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Research Paper

Promoting safe and inclusive water and sanitation services for students with physical disabilities in primary schools: a concept mapping study in Ghana

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ABSTRACT

Improving water, sanitation, and hygiene (WASH) services in schools is crucial to providing inclusive environments for all children to thrive. Particularly for children with disabilities, the school environment can serve as a barrier to their access to and use of WASH facilities. This paper examines strategies and programs needed to promote safe and inclusive WASH services for students with physical disabilities in primary schools in Ghana. We recruited 22 stakeholders from the Upper West Region of Ghana to complete an online concept mapping exercise. Participants identified eight themes for promoting safe and inclusive access to WASH services for students with physical disabilities. These themes included 'building special schools,' 'guidance services,' 'ensuring non-discrimination and fair treatment,' 'additional programs for PWDs,' 'local government interventions,' 'public sensitization,' 'teacher training,' and 'supervision.' These findings can assist stakeholders in identifying strategies and prioritising programs in the short run to improve WASH among students with physical disabilities.

Key words: concept mapping, physical disability, stakeholders, WASH

HIGHLIGHTS

- This study aims to improve WASH services in primary schools in Ghana for students with disabilities.
- Twenty-two stakeholders generated eight themes to promote inclusive access to WASH facilities.
- The GO-zone tool was used to analyze the ease and importance of different strategies.
- Results suggest prioritizing strategies that are both easy to implement and important.
- These findings can help stakeholders improve WASH services for students with disabilities.

1. INTRODUCTION

Even though the new UN Convention on the Rights of Persons with Disabilities (PWDs) guarantees equitable access to social services and participation in school, 90% of children with disabilities do not attend school in low- and middle-income countries and have 10% lower attendance rates than their peers (Coulby & Zambeta 2005; Pessoa *et al.* 2009; Erhard *et al.* 2013a, 2013b). Additionally, the school environments in most low- and middle-income countries do not fully provide a conducive learning environment for persons with physical disabilities. Martin *et al.* (2021) described physical disability as a condition that affects a person's physical functioning, mobility, dexterity, or stamina. According to Jones *et al.* (2002), persons with physical disabilities include anyone who (a) cannot walk and needs a mobility aid, like a tricycle, wheelchair, or walking stick; (b) can walk but needs help, like crutches or a handrail; or (c) can walk but has other physical weaknesses or lack of coordination, like a weak or shaky grip or limited arm/hand movements (p. 7).

Given the challenges faced by children with disabilities in accessing education in low- and middle-income countries, it is important to consider the school environment and its ability to accommodate their needs. One crucial aspect of this is the WASH (water, sanitation, and hygiene) environment in schools. According to the World Health Organization (WHO) and UNICEF, the WASH environment in schools consists of issues pertaining to (1) quality, quantity, continuity, and accessibility of drinking water to all students; (2) student-per-toilet ratios, menstrual hygiene facilities, cleanliness, accessibility to all

students; and (3) excreta management systems and hygiene education, group handwashing, menstrual hygiene materials, and accessibility to all students (UNICEF & WHO 2018). Conceição (2016) describes schools with improved or appropriate WASH services as those that have a 'functioning and dependable water system that delivers clean and sufficient water for all school purposes, including toilet usage, handwashing, and drinking' (p. 5). Conceição (2016) further emphasized that sanitation facilities should be private, safe, accessible, clean, and separate for boys, girls, and workers. While there are clear guidelines and standards for what constitutes appropriate WASH services in schools, the reality is that many schools, particularly in low-income countries, still lack access to these basic necessities.

For years, international organizations such as the WHO and the United Nations (UN) have emphasized the significance of safe WASH services. In addition, the Sustainable Development Goal (SDG) targets call for explicit attention to gender equality and social inclusion and place a high value on ensuring that all students, particularly those with disabilities, have appropriate access to WASH facilities in schools (Grant *et al.* 2016). However, despite progress in promoting inclusive WASH services in schools, over half of the schools in Sub-Saharan Africa do not have access to safe drinking water (UNICEF & WHO 2018). With regard to sanitation, it is estimated that 44% of schools globally lack basic sanitation services, and fewer than 50% of schools have toilets accessible to students with limited mobility (UNICEF & WHO 2017). Despite the efforts of international organizations and the inclusion of WASH services in the SDGs, there is still much work to be done to ensure that all students, particularly those with disabilities, have access to safe and inclusive WASH services in schools. This is particularly true when it comes to understanding and addressing the needs of persons with physical disabilities.

