THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING

VOL. 6 NO. 1 - APRIL 2025

E-ISSN: 2722-0842 | P-ISSN: 2721-8309

Available online at
http://journal.pusbindiklatren.bappenas.go.id/

Ministry of National Development Planning/Bappenas Republic of Indonesia

Research Paper

Water Quality Assessment at Consumption Points in High School Campuses in the Province of Antique, Philippines

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Abstract

This research presents a comprehensive citizen-scientific water quality assessment and evaluation, focusing on water quality at the points of water consumption in public and private high school campuses in the Province of Antique, Philippines. The water quality assessment showed that Escherichia coli was detected (0.0-2.0 CFU/mL) in several samples from tap water exclusively used for handwashing by public school students, indicating potential contamination sources such as outdated treatment facilities. Three Drink type water samples from the public high school and one from the private high school also recorded coliform with 2-10 CFU/mL. To improve the WASH environment of the provincial school campuses, old facilities, such as filters and pipes, need to be checked and renovated to avoid contamination caused by penetration and leakage. The citizen scientific methodology facilitated the collection of water quality information and enhanced discussions with stakeholders, generating practical and affordable solutions based on the findings.

Keywords: Citizen science; WASH; School campus; Tap water; Drinking water.

ARTICLE INFO
Received: November 01, 2024
Received in revised form: February 12, 2025
Accepted: April 30, 2025

doi: 10.46456/jisdep.v6i1.674

THE JOURNAL OF INDONESIA SUSTAINABLE DEVELOPMENT PLANNING
Published by Centre for Planners' Development, Education, and Training (Pusbindiklatren), Ministry of National Development Planning/National Development Planning Agency (Bappenas), Republic of Indonesia

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Supported by Indonesian Development Planners Association (PPPI)

Please cite this article in APA Style as:
Yazawa, T., Rubite, K. J. G., & Macabata-Rubite, P. E. (2025). Water Quality Assessment at Consumption Points in High School Campuses in the Province of Antique, Philippines. *The Journal of Indonesia Sustainable Development Planning, Vol 6(1),* 31-43. https://doi.org/10.46456/jisdep.v6i1.674

1. Introduction

The water, sanitation, and hygiene (WASH) environment in schools is strongly related to students' learning environment and overall motivation. It has been reported that the hygienic environment in schools affects students' school attendance, academic success, dropout, and illnesses, particularly in developing countries (Jasper et al., 2012; McMichael, 2019; Ahmed et al., 2022; Vijayalakshmi et al., 2023). The provision (or absence) of a WASH environment containing related hygiene materials, such as soap, towels, and toilet paper, in schools has been investigated by previous studies (Jasper et al., 2012; Khan et al., 2023). It was revealed that increased access to adequate sanitation facilities in schools – such as instant access to safe drinking water and hygienic toilets – could decrease diarrheal, gastrointestinal, and respiratory illnesses (Jasper et al., 2012; Freeman et al., 2014; Sardar and Behera, 2024). In this context, the need for improving WASH conditions in school settings has recently been gaining attention particularly in Asia (McMichael, 2019; Khan et al., 2023).

On one hand, students and children are easily exposed to pathogens and the most vulnerable to illnesses. On the other hand, with appropriate capacity building, these groups can become agents of the WASH behaviour change within their communities (Greene et al., 2012; Yazawa et al., 2024a). The practice of handwashing with soap, for example, is a simple remedy for effectively reducing the illnesses caused by pathogens (Freeman et al., 2014; Vijayalakshmi et al., 2023; Sardar and Behera, 2024). However, the lack of soap or handwashing materials at schools, particularly in developing countries, has been cited as a major challenge, with some studies reporting as few as 2–7% of schools providing soap for children (Greene et al., 2012). The provision of handwashing materials is occasionally a challenge in schools because of financial and/or motivational restrictions (Greene et al., 2012).

