JRIIE Journal of Research Innovation and Implications in Education
Center for Research Implications & Practice

Website:www.jriiejournal.com ISSN 2520-7504 (Online) Vol.9, Iss.3, 2025 (pp. 1314 - 1326)

A Comparative Study of Students' Knowledge of Water Sources and Sanitation Facilities among Selected Secondary Schools within Kanungu and Wakiso Districts in Uganda

Atuhaire Privah[1], Joseph Obua[2], Nassanga Linda Goretti[3] & Frank Beeza Ahimbisibwe[4]

[1]Department of Environmental Management, Makerere University
[2]School of Forestry Environmental and Geographical Sciences, Makerere University
[3]School of Journalism and Communication, Makerere University
[4]Faculty of Management Science, Mbarara University of Science and Technology
Email: Atuhaire.privah@gmail.com

Abstract: *Inequality in access to water sources and sanitation facilities remains one of the barriers among schools in Uganda. Since there are not many studies on this development agenda, particularly when it comes to quality of water sources and sanitation facilities in rural and urban secondary schools, our findings are crucial because they add to the body of knowledge that could be used to track progress in secondary schools. This paper investigated the accessibility of water sources and sanitation facilities among selected secondary schools in Kanungu and Wakiso districts. A comparative research design and mixed method methods approach was used. Questionnaires and interviews guide were used to collect data. Validity was determined using Cronbach alpha. Data were analyzed using SPPS version 29.0, findings presented using percentages and frequencies while qualitative data was reported in narrative. The study found that 87.7% of the students in Kanungu reported that the main source of water was rainwater harvest while 89.7% through piped water in Wakiso district. 93% reported that the school never had toilets in Kanungu district while 64% in Wakiso district had toilets. 89% in Kanungu reported garbage bins for disposal of solid waste were not there while 90% in Wakiso district reported the same. This study concluded that schools need to invest in water sources and sanitation facilities to access clean water and adequate sanitation facilities. Government needs to develop systems for sustainable water and sanitation facilities for secondary schools to guarantee clean environment desired for health, wellbeing and learning outcomes.*

Keywords: *Facilities, Learning environment, Sanitation, Schools, Water sources*

How to cite this work (APA):

Atuhaire P., Obua, J., Goretti, N. L. & Ahimbisibwe, F. B. (2025). A Comparative Study of Students' Knowledge of Water Sources and Sanitation Facilities among Selected Secondary Schools within Kanungu and Wakiso Districts in Uganda. *Journal of Research Innovation and Implications in Education, 9*(3), 1314 – 1326. **https://doi.org/10.59765/drf294h**.

1. Introduction

Water sources and sanitation facilities are allied to hygiene which is fundamental to human health and wellbeing. For a long time, World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) have coordinated water and sanitation programmes in the developed and developing countries. These United Nations

agencies have also organized global forums to benchmark and monitor progress in the provision of water and sanitation facilities as part of the effort to achieve the targets in Sustainable Development Goal six (SDG 6) and other Goals related to improved livelihoods targets to be achieved by 2030 (UN-Water, 2020). In addition, WHO and UNICEF had tracked progress of developed and developing countries towards achieving the Millennium Development Goals (MDGs) from 2000 to 2015 when the United Nations Sustainable Development Goals (SDGs) replaced the MDGs. Since then, WHO and UNICEF have continued to monitor global progress towards achieving water and sanitation-related targets in the SDGs (WHO, 2018). Furthermore, the outbreak of Covid-19 led to further disruptions in the delivery of water and sanitation facilities (Barbier & Burgess, 2020; WHO/UNICEF, 2021, Tumwebaze et al, 2023).

The global aspiration to achieve water and sanitation for all by 2030 are expected at the level of households and institutions that include schools, healthcare facilities and workplaces. This effort has been complemented by health education programmes that emphasize provision of water and sanitation facilities in schools to improve education and wellbeing, particularly for girls, by providing safe, inclusive, and equitable learning environments (Vishnupriya et al., 2015). Scholars have posited that provision of safe water, toilets and handwashing facilities creates a conducive learning environment, and girls, are motivated to attend school when they have menstruation (Agol et al., 2018; McMichael, 2019)
Furthermore, children who acquire safe water and sanitation habits at school can reinforce positive life-long behaviors in their homes and the communities they come from (UNICEF, 2022). However, millions of children go to school every day and experience unsafe learning environments characterized by inadequate or no drinking water, poor toilets, and no hand washing facilities. UNICEF (2022) reported that in 2021 three in 10 schools did not have basic safe drinking water and sanitation facilities which adversely affected the learning outcomes of nearly 540 million schoolchildren. To achieve universal coverage of safe water and sanitation facilities in schools globally by 2030, a 14-fold effort is needed to increase the current rates of progress towards achieving basic safe drinking water and a three-fold increase in the progress towards achieving basic sanitation (UNICEF, 2022).

According to Shimamura et al. (2022), students need to access safe drinking water in schools as dehydration decreases their cognitive development and harms their wellbeing in the long run. The amount of accessible water for day schools should be 5 liters for every student and staff. Extra amounts of water that need to be accessible for flush toilets is estimated at 10 to 20 liters per day for flush toilets and 1.5 to 3 liters for every individual per day for non-flush toilets (WHO, World Bank and UNICEF, 2022).