The nascent literature on WASH services for persons with physical disabilities often concentrates on water services at the household level, with little attention paid to access to safe drinking water and basic sanitation for persons with physical disabilities within institutions, particularly school settings (Erhard *et al.* 2013a; Chigunwe & Tembachako 2017). It is important to note that for the themes of physical disability and population, the references cited represent the most current information available at the time of writing. This highlights a gap in the literature and underscores the need for further research in these areas. Using a concept mapping approach (Trochim & Kane 2005; Rosas 2012; Katz 2015), this research examines stakeholders' perspectives on strategies and programmes to promote safe and inclusive WASH services for primary schools. By involving stakeholders in the identification of solutions, we aim to ensure that the proposed interventions are relevant, sustainable, and effective. The importance of WASH in schools cannot be overstated, as it is essential for the health and well-being of students and staff. A participatory approach to identifying solutions for WASH in schools has the potential to lead to more successful and impactful programmes.

2. STUDY CONTEXT/METHODS

2.1. The setting of the study

The study was conducted in the Upper West of Ghana. The 2021 Ghana census estimates the region's population at 901,502, representing 2.9% of Ghana's population, with 48.8% males and 51.2% females (Ghana Statistical Service 2021). Nationally, it is estimated that a total of 3.6% of Ghana's population has difficulties walking or climbing stairs, of which 4.4% are females and 2.8% are males (Ghana Statistical Service 2021). Out of the 3.6% of Ghana's population who have various mobility issues, 3.5% are 5 years or older. It is estimated that 702,110 people or 0.8% of the population have various physical disabilities (Ghana Statistical Service 2010). In the Upper West Region, it is estimated that there were 25,821 people with disabilities as of 2010 (Ghana Statistical Service 2010). As of 2016, the Upper West Region had a total of 1941 primary schools, including 54 crèches/nurseries, 707 kindergartens, 708 primary schools, and 472 junior high schools (Ghana Statistical Service 2018). Basic school-level enrolment increased from 229,295 to 290,224 from 2010 to 2016. However, this increase may reflect population growth rather than progress towards achieving SDG4 (i.e., inclusive education for all). Also, the Upper West Region has a non-completion rate of 53% for primary school, 15% for lower secondary, and 29% for upper secondary. In rural areas, completion rates are lower, and the number of students who do not complete each level is greater than in urban areas (Ministry of Education 2020).

According to data from the Ghana Statistical Service, in 2016, only 878 of the 1941 basic schools in the Upper West Region had toilet facilities, representing approximately 45.2% of the total number of basic schools in the region with toilet facilities. Compared to previous years, data showed fewer toilet facilities available, dropping from 1,087 in 2013 to 878 in 2016, representing a 20.9% decrease over 4 years. Additionally, the Ghana Statistical Service reports that only 596 (30.7%) of the Upper West Region's 1941 basic schools have access to quality/good drinking water (Ghana Statistical Service 2018). Similar data

from Abanyie *et al.* (2021) show that only 37.9% of schools in the Wa municipal area, the largest city in the region, had access to potable water, out of which 27.5% of these sources were faecally polluted. In addition, WASH environments, as described by Abanyie *et al.* (2021), show that 7.4% of schools had elevated slabs, making them inaccessible and difficult to use for persons with physical disabilities. Given the high number of persons (25,821 PWDs) with physical disabilities in the region and the challenges they face, it is important to identify strategies that can be used to improve the conditions of WASH, especially for students with physical disabilities.

2.2. Research design and participant recruitment

A participatory mixed-method technique, concept mapping, was used for the study (Trochim & Kane 2005). Concept mapping is a research methodology that produces visual representations of the ideas or concepts of individuals or groups. Described by Trochim & Kane (2005) as a form of structured conceptualization, it combines group processes with statistical analyses to create a composite thinking framework. This methodology integrates input from multiple sources with differing expertise or interests to create a structure that guides action planning, programme development, and evaluation in research studies. As Kane & Trochim (2007, p. 7) explain, concept mapping creates a visual geography of ideas authored by stakeholders from various communities of interest. Combined with specific analysis and data interpretation methods, the resulting maps can guide planning and evaluation efforts on issues that matter to the group.