Water quality information can be viewed as a fundamental aspect of WASH, directly impacting sanitation and hygiene practices. The groundwork for understanding broader WASH issues could be provided by focusing on water quality. In the Philippines, the WASH conditions and practices are of the utmost concern at both the community and school levels. Pfadenhauer and Rehfuess (2015) investigated the impacts of WASH practices on childhood diarrhea in Northern Mindanao, Philippines, using interview data. The supply of soap and cleansing materials, along with the regular cleaning and maintenance of facilities, was concluded as being a necessary WASH intervention. It was reported that students in schools with the WASH training program reported higher rates of handwashing practice compared to schools without the program in the Philippines (Vally et al., 2019; Jetha et al., 2021; Sangalang et al., 2022). The WASH intervention conducted by Duijster et al. (2022) was based on training in the operation and maintenance of toilets in public schools in Roxas City and Passi City in the Philippines. A four-month observation showed a certain improvement in the usability and cleanliness of the toilets. Previous studies had focused on the investigation of the provision or absence of the facilities and materials in schools, students' experiences of illnesses, and current/possible WASH practices. The analyses conducted by most of the previous studies used social and qualitative data obtained from questionnaires, interviews, and the direct observation of students. However, the WASH conditions from the perspective of the quantitative data were rarely studied. For example, the investigation conducted by Greene et al. (2012) targeted *Escherichia coli* (*E. coli*) existing on pupils' hands in Kenya. Sugita (2022) introduced some examples of Japanese elementary schools where licensed school health teachers and school pharmacists regularly monitored the water quality of tap water in schools. Their results contributed to suggestions for improving the WASH environment, particularly by increasing the number of school toilets and implementing rigorous water management policies.

An investigation into the WASH conditions, particularly focusing on the quality of water used by students at points of consumption, has not yet been conducted in schools within a province in the Philippines, where most provinces are rural and still developing WASH facilities. Challenges in constructing these facilities and assessing their conditions persist due to limited research laboratories, environmental data, and budget constraints (Yazawa & Honda, 2021; Yazawa et al., 2024a; Yazawa et al., 2024b). To address this gap, this research conducted the first comprehensive citizen scientific water quality assessment in public and private high school campuses in the Province of Antique, Philippines, involving local citizens and teachers in the collection and recording of water samples. The analysis of water quality was evaluated against the Philippine National Standards for Drinking Water of 2017 (Department of Health, 2017). Public schools, which are government-owned and tuition-free, face challenges such as overpopulation and outdated facilities, while private schools, funded through tuition fees and private sectors, generally have more updated facilities but charge higher fees (Yamauchi, 2005; Bernardo et al., 2015; Bernardo et al., 2022). In terms of water quality at the points of consumption, therefore, it would be expected that private high schools will have better conditions. This research hypothesized that disparities between these school environments could impact students' learning experiences, including WASH conditions, thereby providing new insights into the management of WASH environments in both public and private schools in the Philippines from the perspective of water quality.

2. Methods

2.1 Study sites

This research was conducted in collaboration with one public high school and one private high school in the Province of Antique, the Philippines. The Province of Antique is situated in the western region of Panay Island, Western Visayas. The population of the province is more than 600,000, based on the 2020 census (Philippine Statistics Authority, 2021). The high schools were selected because of their accessibility, teachers' willingness to support the aims of the study, and representation of the local student population. The selected two schools are located in the same subdistrict. Both high schools actively supported the research by facilitating the collection of water samples from various sources on their campuses. Both were founded more than 50 years ago. The total enrollments of the public and private high schools were approximately 1,700 and 600, respectively, including children from grades 6 to 12, i.e. junior and senior high school students.

2.2 Citizen scientific water sample collection

Water samples were collected at both high school campuses from February 12 to 15 and from March 21 to 23, 2024. Water sampling was conducted as a collaborative activity involving local citizens and schoolteachers. A representative local citizen and a teacher participated in the water sample collection and checked the basic water quality parameters such as water temperature, pH, electrical conductivity (EC), and total dissolved solids (TDS). Additionally, they learned how to take field notes and summarize the data after the water sampling in each school. During the water sampling stage, the students' lifestyles, with a particular focus on the ways in which they used water on the campuses, were also shared and discussed. The aim was not only to collect water samples but also to discuss various issues regarding the schools' hygiene environments, based on the data obtained. The selected local citizens included at least one licensed civil engineer and one licensed science teacher in each sampling collection since they have knowledge of environmental management and can grasp the research activities. The other participants were selected based on their willingness to learn how they can manage their environment.