In the low- and middle-income countries, Uganda inclusive, high incidences of diarrheal diseases is attributed to inadequate safe water supply and poor sanitation facilities (Auma et al., 2024) half of the low-income country schools are reported to lack sufficient water and sanitation facilities. Therefore, improving water sources and sanitation facilities in schools is crucial for enhancing students' health, dignity and learning outcomes (Karon et al, 2017). Despite global efforts to upgrade water and sanitation facilities for all in accordance with the United Nations SDG 6, about 88% percent of diarrheal deaths worldwide are still attributed to inadequate supply of safe drinking water and poor sanitation facilities and these are particularly pronounced in the low- and middle-income countries (Chirgwin et al., 2021). In this study, water sources refer to piped water, water supplied through public taps, protected wells, unprotected wells, boreholes, water supplied by tankers, surface water from lakes, rivers, streams and rainwater harvested from roof tops.

It is evident from literature that few studies have been undertaken on water sources and sanitation facilities in secondary schools. In addition, there is scarcity of published research on water sources and sanitation facilities in secondary schools in Uganda and in Sub-Saharan Africa (Nalumenya et al, 2023).In spite of the strategic importance of water and sanitation facilities needed for healthy living and good learning outcomes, no hypothesis has been tested on how schools continue to experience inadequate provision and use of the sanitation facilities (Olatunji & Taiwo, 2021). The study's goals were to investigate how students obtained water sources, find out what students and teachers thought about the sources used in schools, and investigate the reasons for school water supply outages. The following research questions were evaluated in this study: Which water sources are available to the secondary schools in the districts of Kanungu and Wakiso? What are the reasons behind school water supply outages? What opinions do teachers and students have about solid waste management and sanitation facilities at schools?

2. Literature Review

Safe water sources and clean sanitation facilities in schools are essential for the health and education of students. Unfortunately, access to safe water sources and good sanitation facilities is still limited in most developing countries, especially in sub-Saharan Africa (Odafivwotu, 2019). This situation has been a major drawback in achieving the United Nations Sustainable Development Goal (SDG) 6 targets that are aimed at ensuring availability of safe drinking water sources and sanitation for all by 2030 (SDG Report, 2023). As a result, achievement of SDG 6 continues to be a global challenge (Ssekamatte et al., 2022). Insufficient water sources and sanitation facilities increase exposure to

pathogens and risk of illnesses including diarrhea and dysentery, among others (Michael, 2019). Although post COVID-19 pandemic has witnessed improvement in the provision and use of water and sanitation facilities in schools, access to these facilities is still generally limited in low- and middle-income countries (WHO, 2020). This implies that schools in low-income countries continue to miss the benefits of safe drinking water and good sanitation facilities such as creation of a suitable learning environment, promotion of environmental health education, adoption of good hygiene practices, and encouragement of behavior change among students (Chirgwin et al., 2021). In addition, access to safe drinking water sources and use of clean sanitation facilities reduces medical costs and mortality. Reduced disease burden increases school attendance and learning outcomes (Ahmed et al., 2022). This literature addresses understanding student attendance, learning outcomes, school policy, socioeconomic disparities, and global development concerns are related to the accessibility of adequate water and sanitation amenities in schools

It is clear from literature that students spend a large portion of their daytime hours in schools and schools present opportunities to improve students' health (McMichael, 2019). This implies that schools need to have adequate water and sanitation facilities. Despite this need, Ngwenya et al. (2018) reported that nearly one third of schools worldwide lack basic water and sanitation facilities. As a result, students are exposed to diseases that are attributed to contaminated water and poor sanitation facilities. Disease burden increase absence from school thereby lowering academic performance and increasing the likelihood of dropping out of school.

Although access to safe water sources and sanitation facilities has improved, efforts have mainly been directed at home-based or community-based water and sanitation facilities and not to institutions such as schools (McMichael, 2019). It is also clear from literature that water sources and sanitation facilities are rarely incorporated in school management planning, policies and regulations that can help to stop the spread of diseases associated with unsafe drinking water and poor sanitation facilities. This is unfortunate because provision of safe water and sanitation facilities is also one of the strategies applied to curb the spread of COVID-9 (Poague et al., 2022).

