	9.0

Source: Created by the researchers

Table 2. Knowledge of water supply and conservation

Statements of knowledge about water supply and conservation	percent
Do you know the source of the water you consume?	77.4%
Do you think there is a shortage of water resources?	87.2%
Do you think you have sufficient information about methods of conserving water consumption?	60.2%

Source: Created by the researchers

3.2.1 Reliability Coefficient

The reliability coefficient was calculated on a sample of 32 students. The reliability coefficient [Cronbach's Alpha] of “behavior awareness on a personal level” is 0.774, and the reliability coefficient [Cronbach's Alpha] of “behavior awareness on a community level” is 0.782. The Cronbach alpha coefficient for all statements in this questionnaire is 0.864, equivalent to a high value.

3.3 Behavior Awareness on a Personal Level

A study was conducted to investigate students' awareness of daily water usage and their approach to it. The study included eleven questions, and the responses were recorded on a three-point Likert scale where agree was given 3 points, neutral was given 2 points, and disagree was assigned 1 point. Table 3 also displays the statements of this section with the mean and standard deviation.

According to the results, the statements illustrating our students' behavior toward conserving water consumption were found to be highly reliable, with Cronbach's alpha coefficient falling within an

acceptable range.

3.4 Behavior Awareness on a Community Level

The results show that the statements describing our students' behavior awareness on the community level are highly reliable, with Cronbach’s alpha coefficient within an acceptable range. This suggests that the statements in this section are accurate. This part consists of questions about students' behavior awareness on a community level towards daily practices related to water conservation. These items follow a three-point Likert scale [agree = 3, neutral = 2, disagree = 1].

Table 4 also shows the expressions for this part with the arithmetic mean and standard deviation. According to the results, our students have a good understanding of ways to conserve water, are interested in education about water conservation, and have taken the initiative to raise awareness among their peers. There is a correlation between behavior awareness on personal and community levels with $r=0.619$, $p=0.000 < 0.01$.

Table 3. Behavior awareness on a personal level

No.	Behavior awareness on a personal level	Mean	Std. Deviation	Attitude
1-	Use water for short periods frequently instead of running for periods	2.80 60	.43317	Agree
2-	Water the plants early in the morning, and avoid watering in the afternoon and afternoon due to the high level of evaporated water at these times	2.78 36	.51096	Agree
3-	Maintaining swimming pools periodically and ensuring that they are free of leaks	2.76 87	.51902	Agree
4-	Replace old toilets with low-flow toilets that are distinguished by their quality and <u>water-saving</u>	2.71 64	.57008	Agree
5-	Avoid irrigation at sunset as it stimulates the growth of plant fungi that consume irrigation water	2.69 40	.56499	Agree
6-	Use smart irrigation systems that turn off on rainy days	2.68 66	.59342	Agree
7-	Use the dishwasher only when full	2.64 93	.62837	Agree
8-	Avoid using running water to defrost foods	2.50 75	.67996	Agree
9-	Avoid using running water to brush teeth and shave	2.45 52	.76203	Agree
10-	Use the washing machine only when it is full	2.45 52	.71098	Agree
11-	Reducing bath time	2.23 13	.81263	Neutral
Alpha Cronbach = 0.774		2.61 40	.35190	Agree

Source: Created by the researchers

Table 4. Behavior awareness on the community level

No	Behavior awareness on a community level	Mean	Std. Deviation	Attitude
1-	When a water leak occurs in general, do you immediately repair it?	2.8582	.39074	Agree
2-	Do you pay attention to water leaks inside the house [faucets and toilets]?	2.7910	.47612	Agree
3-	Are you trying to conserve water while washing your face and brushing your teeth?	2.5597	.59460	Agree
4-	When purchasing equipment that consumes water [such as a washing machine, for example], do you think about its level of water consumption before purchasing it?	2.5224	.71205	Agree
5-	Are you interested in seeing posts related to water conservation on various social media platforms?	2.5149	.70161	Agree
6-	Are you ready to participate in awareness initiatives regarding the conservation of water consumption?	2.5075	.72284	Agree
7-	Are you interested in learning new information about the water situation and mechanisms for conservation of consumption?	2.3806	.74384	Agree
8-	Do you motivate your colleagues with the need to conserve water consumption?	2.2985	.77586	Neutral
9-	Are you taking any measures to reuse water?	2.1045	.82506	Neutral
Alpha Cronbach = 0.782		2.5041	.40204	Agree

Source: Created by the researchers

3.5 An Assessment of the Factors that Impact Students' Behavior Awareness on Personal and Community Levels:

Other variables were tested using analysis of variance [ANOVA]. Gender, age, and faculty were tested using an independent samples t-test.

3.5.1 Gender and Age

To assess whether there were any gender and age-related differences in the research constructs' levels, we conducted an independent samples t-test. Table 5 shows the relationship between behavior awareness on personal and community levels toward water conservation according to gender and age.