This research categorized the collected water samples based on six types of water outlets at the points of consumption, as detailed in Table 1. Figure 1 provides visual examples of these water outlets. The "Drink" type [Figure 1 (a)] represents water that is typically purchased by the high schools from local water-filling stations to be used for drinking and cooking purposes. A refillable one-gallon container is usually provided by the local water-filling station and used to store the water. Occasionally, a water dispenser connected to electricity may be used to cool/heat the water. Water samples collected from water storage tanks, such as the one shown in Figure 1 (b), were classified as the "Tank" type. The water resource in the tank is usually groundwater that has been pumped up. There were two water tanks in the public high school and one in the private school.

In this research, water from faucets was categorized into two types, based on usage and location. In high schools, there are several handwashing areas where students usually wash their hands. Considering students' more frequent usage and direct exposure to water, the water samples collected from faucets in the handwashing areas [Figure 1 (c)] were labeled as the "Tap-Handwash type", while those from other areas were categorized separately as the "Tap-General" type [Figure 1 (d)]. Water samples were also collected from washrooms on the campuses. As shown in Figure 1(e), water in washrooms is usually stored in buckets for manual flushing. The sixth category includes water pumped up from wells, as shown in Figure 1 (f). Groundwater serves as the province's primary water resource and can be used for various purposes in high schools, particularly when tap water is not available during the dry season (Yazawa et al., 2024b).

Table 1: Types of water investigated and the number of samples collected in this research.

Type	Description of water resource	Number of samples
Drink	Refillable one-gallon water bought from local companies exclusively for drinking and cooking.	9
Tank	Water that is pumped up from groundwater and stored in a stainless steel/plastic tank. Water is supplied to a faucet using gravity.	7
Tap-Handwash	Water from a faucet exclusively installed in a handwashing area for students.	15
Tap-General	Water from a faucet installed in a kitchen, garden, etc. for washing dishes, watering plants, and any other activities.	20
Washroom	Water stored in a bucket in a washroom.	7
Well	Groundwater that has been pumped up.	2