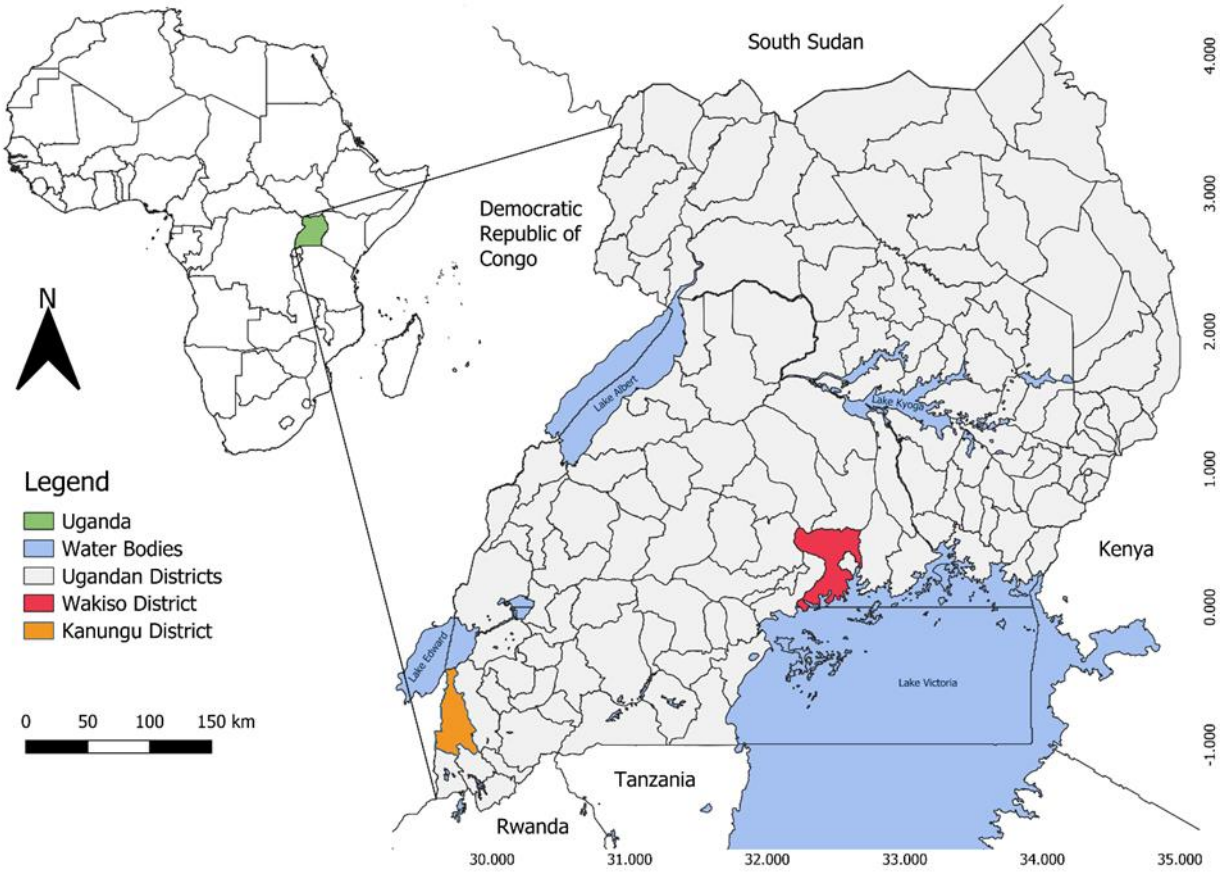
According to De Buck et al., (2017), students who have access to safe water sources and clean sanitation facilities also can use latrines properly, participate in solid waste disposal, wash their hands, attain better learning outcomes, and become change agents. A study by McMichael, (2019) revealed that students use water and sanitation facilities if they kept clean. This finding is in tandem with those of previous studies, which reported a correlation between toilet cleanliness and increased toilet use by students (Mathew et al, 2009). For this reason, safe drinking water and clean sanitation facilities should be provided in schools as a step towards fostering behavior change among students. According to UNICEF (2018), students have better environments to study, learn, and acquire knowledge when schools have reliable and safe water sources and well-maintained sanitation facilities.

3. Methodology

The study was undertaken in Kanungu district (0°57′S, 29°47′E) located in western Uganda bordered by Kihihi town to the north, Kisoro district to the south, Kabale district to the east and Democratic Republic of the Congo to the west. Wakiso district (0°24′N, 32°29′E) is located in central region bordered by Nakaseke district to north, Mukono district to the east and Mityana district to the west (Figure 1). The districts were selected to compare students' knowledge of water sources and the attitudes towards water and sanitation facilities in the secondary schools.

Kanungu district has a population of 277,300 and 52 secondary schools (Jovine, 2017). Water access rates vary from 47 % to 95 %. The district has one piped water scheme and 2,042 domestic water points which serve a total of 262,634 people of whom 210,887 live in rural areas. Three hundred and fifty water points have been non-functional and abandoned for over five years (Atuhaire et al, 2025). Sixty-six percent of the population has access to protected springs and 25% to public to water. Four percent has access to shallow wells and the same percentage has access to deep boreholes Wakiso district has a population of 2,007,700 and 580 secondary schools (Kato, 2016). Water access rates vary from 20 % to 95 %. There are 4,368 domestic water points which serve a total of 1,103,415 people of whom 744,232 are in rural areas. One thousand and one hundred water points have been non-functional and abandoned for over five years (Atuhaire et al, 2025). Forty eight percent of the population has access to shallow wells, 23% to protected springs and 13% to deep boreholes (Figure 1).

Map of Uganda showing study districts



3.1 Study design

The study adopted a comparative research design (Brannen, 2017) data were collected from the population at single point in time as pointed out with a mixed methods approach includes philosophical assumptions that provide directions for the collection and analysis of data from multiple sources in a single study (Dawadi et al, 2021). To support data collection, four research assistants familiar with secondary schools in Kanungu and Wakiso districts were recruited and trained for five days in data collection methods, data storage and sharing, using Open Data Kit (ODK) in tablets and phones.

3.2 Sample size and sampling technique

Using Krejcie and Morgan (Chuan & Penyelidikan, 2006) table for sample size determination, a sample of 28 mixed day and boarding secondary schools in Kanungu district and 48 schools in Wakiso district were selected and a total of 150 O' and A' level students were interviewed. In Uganda's education system, secondary education is the second level of organized Secondary schools consisting of lower secondary level referred to as ordinary or O' level and upper secondary level referred to as advanced or A' level. Using simple random sampling, 159 students were selected from the selected secondary schools with the help of the teachers by considering whether they belonged to the school environment, sanitation or health science clubs.