A major advantage of concept mapping is that it allows researchers to comprehend complex systems in terms of intra- and inter-personal connections because of their psychological and sociological roots (Sutherland & Katz 2005). This means that concept mapping can help researchers understand how different factors within a system are interconnected and how they influence each other. By visualizing these connections, researchers can gain a deeper understanding of the system as a whole and identify key areas for intervention. This advantage makes concept mapping particularly relevant for addressing problems related to promoting safe and inclusive water and sanitation services for students with physical disabilities in primary schools. In Ghana, this issue is particularly pressing due to the lack of adequate facilities and resources available to students with physical disabilities. By using concept mapping, researchers can gain insights into how different concepts are related to each other within the context of promoting safe and inclusive water and sanitation services for these students. The maps created by concept mapping will provide a framework or structure that can immediately be used to guide action planning, programme development or evaluation, and measurement. Overall, this research offers a powerful tool for promoting safe and inclusive water and sanitation services for students with physical disabilities in primary schools in Ghana by providing a comprehensive understanding of the problem at hand through the visual representation and integration of multiple perspectives.

For this study, participants were purposively selected using research teams' wide network of practitioners and policymakers within the WASH and disability sectors in Ghana. Although a sample size of 25 was initially agreed upon, 29 stakeholders ($n = 29$) were ultimately selected for the study due to high interest from various stakeholder groups. This number falls within the range suggested by Trochim & Kane (2005) in their concept mapping studies, which is 6–33 participants. However, it is important to note that this deviation from the initially agreed-upon sample size may have introduced some limitations to the study. One such limitation is representativeness: the increase in sample size may have affected the representativeness of the sample if the additional participants were not representative of the population of interest. To address this limitation, we ensured that the additional participants were representative of the population of interest by using appropriate sampling methods (Memon *et al.* 2020). The list of stakeholder participants included policymakers (3), non-governmental organizations (5), water sector (2), education sector (7), leaders of community-based disability groups (2), and students with physical disabilities (5). Participants were purposively selected to ensure a fair representation of all stakeholder groups. We completed the entire concept mapping process, from initial planning to final analysis and interpretation of results, within a 2-week timeframe. This allowed us to quickly gather and analyse data from stakeholders. We then organized a stakeholder consultative meeting to discuss the findings. Regarding gender representation, 13 participants were males and 9 were females.

2.3. Data collection and analysis

For data collection and analysis, Groupwisdom (The Concept System® groupwisdom™ [Web-based Platform], 2022) web app software was used. The data collection process was structured into four major sections: participants' demographic information, brainstorming, sorting, and rating.

The participants in the concept mapping included policymakers, non-governmental organizations, educators, leaders of community-based disability groups, and students with physical disabilities. Unfortunately, not all invited participants could attend the idea generation and brief Zoom meeting. Only 22 out of the 29 invited individuals showed up. Twenty-two participants completed the demographic section of the concept mapping, 21 completed the brainstorming section, 19 completed the sorting section, and 17 completed the rating component.

2.3.1. Idea generation

The data collection began with a Zoom meeting in which participants were briefed on the challenges children face while using WASH facilities in primary schools. Next, we established and discussed the focus question to ensure comprehension by all participants. The focus question for the concept mapping was 'What strategies and programs are needed to promote safe and inclusive WASH services in schools?' During the Zoom training, we took participants through the discussion process to ensure they maintained respect for each other's opinions when the stakeholders' workshop was being held. Following the meeting, participants were sent an invitation to the brainstorming activity, where they were required to identify strategies or programmes needed to promote safe and inclusive WASH services for schools.

First, we asked participants to make as many statements on the study issue as feasible using the brainstorming prompt. In all, 167 statements were generated. Next, the research team 'cleaned' the participants' responses by removing duplicates and correcting typos and incomplete sentences. After these processes, 108 statements relevant to the research objective were maintained.

2.3.2. Sorting and rating

The next step involved participants sorting the final statements generated from the brainstorming stage into conceptual piles. To do this, participants were asked to arrange statements into piles. Participants further generated labels for each pile they created based on their shared characteristics, e.g., 'public and community sensitization.' Participants were asked to follow three main guidelines: (1) not placing a single statement in multiple piles, (2) not placing all statements under one pile and lastly, (3) a single statement cannot make up a pile. Four participants were later excluded from the analysis because they did not meet the guidelines. To ensure heterogeneity across piles and avoid one-item piles, the system was programmed to accept not less than four statements per pile.

The rating activity was done independently after the sorting was approved. This step required participants to rate all the statements and clusters identified using a five-point Likert scale. The rating of each statement was done twice. First, based on how important participants believe a strategy and/or programme was to promote safe and inclusive WASH services in schools. Second, participants rated initiatives on the ease of implementation. The rating was done using a Likert scale that ranged from 1 (not important/very difficult) to 5 (extremely important/very easy). The ratings for both the individual items and the clusters can be found in the Supplementary Material. Similar to the sorting, only participants who completed the rating and got approved had their data included in the analysis. In all, 17 participants completed both ratings.