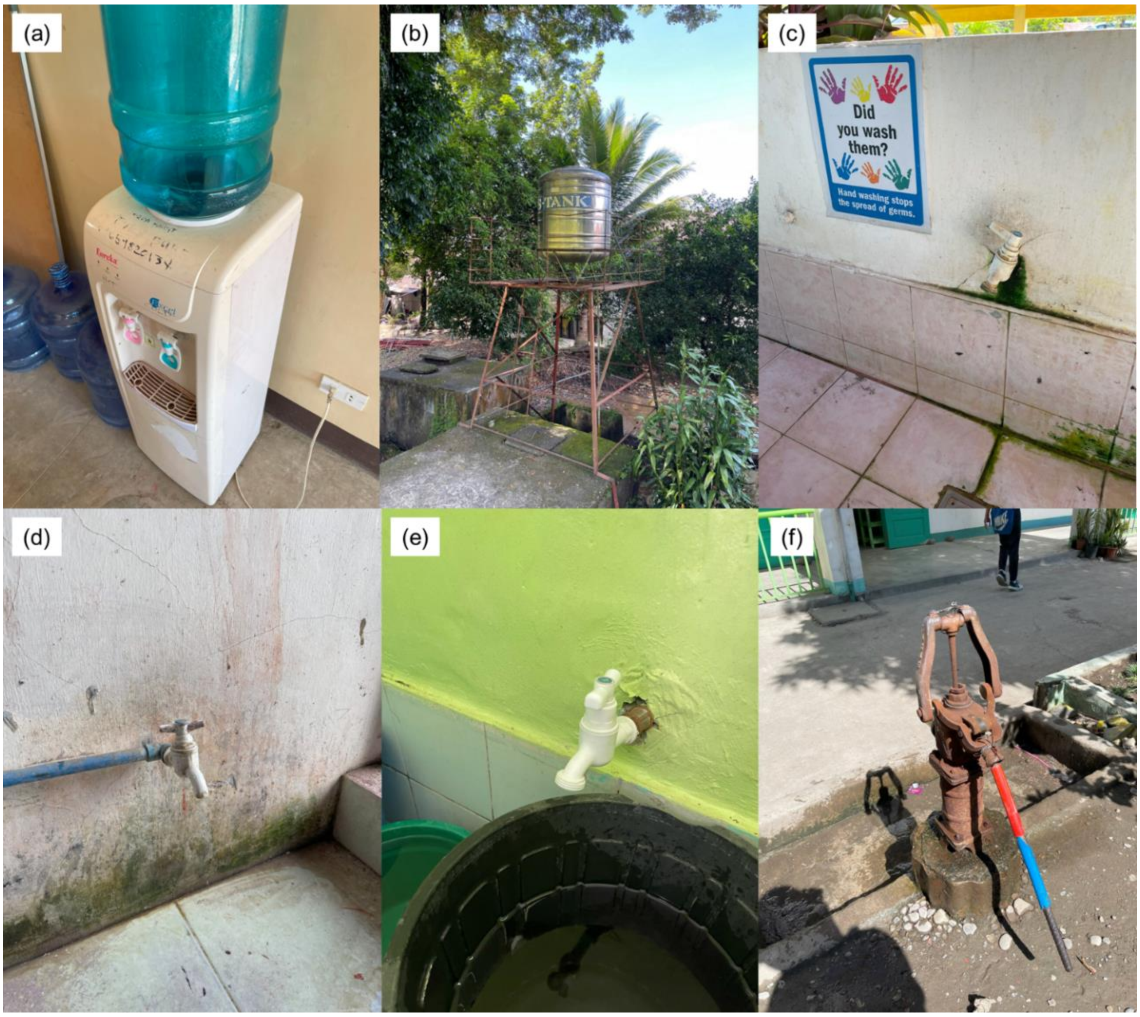

Figure 1. Types of water outlets corresponding to those described in Table 1. The pictures represent the following types: (a) Drink, (b) Tank, (c) Tap-Handwash, (d) Tap-General, (e) Washroom, and (f) Well.

2.3 Water quality assessment and evaluation

The water quality assessment conducted in this research includes on-site measurement and laboratory testing. Fundamental water quality parameters, including water temperature, pH, EC, and TDS, were checked and recorded onsite by citizens using the pH/EC meter (EA776AE-3A, Hanna Instruments, USA). Water samples were then collected using sterile polypropylene bottles, transported to a local laboratory, and set for the enumeration of *E. coli*/coliform within the same day. The enumeration of *E. coli*/coliform was facilitated by the Petrifilm™ Rapid *E. coli*/Coliform Count Plates (REC plates, 3M, USA). The REC plates were first inoculated with 1 mL of water samples using a pipette. They were then incubated at 35 °C of temperature for 18-24 hours and used for counting colonies. The recommended counting range for the REC plates is less than 100 colonies for both *E. coli* (which appeared as a blue color) and coliform (which appeared as blue and red colors). In this research, however, a maximum of 150 colonies was enumerated since the diluent was not available in the province. To ensure the data reliability of bacterial counting, where there were more than 150 colonies in the plate, this research labeled the result as being too numerous to count (TNTC). For *E. coli* and Coliform, the Philippine National Standards for Drinking Water of 2017 (hereafter PNSDW) (Department of Health, 2017) employs three methods of analysis – the multiple tube fermentation technique (MTFT); the enzyme substrate coliform test (EST); and the membrane filter technique (MFT) – and sets the standard values for each method. This research referred to the standard values of the MFT for the evaluation considering its methodology using a similar agar (Corry et al., 2003; Ukpong and Udechukwu, 2015). Since this research inoculated 1 mL of water samples but the standards for *E. coli* and Coliform are based on 100-mL units, 0 colonies (Not Detected) are a desirable condition in the results.

This research evaluated the results of water quality based on the guidelines in the PNSDW (Department of Health, 2017). The Department of Health (DOH) updated the PNSDW of 2007 in consideration of the scope of the Sustainable Development Goals, with the support of the World Health Organization, and finalized the updated PNSDW in 2017. The PNSDW can be applied to all drinking-water service providers, from the government level to private service providers. Table 2 shows the water quality standards guided by the PNSDW. There are no standard values for water temperature and EC in the PNSDW. Generally, an increase in water temperature is correlated to increases in EC and TDS (Government of Canada, 2021). In addition, a higher water temperature affects the taste, odor, and growth of microorganisms. Particularly, the ideal range of water temperature for the growth of microorganisms is from 20 °C to 60 °C (Government of Canada, 2021). Thus, water with a temperature within this range potentially indicates microorganisms growing inside the distribution/piping system. With regard to EC, it is correlated to TDS concentration. Thus, the evaluation of EC can be altered by the evaluation of TDS, in which the maximum allowable level is designated in the PNSDW as 600 mg/L. In the PNSDW, pH and TDS exclusively for drinking water from refilling stations are treated separately, with 5-7 for pH and <10 mg/L for TDS. This is to consider the validity of the efficiency of the reverse osmosis or distillation process, which removes the calcium carbonate and retains the carbon dioxide.