3.3 Data collection

Data was collected between August –December 2023, to compare students' knowledge on water sources and sanitation facilities in 76 schools were collected using a structured questionnaire and additional data was collected from 10 key informants from the sector experts to supplement the collected data.

The questionnaire gathered information on students' profile, water sources accessed by selected secondar schools, students' view on water sources and teachers' view on sanitation facilities and waste management in the schools. Students were asked to rate their views based on a five-point Likert scale namely, 1= Strongly disagree, 2=Disagree, 3=Neutral, 4=Agree and 5= Strongly agree.

Reliability and Validity of the questionnaire

Cronbach alpha coefficient of reliability was computed to gauge question wording, clarity, focus, consistency and coherence. Reliability in this case refers to the extent to which the questionnaires administered to the students would give the same measured outcome when repeated in another study under similar conditions. The alpha coefficient computed was 0.824 indicating that the questionnaire was reliable and could be administered to the students. Scholars have suggested different acceptable values of Cronbach alpha, ranging from 0.70 to 0.95 based on the argument that an alpha value that is less than 0.7 could be due to few questions in the questionnaire, poor inter-relatedness between the questions or heterogeneous constructs whereas an alpha value that is close to 0.95 suggests that some questions were redundant as they sought the same information in different ways. In this regard, Streiner (2003) recommended a maximum alpha value of 0.90. Validity of this questionnaire was tested through pilot study to gather feedback to compare results in addition to sector expert views for content and face validity.

3.4 Data analysis

Questionnaire responses were edited, coded and entered in IBM SPSS software version 29 to create a data file that was later used to generate a statistical summary. Data were subjected to chi-square test to **compare students' knowledge of accessibility of water sources and sanitation facilities in selected secondary schools** of Kanungu and Wakiso districts.

3.5 Ethical Considerations

Through informed consent, confidentiality, voluntary involvement, and safety from harm, every participant in this research was treated with dignity. To preserve the participants' integrity and accountability, this study also sought guarantee truthfulness, equity, cultural sensitivity, and ethical approval.

4. Results and Discussion

The main aim of this paper was to find out how water sources and sanitation facilities were accessed within the secondary school in Kanungu and Wakiso district**.** Out of 153 students interviewed, 44.3% were male and 55.7% were female in each district. Students in Kanungu and Wakiso districts had a statistically significant common view on the water sources used in their schools and stated that they were more than 500 m from the schools ($\chi2$=10.668, p=0.005). They also held a statistically significant common view that water was brought to the school in a tanker ($\chi2$=13.150; p=o.001). Students further stated that school workers fetched water that was used in the schools ($\chi2$=47.668, p=0.001). Students ($\chi2$=24.0, p=0.001) stated that a community volunteer fetched water that was used in the schools ($\chi2$=24.0, p=0.001) >0.05). Students also stated that they fetched water for washing their utensils ($\chi2$=6.840, p=0.033) (Table 1).

Table 1: Accessibility of water sources by schools in Kanungu and Wakiso districts (values under the districts are percentage response)

S/N	Statements	Kanungu district	Wakiso district	Total	$\chi 2$	p-value
1	Water source is more than 500 m from the school	25.4	9.1	15.2	10.668	0.005
2	Students move less than 500 m from the school	59.3	60.6	60.1	1.904	0.386
3	Water is found within the school compound	84.7	94.9	91.1	4.454	0.108
4	Water is brought to the school in a tank	1.7	22.2	14.6	13.150	0.001
5	A paid water vendor brings water to school	3.4	1.0	1.9	1.171	0.557
6	School workers fetch water	39	5.1	17.7	47.668	0.001
7	A community volunteer fetches water	1.7	2.0	1.9	24.0	0.001
8	Students fetch water for washing their own utensils	1.7	13.1	8.9	6.840	0.033

*P-values with * represent a significant relationship at 0.05 level of significance. Statistical comparisons were performed using Chi-square*

Table 2: Chi-square test of the relationship between students' views and sources of water used in the secondary schools (*values under the districts are % response*)

S/N	Water source	Kanungu district	Wakiso district	Total	χ^2	p-value
1	Piped water	75.4	87.9	83.3	4.031	0.045
2	Borehole	21.1	26.3	24.4	0.533	0.465
3	Protected well/spring	12.3	39.4	29.5	16.488	0.000
4	Unprotected well/spring	3.5	1.0	1.9	1.727	0.422
5	Harvested rainwater	87.7	86.9	87.2	0.58	0.748
6	Tanker truck	0.0	35.4	22.4	30.972	0.000
7	Surface water (lake, river, stream)	5.3	18.2	13.5	5.27	0.072

*P-values with * represent a significant relationship at 0.05 level of significance. Statistical comparisons were performed using Chi-square*