2.3.3. Representation, analysis, and interpretation

Multidimensional scaling and cluster analysis were employed to ensure rigorous analysis. First, the group wisdom was used to create cluster maps by taking the sorted data across all participants and creating a basic cluster map in which a point within a cluster represented each statement on the map, and statements were then grouped based on relative importance and/or ease of implementation. To determine the strength of relationships between different clusters or groups of ideas, we used a technique called bridging (Trochim & Kane 2005). The bridging values were calculated by multiplying the co-occurrence frequency of two clusters by the product of their average ratings and dividing this value by the product of their individual cluster sizes. This resulted in a numerical value that represented the strength of the relationship between the two clusters. The higher the bridging value, the stronger the relationship (Trochim & Kane 2005). In our study, we assigned bridging values to links between clusters and statements. These values indicated how strongly these clusters were related and helped us gain a better understanding of how different ideas were connected (Trochim & Kane 2005).

Next, pattern match and GO-zone diagrams were generated to represent the results. Pattern matching is a technique for visually identifying overarching patterns in data (Kane & Trochim 2007). It involves comparing multiple patterns of ratings to determine if there is overall agreement or disagreement between them. The pattern match graph, also known as the 'ladder' graph, is a bivariate comparison of cluster average ratings that displays aggregate patterns (Kane & Trochim 2007). It is used to compare the ratings of multiple groups or waves of measurement for a single variable or to compare multiple variables. We

also used a GO-zone technique to determine the best techniques based on recommendations from stakeholders during concept mapping. A GO-zone is a bivariate plot of two patterns of ratings at the statement level. The bivariate space is divided into quadrants based on the average x and y values (Kane & Trochim 2007). For instance, when comparing the importance and feasibility ratings of statements, the GO-zone is the quadrant that displays statements rated above average in both importance and feasibility (Kane & Trochim 2007). A qualitative commentary was made to deepen the diagrams' comprehension.

A workshop was later organized with 35 stakeholders from the Upper West Region following the completion of the study. All of these stakeholders were also participants in the study itself. Additionally, invitations were extended to heads of government stakeholder institutions to attend the workshop and provide their insights. The goal was to seek their perspectives on the strategies and clusters generated during the concept mapping process. The findings were presented to the stakeholders for their comments/feedback.

The study was reviewed and approved by the General Research Ethics Board at Queen's University in Kingston, Canada, and the Committee on Human Research, Publications and Ethics at the Kwame Nkrumah University of Science and Technology in Kumasi, Ghana. To ensure participants' anonymity, the system was configured to prevent responses from being linked to their user accounts. Ethical considerations were taken into account throughout the survey process. All relevant ethical protocols were adhered to, including obtaining informed consent from participants, ensuring the confidentiality and anonymity of responses, and minimizing any potential harm or discomfort to participants.

3. RESULTS

The participants in the study were mostly between the ages of 25–50 and came from various backgrounds. There were also two teens with physical disabilities in attendance. Having a mix of ages and backgrounds brought a range of perspectives and ideas to the table, which benefited the idea generation and the rest of the study. For analysis, we used the sorting data from 15 participants whose sortings were approved and who also completed the rating of the statements. Four participants' sortings were rejected due to non-compliance with the sorting instructions.

3.1. Cluster analysis

In this section, we used a cluster map diagram to visually represent the relationships between different statements generated during the brainstorming sections. The participants developed and named eight distinct clusters (Figure 1). These clusters comprised 'infrastructure,' 'guidance services,' 'ensuring non-discrimination and fair treatment,' 'additional programs or additional programs for PWDS,' 'local government interventions,' 'public and community sensitization,' 'training of teachers,' and lastly, 'supervision.' Average bridging values are shown for each cluster. Bridging values usually range from 0 to 1 and explain how each item on the map is connected to the statements surrounding it by the degree to which the aggregated sorting data support the connection. The numbers on the cluster map correspond to the statements listed in the Supplementary Material, Annex. Each statement is categorized under a cluster theme and has an identifiable number.

3.1.1. Sensitization

Themes under these mostly covered strategies or policies to educate and empower community members to promote the inclusion and acceptance of persons with physical disabilities. Participants believe that public sensitization will reduce the stigma persons with physical disabilities face and enable people to assist persons with physical disabilities in using WASH services. The sensitization cluster has statements with relatively low mean bridging values of 0.39, indicating that these statements were frequently sorted with nearby statements.