Table 2: Water quality standards set by the Philippine National Standards for Drinking Water of 2017 (Department of Health, 2017).

Parameters	Water quality standard/Maximum allowable level
Temperature (°C)	Unavailable
pH-drinking	5.0-7.0
pH-others	6.5-8.5
EC (µS/cm)	Unavailable
TDS-drinking	<10 mg/L
TDS-others	600 mg/L
E. coli	<1 colonies/100 mL (Membrane Filter Technique)
Coliform	<1 colonies/100 mL (Membrane Filter Technique)

3. Results and Discussions

3.1 Assessment and evaluation of water quality in high school campuses

Figure 2 shows the results of the water quality assessment for six types of water consumption points in public and private high schools. The results are shown separately for public and private high schools to facilitate consideration of the different school environments in the discussion. Table 3 summarizes the statistics of the water quality assessment. The *p*-values were calculated against the standard of water quality parameter. For pH-drinking and pH-others, values of 6.0 and 7.5 were used as the representative standards.

With the exception of the drinking water that was connected to electricity (i.e. four samples in the public high school and one sample in the private high school), the average water temperature is approximately 30°C for all water types. This is within the desirable range of 20 - 60°C for the growth of microorganisms. Plastic faucets for both handwashing and general purposes are usually located outside, and plastic water pipes are also put outside in both public and private high schools. Thus, the water temperature can easily be affected by the room/outside temperature and sunlight. The pH of five types of water (i.e. Tank, Tap-Handwash, Tap-General, Washroom, and Well) is lower than its drinking water since the water temperature is higher. The pH for these five types is almost neutral and within the standard range. However, the pH of the drinking water is higher than the standard range of drinking water (5.0-7.0), at 8.1 on average. Similar trends of water temperature and pH were observed in both public and private high schools.

No standard for EC was available in the PNSDW. Thus, the TDS concentration was used for assessment. The TDS standard for drinking water is less than 10 mg/L, as shown in Table 2. As can be seen in Table 3, the median of the TDS concentration of nine samples collected from two schools is 6.5 ppm. However, the TDS concentration in drinking water from the public high school is higher than that from the private high school (Figure 2). Although the sample size is small and different, the TDS concentrations of the tanks in the public high school are higher than the water in the tank in the private high school. This might be affected by the materials of the tanks; the public high school uses plastic tanks, while the private high school uses stainless steel ones. In addition, one drinking water sample from the public high school showed concentrations of TDS at 66 ppm and coliform at 96 CFU/mL at the same time, implying that even drinking water bought from the water-filling station is polluted at the time when students drink it. The TDS of other types of water met the standard, i.e. 600 mg/L of the maximum allowable level.

E. coli was detected in the following water samples from the public high school: Tank, Tap-Handwash, and Washroom. Coliform was confirmed in most of the water samples from both public and private high schools. Although *E. coli* was not detected in the Drink type water samples, a high coliform concentration of 96.0 CFU/mL was confirmed from one Drink type water sample in the public high school. The sample also contained a high TDS concentration (66 ppm). The other four Drink type water samples, three from the public high school and one from the private high school, also recorded coliform with 2-10 CFU/mL. Furthermore, coliform was also detected in the other water types, excluding one water sample from the tank in the private school and one from the well in the public school. Such results fail to meet the standards set out in the PNSDW.