4.1 Students' views regarding sanitation facilities and solid waste management in secondary schools

Students in Kanungu and Wakiso districts held statistically significantly common views about solid waste management in the secondary schools. About 85% of students in Kanungu district and 16.0 % in Wakiso district strongly disagreed that the schools had well maintained pit latrines with concrete slabs. Chi-square test revealed a statistically significant relationship in the views of the students in the two districts ($\chi 2=72.65$, $p=0.000$). Similarly, in Kanungu district 93.2% of the students and 30.3 % in Wakiso district did not agree that the schools had enough toilets. Chi-square test revealed a statistically significant relationship in students' views in the two districts ($\chi 2=60.641$, $p=0.000$). Furthermore, 84.7% of students in Kanungu district and 22.0% in Wakiso district strongly disagreed that there were incinerators for used

sanitary towel disposal in the schools. Chi-square test revealed a statistically significant relationship in the students' views in the two districts ($\chi2$=73.239, p=0.000). About 90% of students in Kanungu district disagreed while 90% of the students in Wakiso district agreed with the statement that the schools had enough garbage bins for solid waste disposal. Chi-square test revealed a statistically significant relationship in the students' views in the two districts ($\chi2$=122.145, p=0.000). From the perspective of students, results revealed that 93.8% of those in Kanungu district disagreed and 56% of those in Wakiso district agreed that the schools had septic tanks for waste disposal. Chi-square test revealed a statistically significant relationship in the students' views in the two districts ($\chi2$=67.366, p=0.000). About 88% of students in Kanungu district disagreed and 48.0% in Wakiso district agreed to the statement that the schools had adequate number of workers to manage waste. Chi-square test revealed a statistically significant relationship in the students' views in the two districts ($\chi2$=29.697, p=0.000). About 50% of students in Kanungu district disagreed while 82% of them in Wakiso district strongly agreed with the statement that the schools had an established waste management system. Furthermore, 51% of students in Kanungu district and 61% in Wakiso district strongly disagreed with the statement that solid waste was buried in the school compound. Chi-square test revealed a statistically significant relationship in the students' views on this statement in the two districts ($\chi2$=17.804, p=0.000). Finally, students in Kanungu district (78.0%) and 94.9% in Wakiso district stated that they were aware of solid waste management methods. Chi-square test revealed a statistically significant relationship in the students' views on this statement in the two districts ($\chi2$=22.985, p=0.000) (Table 3).

Table 3: Chi-square test of students' views regarding solid waste management in the secondary schools

			Kanungu district		Wakiso district			
S/N	**Statements**		**n**	**%**	**n**	**%**	**$\chi2$**	**p-value**
1	This school has well maintained pit latrines with slabs	*Strongly disagree*	50	84.7	16	16.0	72.65	0.000
		Not sure	1	1.7	3	3.0		
		Strongly agree	8	13.6	81	81.0		
2	This school has enough toilets	*Strongly disagree*	55	93.2	30	30.3	60.641	0.000
		Not sure	2	3.4	5	5.1		
		Strongly agree	2	3.4	64	64.6		
3	This school has incinerator for sanitary towel disposal	*Strongly disagree*	50	84.7	22	22.0	73.239	0.000
		Not sure	9	15.3	10	10.0		
		Strongly agree	0	0.0	68	68.0		
4	This school has enough garbage bins for disposal of solid waste	*Strongly disagree /*	53	89.8	6	6.0	122.145	0.000
		Not sure	5	8.5	4	4.0		
		Strongly agree /	1	1.7	90	90.0		
5	This school septic tanks for disposal of semi-solid and liquid waste	*Strongly disagree /*	55	93.2	26	26.0	67.366	0.000
		Not sure	2	3.4	18	18.0		

		Strongly agree	2	3.4	56	56.0		
6	This school as adequate number of workers to manage wastes	*Strongly disagree /*	52	88.1	48	48.0		
		Not sure	4	6.8	6	6.0	29.697	0.000
		Strongly agree	3	5.1	46	46.0		
7	This school has an established waste management system	*Strongly disagree /*	50	29.0	4	4.0	117.083	
		Not sure	8	13.6	14	14.0		0.000
		Strongly agree	1	1.7	82	82.0		
8	Waste is mainly collected by a service provider	*Strongly disagree*	48	81.4	32	32.0	37.723	
		Not sure	4	6.8	10	10.0		0.000
		Strongly agree	7	11.9	58	58.0		
9	Solid waste is usually burned on the school compound	*Strongly disagree*	12	20.3	39	39.0	7.174	
		Not sure	1	1.7	4	4.0		0.028
		Strongly agree	46	78.0	57	57.0		
10	Solid waste is buried at school	*Strongly disagree*	30	51.7	61	61.0	17.804	
		Not sure	2	3.4	21	21.0		0.000
		Strongly agree	26	44.8	18	18.0		
12	Students are aware of waste management methods in this school	*Strongly disagree*	12	20.3	0	0.0	22.985	
		Not sure	1	1.7	6	6.0		0.000
		Strongly agree	46	78.0	94	94.0		
13	Students participate in general cleaning and waste management	*Strongly disagree*	2	3.4	4	4.0	0.038	
		Not sure	0	0.0	0	0.0		0.845
		Strongly agree	57	96.6	96	96.0		

*P-values with * represent a significant relationship at 0.05 level of significance. Statistical comparisons were performed using Chi-square*

4.2 Discussion

Access to safe water sources and sanitation has long been an integral part of Uganda Government's National Development Plan which also prioritizes provision of safe drinking water and adequate sanitation facilities (World Bank, 2018). Narratives on the linkages between water and sanitation facilities in schools gained momentum in the last decade (Agol et al., 2018). Research indicates that poor water and sanitation facilities hampers attainment of learning outcomes. Therefore, availability and access to toilets, water and other sanitation facilities are crucial for attainment of quality learning and good health (Fuller et al., 2015; Vishnupirya et al., 2015). Generally, inclusive access to safe and reliable water sources and adequate sanitation facilities are critical in schools' attainment of quality education and fostering good health (WHO, 2019). In many schools in the developing countries, including Uganda, basic water and sanitation facilities are inadequate, and this affects students' learning outcomes and well-being (Sang et al., 2023). Inadequate water and sanitation facilities poses a risk to the students as elucidated by the protection motivation theory.