3.1.2. School infrastructure

This cluster covered building accessible features in WASH facilities and general disability WASH infrastructure development. The building of the special schools' pile had an average bridging value of 0.11, indicating how close together these statements were.

3.1.3. Guidance and counselling

Common themes in this cluster included motivation and counselling. This pile had a relatively low average bridging value of 0.27, signifying the closeness of the statements to each other. Examples of the statements captured under this cluster include providing psychological support to students with physical disabilities and motivation to boost their confidence in using basic

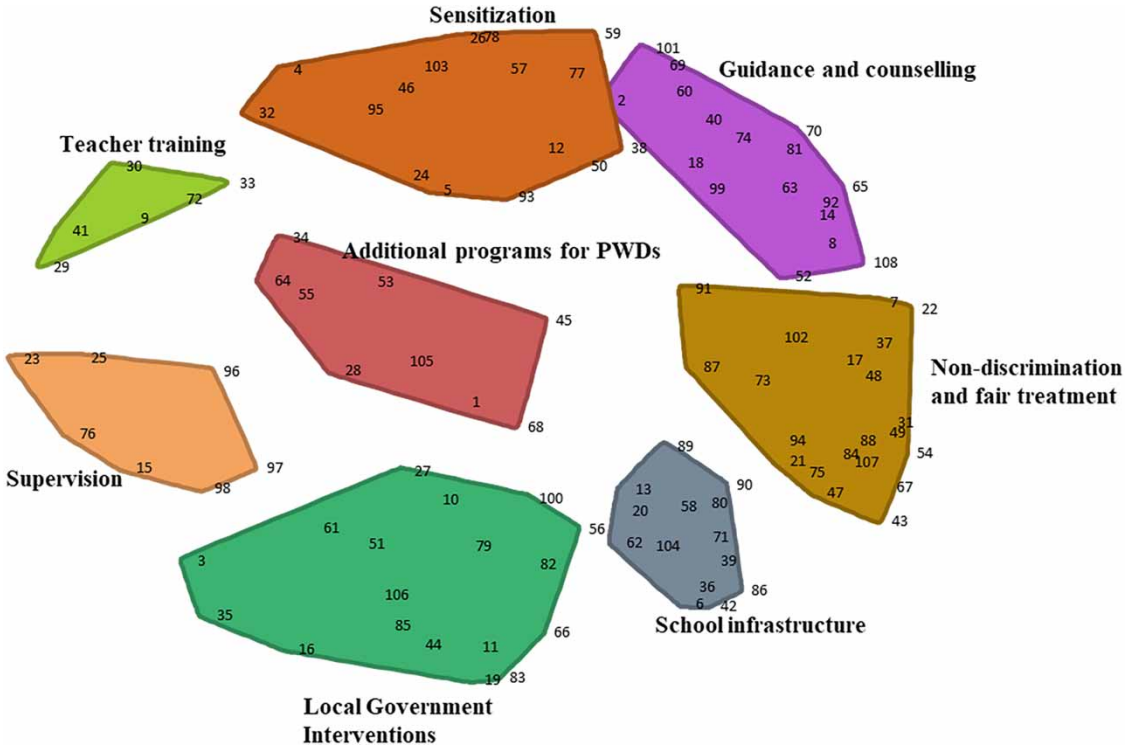

Figure 1 | Cluster map of WASH strategies.

WASH facilities. The proposed strategies also looked at counselling for bullies of persons with physical disabilities to end stigma and promote safe and inclusive access among all students.

3.1.4. Non-discrimination and fair treatment

This theme is organized around human rights, fair treatment, equal opportunities, and the removal of legal barriers. Statements under this category include eliminating social and cultural norms that limit spaces and opportunities for school children with physical disabilities. Participants also proposed the development of a roadmap and punitive measures to sanction supervisors or authorities who deliberately deny children with disabilities from accessing WASH facilities or other educational facilities.

3.1.5. Additional programmes

This cluster for persons with physical disabilities focused on developing additional educational programmes to enable persons with physical disabilities to tap into other potentials or talents. The cluster had statements that were closely related to the non-discrimination cluster.

3.1.6. Local government intervention

This pile had the most statements. Participants believe that governments play a large role in education and WASH. The theme of local government interventions encompassed government support for the provision of WASH services and infrastructure, policy formation and implementation, resource mobilization and monitoring, and development of a WASH database and reporting. During the consultative meeting with stakeholders, participants explained that although the policies exist on paper, there are no resources or systems to ensure their implementation. Participants therefore proposed backing the implementation of the Inclusive Education Policy with the necessary financial and human resources.