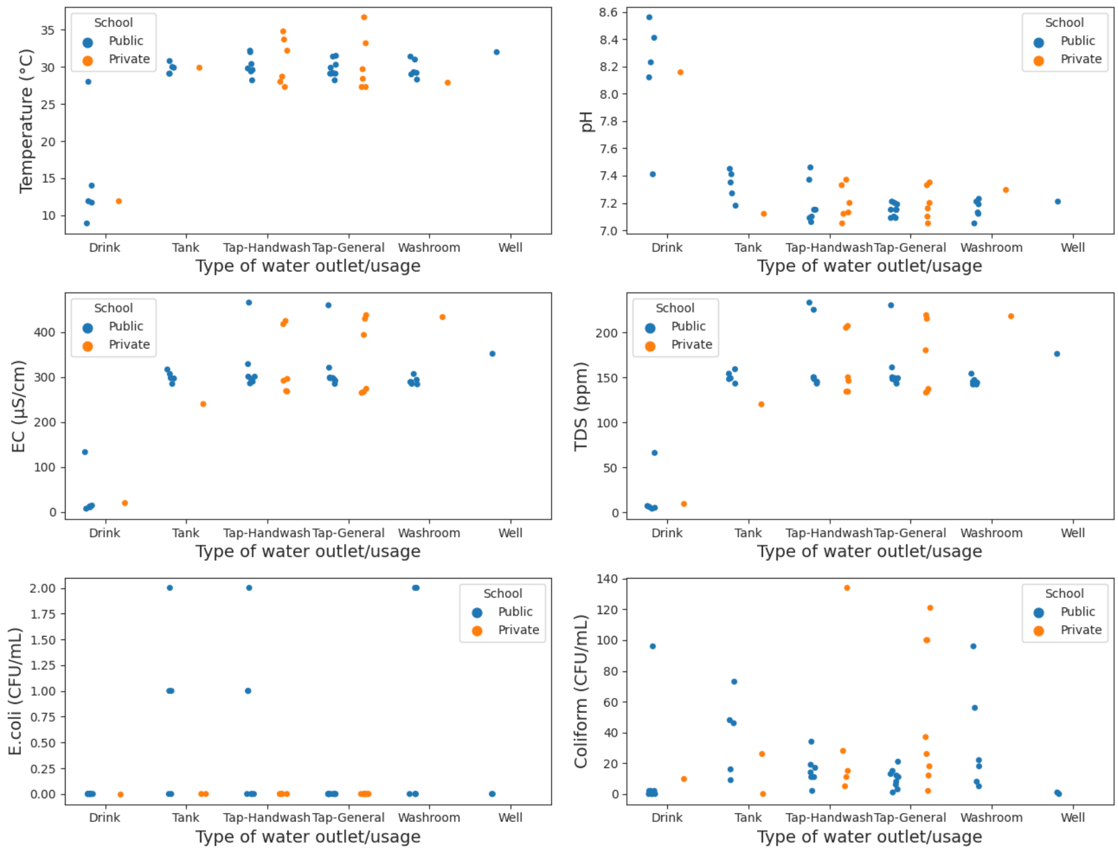

Figure 2. Results of the water quality assessment for six types of water consumption points in public and private high schools.

Table 3: Statistical summary of water quality assessment for six types of water consumption points in public and private high schools.

Type	Statistics	Temperature (°C)	pH	EC (µS/cm)	TDS (ppm)	*E.coli* (CFU/mL)	Coliform (CFU/mL)
Drink	Minimum	8.9	7.4	7.0	4.0	0.0	0.0
	Maximum	28.0	8.6	133.0	66.0	0.0	96.0
	Average	14.4	8.1	32.8	16.3	0.0	12.4
	Median	11.9	8.2	13.0	6.5	0.0	2.0
	Standard deviation	6.9	0.4	49.3	24.4	0.0	31.5
	p-value	-	0.000***	-	0.549	-	0.3
Tank	Minimum	29.1	7.1	240.0	120.0	0.0	0.0
	Maximum	30.8	7.5	317.0	159.0	2.0	73.0
	Average	29.8	7.3	290.7	145.5	0.6	31.1
	Median	29.9	7.3	297.5	148.5	0.0	26.0
	Standard deviation	0.6	0.1	27.0	13.6	0.8	25.7
	p-value	-	0.012*	-	0.000***	0.113	0.024*
Tap-Handwash	Minimum	27.3	7.1	268.0	134.0	0.0	2.0
	Maximum	34.8	7.5	466.0	233.0	2.0	134.0
	Average	30.5	7.2	325.9	166.9	0.3	25.1
	Median	29.8	7.2	296.0	150.0	0.0	14.5
	Standard deviation	2.3	0.1	65.6	36.1	0.7	35.4
	p-value	-	0.000***	-	0.000***	0.104	0.032*
Tap-General	Minimum	27.3	7.1	265.0	133.0	0.0	1.0