Availability of water sources and clean sanitation facilities are vital during any pandemic to mitigate disease spread. The advent of COVID-19 provided a learning opportunity and heightened awareness about the importance of reliable water sources as well as provision of clean sanitation facilities in schools. Water sources and sanitation facilities are fundamental in ensuring a clean environment in schools. This study was undertaken in the wake of COVID-19 pandemic and the results revealed that availability of water sources can ease supply to schools which in turn foster hygiene leading to positive learning outcomes. This observation is in line with UNICEF's Report (2018) which noted that schools with adequate and reliable water supply, sanitation facilities and clean environment are often in better position to effectively manage pandemics. Therefore, it important to ensure that during pandemics, schools have reliable water supply and adequate sanitation facilities. Access to safe and reliable water sources and coupled with adequate sanitation facilities are fundamental for maintaining good hygiene which in turn contributes to the health and well-being of students. Handwashing facilities, safe drinking water, and clean toilets can reduce the spread of infectious diseases, particularly during pandemics (UNICEF, 2018). This resonates with the protection motivation theory which emphasizes cognitive understanding of environmental related behavoir that is fundamental in reducing risks of disease spread due to use of unsafe drinking water and poor sanitation facilities.

This study has also revealed the views of students in secondary schools in Kanungu and Wakiso districts about ways in which they access water sources. The disparity in their views affirmed by the chi-square statistical tests imply that several factors could account for the differences. It can be implied from this study that COVID-19 pandemic exacerbated existing inequalities in access to water sources and sanitation facilities in the secondary schools located in rural and metropolitan areas. Generally, many schools, particularly in low-income areas, face the challenges of maintaining clean sanitation facilities. The situation was worse during COVID-19 due to lockdowns, reduced funding and shifts in government funding priorities (Greyling et al, 2021).

The results of this study revealed that access to water sources, reliable water supply and sanitation facilities were not uniformly distributed in the secondary schools in Kanungu and Wakiso districts. Globally, schools in rural and urban areas do not have equal access to safe water supply and sanitation facilities (Jasper & Bartram, 2012). According to the World Bank report of 2018 on water and sanitation, 72% of the schools in urban areas in Uganda had access to safe water, compared to 67% in the rural areas. This indicates that Uganda is still far from achieving target 6.1 of the United Nations Sustainable Development Goal (SDG) 6 which states that "By 2030, countries should achieve universal and equitable access to safe and affordable drinking water for all" (WHO, World Bank and UNICEF, 2022). A global survey undertaken in 2022 revealed that 69% of schools had basic drinking water facilities while 19% did not (UNICEF and WHO, 2020). Furthermore, the report revealed a slight improvement over the 2018 status indicating that 90.6% of the schools in urban areas in Uganda have access to water and sanitation, compared to 77% in the rural areas.

Distance to water sources is critical in accessing water for use in schools. In rural secondary schools, a distance of 500 meters to a water source implies that students spend significant amount of time fetching water instead of attending school. This can lead to higher absenteeism that lowers learning outcomes (Shimamura et al., 2022). In urban secondary schools, it is generally expected that water supply systems are more developed, and schools are connected to national water supply networks, making it unusual for schools to be located more than 500 meters away from a water source. According to Hamlet (2021), distance to water source is a determinant of time allocation which affects the quality and outcome of learning in schools. In India, Hamlet (2021) reported that water collection reduced school children's participation in classwork and the learning outcomes while in Indonesia,

Komarulzaman et al. (2019) reported the correlations between water availability, health, school enrolment and absenteeism.

Distance to water sources, whether in rural or urban settings, presents challenges that can curtail school attendance, health, and learning outcomes. The results of this study are in sync with the findings by Blick et al (2024) who noted that access to water in school environment positively impacts learning and health outcomes. Therefore, provision of water and sanitation facilities in schools help to mitigate the aforementioned challenges. However, this will require a multifaceted approach that includes improvement of water sources, increasing school community's awareness about water and sanitation and promoting gender inclusive access to water and sanitation facilities in the schools (Ahmed et al., 2021).

Despite evidence of the adverse effects of improper solid waste disposal on the environment, a critical imperative exists to engage and educate the school communities on the importance of solid waste management as a key component of good sanitation in schools (Deborah, 2021). Communication, positive reinforcement, and adoption of solid waste management practices and engaging educational approaches are essential for attaining sustainable practices that can lead to good sanitation and clean school environment. According to Azman (2024), students are often aware of the importance of solid waste management, and this can be reinforced by exposure to proper waste management practices (Ahmad et al., 2021). In this way, students can perceive solid waste disposal from a green environment. In this study, students agreed that solid waste is usually buried in the school compound. This practice should be encouraged more than waste burning which generates carbon dioxide emissions thereby contributing to global warming (Manea et al., 2024). To avoid this situation, schools need to adopt environmentally friendly solid waste management practices.

5. Conclusion and Recommendations

5.1 Conclusion

The following conclusions can be drawn as follows
Water sources for secondary schools in Kanungu and Wakiso districts included protected wells, unprotected wells, rainwater harvested from roof tops, piped water, water ferried to the schools by water tankers and school workers. The study found that many secondary schools still lacked water sources, even though access to sanitary facilities and water sources differed between the rural and urban schools. It was discovered that increasing the accessibility of soap, clean water, and working toilets was crucial for encouraging positive student attitudes as well as for advancing academic achievement and health.