3.1.7. Teacher training

This theme centred on providing in-service training and educating new teachers on inclusive and disability-related teaching techniques and practices. For instance, participants suggested providing in-service training to teachers caring for persons with

physical disabilities in primary schools. Another recommendation called for the inclusion of disability studies in teacher training courses to ensure teachers are prepared to deal with disability-related issues in their service schools. During stakeholder discussions, some teachers revealed that not all teachers possess the necessary skills to teach and care for persons with physical disabilities. For instance, a participant mentioned that 'some persons with physical disabilities drop out of school because their teachers are unwilling to help them.'

3.1.8. Supervision

This theme addresses management strategies at the regional and national levels to ensure that WASH programmes, policies, and frameworks receive sufficient consideration. Strategies under supervision also addressed the government's monitoring and adapting policies and frameworks to meet changing demands and periods. Participants also called for parents' involvement in ensuring their children's WASH needs are met.

3.2. GO-zones

In this section, we utilize the GO-zone to visualize the most effective strategies for addressing inadequate access to WASH for individuals with physical disabilities. The GO-zone is a specific range of values that meet certain criteria and are considered optimal for decision-making. By identifying and analysing the GO-zone, we can gain valuable insights into effective strategies that are easy to implement. This allows us to make more informed decisions. Figure 2 is a bivariate plot showing the relevance of the 108 statements vs. their ease of implementation. The plot is divided into four quadrants based on how important and easy it is to implement each strategy on average. The strategies ranked above average by participants on relevance and ease of importance are found in the upper right quadrant. The strategies in the lower left quadrant are deemed less important and relatively not simple to implement, whereas the strategies in the upper left quadrant are simple to implement but comparatively less important. The GO-zone quadrant assists policymakers in determining where to concentrate their efforts to effect change.

3.3. Pattern match

The rating results are presented using a pattern match diagram that shows stakeholder assessments of the average relative relevance and ease of implementing strategies across clusters (see Figure 3).

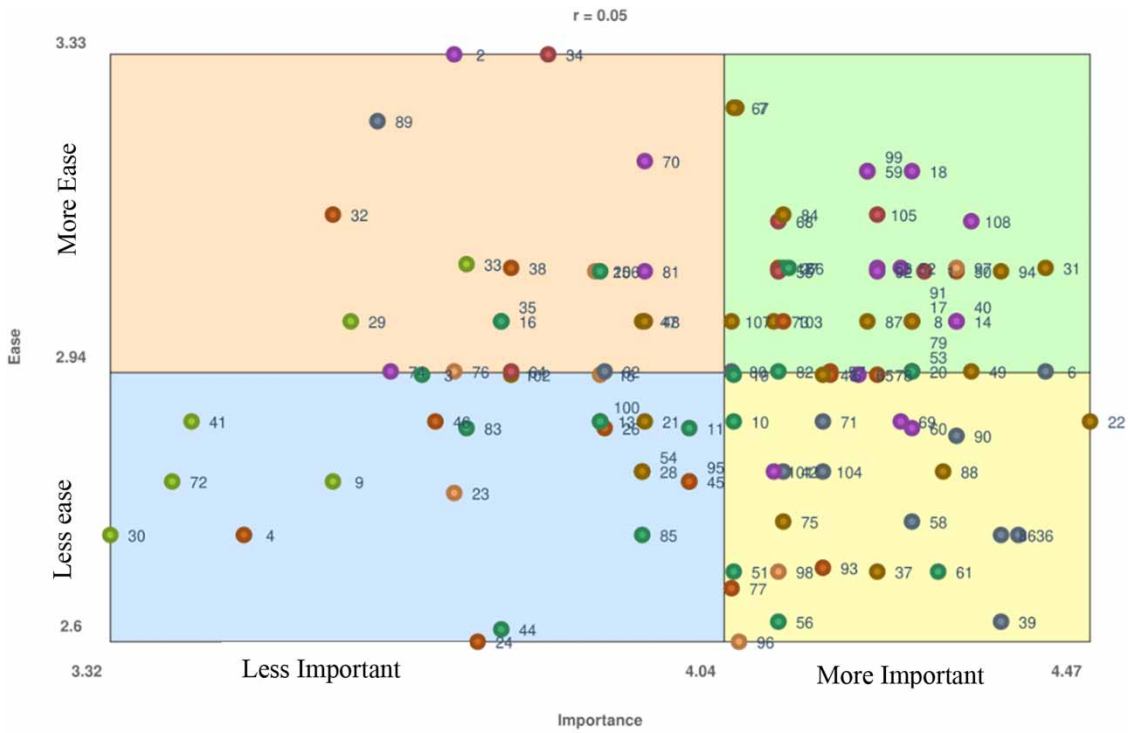

Figure 2 | Bivariate 'GO-zone' plot showing importance and feasibility ratings for the 108 strategies.