Type	Statistics	Temperature (°C)	pH	EC (µS/cm)	TDS (ppm)	*E.coli* (CFU/mL)	Coliform (CFU/mL)
	Maximum	36.7	7.4	460.0	230.0	0.0	121.0
	Average	30.0	7.2	327.6	162.9	0.0	29.8
	Median	29.2	7.2	298.0	149.0	0.0	13.0
	Standard deviation	2.4	0.1	66.9	32.4	0.0	38.2
	p-value	-	0.000***	-	0.000***	-	0.005**
Washroom	Minimum	27.9	7.1	284.0	142.0	0.0	5.0
	Maximum	31.4	7.3	435.0	218.0	2.0	96.0
	Average	29.4	7.2	311.9	156.0	0.7	34.2
	Median	29.2	7.2	289.0	145.0	0.0	20.0
	Standard deviation	1.3	0.1	54.8	27.6	1.0	35.3
	p-value	-	0.000***	-	0.000***	0.175	0.064
Well	Minimum	32.0	7.2	352.0	176.0	0.0	0.0
	Maximum					0.0	1.0
	Average					0.0	0.5
	Median					0.0	0.5
	Standard deviation	-	-	-	-	0.0	0.7
	p-value	-	-	-	-	-	0.5

(*p<0.05, **p<0.01, ***p<0.001, "-" indicates the p-value is unavailable.)

3.2 Implications for the improvement of WASH environments on high school campuses in the province

The results of the water quality evaluation in this research revealed the existence of *E. coli* in the tap water in the handwashing areas in the public high school. Furthermore, the presence of *E. coli* was also confirmed in the water samples from the storage tank and washroom bucket in the public high school. It is less likely that the students will come into direct contact with the water in the water storage tank or the washroom bucket. However, the tap water that is particularly designated for handwashing will be directly touched by students on a daily basis. Tap water is usually supplied from the water storage tanks using gravity. In the private school, *E. coli* was not detected in water samples from either the storage tank or faucets. This suggests that proper treatment or disinfection methods could effectively prevent *E. coli* contamination in the tap water of the whole campus. In contrast, the public high school relied on a simple filtration system attached to the water storage tank, as shown in Figure 3. However, water quality tests revealed that the concentrations of *E. coli* and coliform in the water sample collected immediately after the filter were 2 CFU/mL and 71 CFU/mL, respectively; on the other hand, the concentrations just before the filter were 0 CFU/mL for E. coli and 48 CFU/mL for coliform. These findings indicate that the installed filtration system may occasionally be contributing to water contamination rather than improving water quality. As the filter becomes older, it appears to become a breeding ground for bacteria. This underscores the critical need for regular and careful maintenance of water treatment facilities.

Figure 3. Filter installed to treat water from the storage tank.

Despite the fact that *E. coli* was not detected, the existence of coliform in the drinking water remains alarming. Students usually bring their own reusable bottles to collect drinking water from the gallon container. Several water gallon containers are located on both public and private schools' campuses. Five of the nine water samples collected from the water gallon containers contained coliform. In addition, the concentration of TDS did not meet the standard of drinking water (<10 mg/L) in two water samples. Such pollution might stem from the refilling stage or from the use of unmaintained/old facilities within the immediate environment. Aside from the Drink and Well water types, four other types of water were found to contain coliform in both high schools. Stainless steel tanks and plastic faucets could be affected by the room/outside temperature and sunlight. Consequently, the water inside has a high temperature of around 30°C, which is a favorable condition for the growth of microorganisms. Old plastic water piping, as shown in Figure 4, could also be contributing to the water pollution caused by the penetration of pollutants.

Figure 4. Plastic pipe connected to a faucet in a kitchen.