Students in Kanungu and Wakiso districts showed differing knowledge toward water sources and sanitation facilities, with comfort and safety influencing their perceptions. Access to soap and handwashing stations significantly shaped positive views among students.

Regarding waste management and sanitation facilities, students in the districts of Kanungu and Wakiso had divergent opinions. The study underlined that promoting better hygiene habits and student wellbeing requires upgrading restroom conditions and offering soap and handwashing stations.

5.2 Recommendations

The following recommendations have been made from this study

1. To improve student health, attitudes, and academic performance, secondary schools in Kanungu and Wakiso districts should prioritize expanding on knowledge relating to access to clean water, soap, and functional sanitation facilities
2. There is need to maintain reliable and secure water sources and sanitary facilities while improving student comfort, safety, and access to soap and handwashing stations.
3. To foster improved hygiene practice and enhance student wellbeing, schools in Kanungu and Wakiso districts should invest in upgrading restroom facilities and ensuring consistent access to soap and handwashing stations.

Acknowledgement

The research leading to this paper was undertaken with financial support from Makerere University Research and Innovations (MAKRIF) grant. We gratefully acknowledge the research assistants for their roles in data collection, teachers and students in the schools visited and officials from the Ministry of Health; Ministry of Education and Sports; Ministry of Water and Environment; Kanungu and Wakiso district local governments for granting the interviews.

References

Agol, D., Harvey, P., & Maíllo, J. (2018). Sanitation and water supply in schools and girls' educational progression in Zambia. *Journal of Water, Sanitation and Hygiene for Development, 8*(1), 53-61. http://dx.doi.org/10.2166/washdev.2017.032

Atuhaire, P., Obua, J., Nassanga, G. L., Byaruhanga, M. B., & Ahimbisibwe, F. (2025). Students' attitudes towards water and sanitation facilities in selected secondary schools in Kanungu and Wakiso Districts during post COVID-19 era in Uganda. *East African Journal of Science, Technology and Innovation*, *6*(3). https://doi.org/10.37425/4dv4kh84

Auma, B., Musinguzi, M., Ojuka, E., Kigongo, E., Tumwesigye, R., Acup, W., ... & Opio, B. (2024). Prevalence of diarrhea and water sanitation and hygiene (WASH) associated factors among children under five years in Lira City Northern Uganda: Community based study. *PLoS One*, *19*(6), e0305054.. https://doi.org/10.1371/journal.pone.0305054

Barbier, E. B., & Burgess, J. C. (2020). Sustainability and development after COVID-19. *World development*, *135*, 105082. https://doi.org/10.1016/j.worlddev.2020.105082

Blick, S. E. (2024). Impact of a school-based water and hygiene intervention on child health and school attendance in Addis Ababa, Ethiopia: a cluster-randomised controlled trial. *BMC Med*, Vol 22,348. https://doi.org/10.1186/s12916-024-03558-x

Brannen, J. (2017). Combining qualitative and quantitative approaches: an overview. *Mixing methods: Qualitative and quantitative research*, 3-37. https://www.scirp.org/reference

Chirgwin, H., Cairncross, S., Zehra, D., & Sharma Waddington, H. (2021). Interventions promoting uptake of water, sanitation and hygiene (wash) technologies in low-and middle-income countries: an evidence and gap map of effectiveness studies. *Campbell Systematic Reviews*, *17*(4), e1194. https://doi.org/10.1002/cl2.1194

Chirgwin, H., Cairncross, S., Zehra, D., & Sharma Waddington, H. (2021). Interventions promoting uptake of water, sanitation and hygiene (wash) technologies in low-and middle-income countries: an evidence and gap map of effectiveness studies. *Campbell Systematic Reviews*, *17*(4), e1194. https://doi.org/10.1002/cl2.1194

Dawadi, S., Shrestha, S., & Giri, R. A. (2021). Mixed-methods research: A discussion on its types, challenges, and criticisms. *Journal of Practical Studies in Education*, *2*(2), 25-36. https://doi.org/10.46809/jpse.v2i2.20

De Buck, E., Van Remoortel, H., Hannes, K., Govender, T., Naidoo, S., Avau, B., ... & Young, T. (2017). Approaches to promote handwashing and sanitation behaviour change in low-and middle-income countries: a mixed method systematic review. *Campbell Systematic Reviews*, *13*(1), 1-447. https://doi.org/10.4073/csr.2017.7

Deborah, J. K., Vidal, D. G., & Dinis, M. A. P. (2021). Innovative use of plastic for a clean and sustainable environmental management: Learning cases from Ghana, Africa. *Urban Science*, *5*(1), 12. http://dx.doi.org/10.3390/recycling6010006

Hamlet, L. C., Chakrabarti, S., & Kaminsky, J. (2021). Reduced water collection time improves learning achievement among primary school children in India. *Water Research*, *203*, 117527. https://doi.org/10.1016/j.watres.2021.117527

Karon, A. J., Cronin, A. A., Cronk, R., & Hendrawan, R. (2017). Improving water, sanitation, and hygiene in schools in Indonesia: A cross-sectional assessment on sustaining infrastructural and behavioral interventions. *International Journal of Hygiene and Environmental Health*, *220*(3), 539-550. http://dx.doi.org/10.32598/JRH.14.3.2255.2

Kenney, E. L., Daly, J. G., Lee, R. M., Mozaffarian, R. S., Walsh, K., Carter, J., & Gortmaker, S. L. (2020). Providing students with adequate school drinking water access in an era of aging infrastructure: A mixed methods investigation. *International journal of environmental research and public health,* 17(1), 62. https://dx.doi.org/10.3390/ijerph17010062

Komarulzaman, A., de Jong, E., & Smits, J. (2019). Effects of water and health on primary school enrolment and absenteeism in Indonesia. *Journal of Water and Health*, *17*(4), 633-646. https://www.scirp.org/reference/referencespapers?