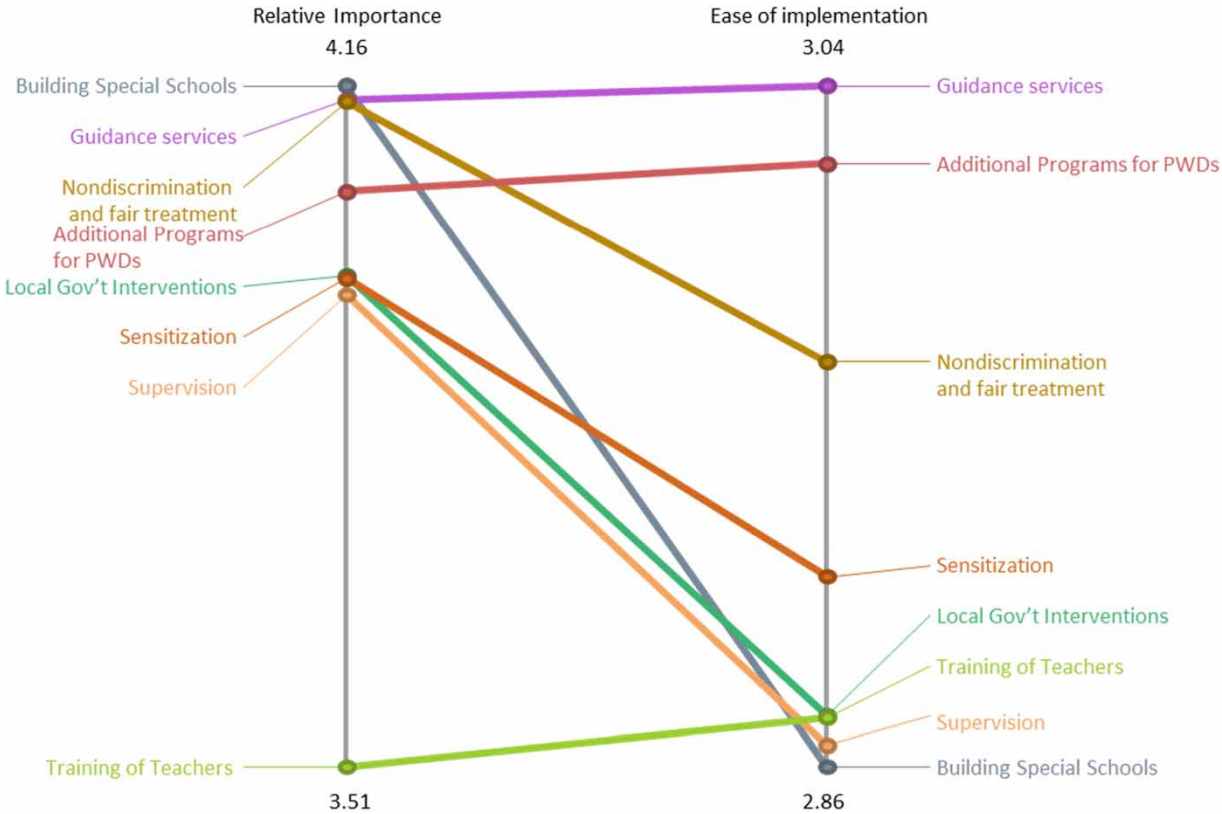

Figure 3 | Pattern matches showing ratings for all participants.

School infrastructure for people with disabilities was rated the most important strategy and the most difficult to implement. This is because infrastructure is a resource- and time-intensive activity. However, inclusive infrastructure creates a thriving environment for students with physical disabilities. Additional programmes pile was ranked third on relevance and second on the ease of implementation. 'Training for teachers' in inclusive schools was ranked as the least important factor but ranked fifth in the ease of implementation.

The analysis of each strategy's perceived importance among all stakeholder groups revealed some differences (refer to Figures 4–6 in the Supplementary Material, Annex). Non-governmental organizations rated building special schools as more important than other groups, but it was still highly rated by all. Guidance and counselling had a stronger correlation with improving the lives of students with physical disabilities compared to other groups but was still highly rated by all. Teachers and government sector representatives placed non-discrimination at higher importance compared to other groups, but it was still highly rated by all. Local government intervention and sensitization were both highly rated by all stakeholder groups. Supervision and training of teachers were also highly rated by all stakeholder groups. Despite some differences in perceived importance across different stakeholder groups, there is a general consensus that each strategy is crucial for improving outcomes for PWDs in Ghana and should be considered when designing interventions or policies aimed at enhancing their quality of life.