This research discussed the WASH environments in public and private local high schools in the Province of Antique based on the water quality at the points of consumption. In summary, three perspectives can be taken to improve the WASH environment of local schools: facility, school-level practice, and individual practice. At the campus-level, old facilities should be checked and replaced/renovated. For example, as indicated in Figures 3 and 4, old filters, pipes, and other pieces of equipment need to be maintained regularly to prevent pollution caused by penetration and leakage. Certain school-level practices, such as chlorine disinfection and covering the tanks, could also be effective in maintaining cleanliness, particularly for those water tanks providing the main water supply for the whole campus. Chlorine residual of 0.5-1.5 mg/L as free chlorine in water tanks is also the standard designated by the PNSDW (Department of Health, 2017). Covering water tanks is a common practice in Southeast Asia and could be done by local citizens to maintain a hygienic environment (Artiningsih & Yuniartanti, 2016; Thokchom et al., 2022; Adhikari et al., 2023). Finally, encouraging handwashing is a necessary individual educational practice to avoid exposure to pathogens. Neither high school provided soap in the handwashing areas. As has been demonstrated in previous studies (Greene et al., 2012; Freeman et al., 2014), the lack of materials, such as soap and towels, affects the practice of handwashing by students. Since the two schools surveyed in this research did not supply handwashing materials, the preparation of such materials could be the first step to encourage students.

It should be noted here that the usual testing should be conducted in a DOH-accredited laboratory, following the specified guidelines for water sampling and examination. Moreover, water samples from only one public and one private high school were analyzed in this research without considering meteorological-seasonal or school-seasonal variations. Water consumption and E. coli concentration have been reported to be higher in the rainy and dry seasons, respectively (Aydamo et al., 2024). It has been reported that seasons of low water use (i.e. school break) and normal water use (i.e. school was in session) also affect microbial water quality in school buildings (Aw et al., 2022). Since stagnant water might cause no chlorine residual and high microbial concentrations (Ra et al., 2023), how long water has been stored in a water tank, washroom bucket, etc. should be considered when sampling is done in further research. Since the water sampling was conducted during the dry season when classes were held, the results cannot be generalized from this research alone. However, this research indicates that the necessary WASH-related actions should be taken, even at the school campus levels, in order to maintain safe water quality levels for students. In addition, this research used the PNSDW even for the evaluation of non-drinking waters. For natural water resources, the Water Quality Guideline and General Effluent Standards of 2016 were issued by the Department of Environment and Natural Resources (Department of Environment and Natural Resources, 2016). However, as this research focused on the points of water consumption that students might directly use, stricter standards (i.e. the PNSDW) were taken as the evaluation criteria. Even water that is not intended for drinking purposes should be carefully monitored at the points of water consumption in schools because they are the main sources of exposure for students.

Conclusion

This research conducted a thorough citizen scientific water quality assessment, focusing on the points of water consumption on public and private high school campuses in the Province of Antique, Philippines. The water quality conditions were evaluated based on the guidelines of the Philippine National Standards for Drinking Water of 2017. Finally, possible steps to improve the local water, sanitation, and hygiene (WASH) environments were discussed, considering the situations of the high schools located in the province. The results of the water quality assessment showed that *Escherichia coli* (*E. coli*) was detected in several samples of tap water that was exclusively intended for handwashing by public school students. Furthermore, the results suggest that the old treatment facility, which was initially installed to remove pollutants, now pollutes the water. To improve the WASH environment of the school campuses in the province, certain practices were suggested from the three perspectives of facility, school-level practice, and individual practice. Old facilities, such as filters, pipes, and even faucets, need to be checked and renovated to avoid contamination caused by penetration and leakage. School-level and individual practices, such as chlorination, covering water tanks, and the encouragement of handwashing, could be the first steps towards improving the WASH environments.

A common challenge for local schools in the province of the Philippines is a lack of research laboratories (e.g. accredited laboratories nearby), environmental data, and budget . Thus, it is difficult for them even to regularly check the water quality before tackling any WASH-related issues. The citizen scientific methodology used in this research facilitated not only the collection of basic water quality information but also a discussion of possible and affordable solutions together with local citizens, based on the data obtained and the conditions observed on the spot. Further research should include an increased number of samples/schools, an in-depth water quality assessment in an accredited laboratory with designated parameters, and suggestions for concrete management plans to improve the WASH environments for local schools in the province.

Acknowledgments

We would like to thank two high schools for their approval and support to conduct this research. This research was supported by the year 2023 special fund of the Institute of Industrial Science, The University of Tokyo, JSPS KAKENHI Grant Numbers 24K20969, 21H05179, and The Obayashi Foundation Grant Number 2023-Research-15-153.

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