Manea, E. E., Bumbac, C., Dinu, L. R., Bumbac, M., & Nicolescu, C. M. (2024). Composting as a sustainable solution for organic solid waste management: Current practices and potential improvements. *Sustainability*, *16*(15), 6329. https://doi.org/10.3390/su16156329

McMichael, C. (2019). Water, sanitation and hygiene (WASH) in schools in low-income countries: a review of evidence of impact. *International journal of environmental research and public*

health, *16*(3), 359. https://doi.org/10.3390/ijerph16030359

Ngwenya, B. N., Thakadu, O. T., Phaladze, N. A., & Bolaane, B. (2018). Access to water and sanitation facilities in primary schools: A neglected educational crisis in Ngamiland district in Botswana. *Physics and Chemistry of the Earth, Parts A/B/C*, *105*, 231-238. https://doi.org/10.1016/j.pce.2018.03.006

Ohwo, O. (2019). Dimensions of inequality in urban and rural water, sanitation and hygiene services in Sub-Saharan Africa. *European scientific journal*, *15*(8), 144-162. https://doi.org/10.19044/esj.2019.v15n8p144

Olatunji, R. W., & Taiwo, N. T. (2021). Availability and adequacy of water, sanitation and hygiene (wash) facilities in secondary schools. *Journal of Environmental Science and Sustainable Development*, *4*(2), 177-194. https://doi.org/10.7454/jessd.v4i2.1079

Poague, K. I., Blanford, J. I., & Anthonj, C. (2022). Water, sanitation and hygiene in schools in low-and middle-income countries: a systematic review and implications for the COVID-19 pandemic. *International journal of environmental research and public health*, *19*(5), 3124. https://doi.org/10.3390/ijerph19053124

Rahmat, S. N., Al-Gheethi, A. A. S., Ayob, S., & Mohd Shahli, F. (2020). Development of dual water supply using rooftop rainwater harvesting and groundwater systems. *SN Applied Sciences*, *2*, 1-8. https://link.springer.com/article/10.1007/s42452-019-1862-9

Sang, E. J., Aming'a, R., & Omuse, E. (2023). Effects of Availability and Access to Safe Drinking Water on Students' Academic Performance in Secondary Schools in Muhoroni Sub-County, Kenya. *Journal of Research Innovations and Implications in Education,* 7(2), 317-325. https://doi.org/10.59765/xc94jbjs

Shimamura, Y., Shimizutani, S., Taguchi, S., & Yamada, H. (2022). The impact of better access to improved water sources on health, schooling, and water collection of girls and boys in rural Zambia. *The Journal of Development Studies*, 58(9), 1750-1771. https://doi.org/10.1080/00220388.2022.2048650

Tumwebaze, I. K., Sseviiri, H., Bateganya, F. H., Twesige, J., Scott, R., Kayaga, S., ... & Howard, G. (2023). Access to and factors influencing drinking water and sanitation service levels in informal settlements: Evidence from Kampala, Uganda. *Habitat International*, *136*, 102829. https://doi.org/10.1016/j.habitatint.2023.102829

UNICEF (2018). Drinking water, sanitation, and hygiene in schools: global baseline report 2018. UN. https://www.unicef.org/reports/drinking-water-sanitation

UNICEF (2022). Progress on drinking water, sanitation, and hygiene in schools: 2000-2021 Data update. Accessed from https://data.unicef.org/resources/jmp-wash-in-schools-2022/.

UNICEF and WHO (2020). Progress on drinking water, sanitation, and hygiene in schools: special focus on COVID-19. Division of Communication, 3 United Nations Plaza, New York 10017, USA. https://www.unicef.org/reports/progress-on-drinking-water

WHO (2018) Drinking water, sanitation and hygiene in schools. Global baseline report. New York: United Nations Children's Fund (UNICEF) and World Health Organization. https://www.who.int/publications/m/item/drinking-water-sanitation

WHO (2019) Improving health and learning through better water, sanitation, and hygiene in schools? Regional Office for Europe UN City, Marmorvej 51 DK-2100 Copenhagen Ø, Denmark. https://www.who.int/europe/activities/ensuring-water-sanitation

WHO (2020) Global progress report on water, sanitation, and hygiene in health care facilities. Geniva. https://www.who.int/publications

WHO, World Bank and UNICEF (2022). State of the world's drinking water: an urgent call to action to accelerate progress on ensuring safe drinking water for all. World Health Organization, Geneva. https://www.who.int/publications/i/item/

World Bank Group (2018). Water and Sanitation in Uganda. In Clarence Tsimpo and Quentin Wodon (eds). The World Bank, Washington DC. https://documents.worldbank.org/en/publication/documents-reports

World Health Organization. (2021). *WHO global water, sanitation and hygiene: annual report 2020*.

WHO Global water, sanitation and hygiene: Annual report 2021