There are no significant differences between behavior awareness on personal and community levels based on gender and age, according to Table 6.

Table 5. The relationship between behavior awareness on personal and community levels toward water conservation according to gender and age

Variable		Gender		Age	
		Male	Female	Less than 20	Greater than or equal to 20
Behavior awareness on a personal level	N	55	79	45	89
	Mean	2.5769	2.6398	2.5475	2.6476
	Std. Deviation	.35736	.34799	.37155	.33872
Behavior awareness on a community level	N	55	79	45	89
	Mean	2.4667	.44207	2.4148	.45530
	Std. Deviation	2.5302	.37234	2.5493	.36674

Source: Created by the researchers

Table 6. Independent samples T-tests based on gender and age

Independent samples T-tests: based on gender							
Variable	t	df	Sig. [2-tailed]	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Behavior awareness on a personal level	-1.019	132	.31	-.06296	.06179	-.18518	0.05927
Behavior awareness on a community level	-0.9	132	.37	-0.06357	.07065	-.20333	0.07619
Independent samples T tests: based on age							
Variable	t	Df	Sig. [2-tailed]	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
Behavior awareness on a personal level	-1.564	132	.12	-0.10012	0.06402	-.022677	0.02652
Behavior awareness on a community level	-1.845	132	.067	-0.1345	0.07288	-0.27867	0.00967

Source: Created by the researchers

Table 7. The Relationship between behavior awareness on personal and community levels toward water conservation based on average family income

Variable	Category	Mean	SD	N	ANOVA
Behavior awareness on a personal level	less than 500	2.5909	.40350	26	F 1.639 Sig. 0.198
	500-1000	2.6690	.30706	64	
	greater than 1000	2.5475	.37533	44	
Behavior awareness on a community level	less than 500	2.5000	.40399	26	F 2.654 Sig. 0.074
	500-1000	2.5781	.36406	64	
	greater than 1000	2.3990	.43749	44	

Source: Created by the researchers

Table 8. The Relationship between behavior awareness on personal and community levels toward water conservation, according to the governorates

Variable	Governorates	Mean	SD	N	ANOVA
Behavior awareness on a personal level	North	2.06364	0.51426	2	F 0.025 Sig. 0.975
	Middle	2.6149	0.35496	127	
	South	2.5818	0.28459	5	
Behavior awareness on a community level	North	2.6111	0.54997	2	F 1.296 Sig. 0.277
	Middle	2.4917	0.40245	127	
	South	2.7778	0.30429	5	

Source: Created by the researchers

3.5.2 Average Family Income

An analysis of variance was conducted to investigate the influence of average family income on awareness of behavior at personal and community levels regarding water conservation. There are no significant differences between behavior awareness on personal and community levels towards water conservation, regardless of average family income, according to Table 7.

3.5.3 Governorates

An analysis of variance was conducted to examine the effect of governorates on the study. Table 8 shows no significant differences in behavior awareness on personal and community levels towards water conservation attributed to governorates.

4 Discussion

In some studies, participants believed that the most dominant component in water conservation behavior was the awareness of water issues. Our study found ASU students are aware of water supply and conservation in Jordan. This was also documented in a study conducted on students at Jordan University, [9]. In a study conducted on MSA students, the university has a low impact on awareness, [4]. To create policies that are efficient in conserving water, it is necessary to undertake a thorough and thoughtful approach. It is essential to understand people's awareness and behavior towards water conservation. Our students showed good behavior awareness on personal and community levels. Comparing our results with other studies, female participants had a significantly higher positive attitude towards water conservation behavior than male participants according to [17]. In our study, there was no statistical significance between male and female participants, [17]. Our results revealed positive

knowledge and behavior of ASU students similar to students in Metro Manila, [18]. In a previous study at Al-Balqa University, researchers found that students of scientific faculties were more aware than those in humanities faculties, [19]. Our results didn't show any significant differences.

5 Conclusion

This study succeeded in identifying the level of awareness of students at the University of Applied Sciences about the importance of water resources and their behavior to conserve water. Part B, which concerns behavioral awareness at the personal level has the highest average value of 2.6140 [standard deviation 0.35190]. The mean value of part C related to behavioral awareness at the community level showed a high value of 2.5041 [standard deviation of .40204]. There is a positive relationship between the level of awareness and practices implemented to support the conservation of water resources.

Acknowledgements:

The researchers acknowledge Applied Science Private University, Amman, Jordan, for the full financial support granted to this research article.

Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During the preparation of this work, the authors used Grammarly Ink TOOL/SERVICE to correct grammar. After using this tool/service, the authors reviewed and edited the content as needed and takes full responsibility for the content of the publication.

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Sources of Funding for Research Presented in a Scientific Article or Scientific Article Itself:

Applied Science private university-Am man-Jordan.

Conflict of Interest

No conflict of interest

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