4. DISCUSSION

In the following discussion, we will explore the strategies and programmes needed to promote safe and inclusive WASH services for primary schools in Ghana. We will be examining the various approaches that can be taken to ensure that these services are effective and accessible to all students, and will consider the challenges and opportunities that arise in this context. Through this analysis, we aim to provide valuable insights into how we can support the provision of WASH services in primary schools and to identify the most effective strategies for promoting safe and inclusive WASH services in this setting. Ensuring everyone has access to safe water and sanitation is a key component of the UN's SDGs. The United Nations (2018a)

advocates that no one should be left behind in accessing WASH services irrespective of income, gender, age, ethnicity, migratory status, disability, or geographical location. However, persons with physical disabilities, regardless of gender, encounter enormous obstacles in their daily lives (United Nations 2018b). The lives of persons with physical disabilities and their connection with the community and the environment are at the core of disability studies.

The study employed concept mapping to gather stakeholder perspectives on strategies for promoting safe and inclusive water and sanitation services for students with physical disabilities in primary schools. Concept mapping proved to be a powerful technique for gaining early insights into the problem at hand. By using clustering and pattern-matching techniques, we identified patterns and relationships among ideas, providing valuable insights into stakeholder perspectives and highlighting key areas for further investigation. The benefits of conducting a concept mapping study in this context include its ability to visually represent complex ideas and relationships, allowing for a more comprehensive understanding of the problem. This approach enabled us to gain a deeper understanding of the needs and concerns of students with physical disabilities in primary schools in Ghana and to develop responsive strategies for promoting safe and inclusive water and sanitation services.

Eight distinct clusters were generated after the generation of 108 statements through brainstorming. Key strategies for promoting safe and inclusive water and sanitation services include building special schools, providing guidance and counselling, promoting non-discrimination, implementing additional programmes for PWDs, local government intervention, sensitization, supervision, and training of teachers. These were mostly organized around activity types and implementing stakeholders. On the other hand, strategies involving 'guidance and counselling services' and 'non-discrimination and fair treatment' (similar clusters that deal with reducing stigma and empowering people with a physical disability) were ranked as extremely important and appear promising in terms of ease of implementation. The study emphasizes the importance of involving multiple stakeholder groups in identifying key factors for improving the quality of life of students with physical disabilities in primary schools in Ghana. Differences in stakeholder perceptions of what is most important should be considered when designing interventions or policies. Incorporating these insights may lead to significant progress towards achieving greater inclusion and equity within education systems.

The 'GO-zone' shows the best set of strategies that, when implemented, will greatly improve WASH conditions among persons with disabilities. Most of the statements in the GO-zone were mostly strategies tackling issues of marginalization and were deemed important by most participants. For example, participants attributed the worsening state of WASH among students with disability not only to the lack of accessible WASH facilities but also to the lack of support for persons with physical disabilities to use the existing facilities (Groce *et al.* 2011). In addition, stigma was raised as a major factor influencing the poor use of WASH facilities. During one of the discussions with the stakeholders, for example, a teacher noted that 'children with physical disabilities are terrified to use the toilet in school because they may soil themselves and their friends may laugh at them.' This highlights the stigma, which can be a significant barrier to providing safe and inclusive WASH services in primary schools. The fear of being ridiculed or ostracized can prevent children with disabilities from accessing the facilities they need and can lead to a range of negative outcomes, including poor hygiene, missed school days, and decreased self-esteem (Erhard *et al.* 2013a, 2013b).

Participants recommended guidance and counselling to improve children's coping mechanisms and reduce their reactions to stigma. Clusters such as guidance and counselling were comprised mostly of activities geared towards improving self-esteem and reducing psychosocial stresses in children with physical disabilities. This recommendation supports previous studies (Mattsson 1972; Woolfson 2004), which, for example, have highlighted that reducing the emotional and psychosocial stresses associated with the use of WASH facilities would improve access among children with disabilities. In addition, it was recommended that strategies be developed to improve self-empowerment courses for people with disabilities, in which participants will be taught essential life and coping skills. This novel idea may enhance the self-esteem of persons with physical disabilities and empower them to cope with the physical and structural challenges faced in using WASH facilities in the school.

Participants suggested several strategies under the overarching topic of sensitization, which called for collaborative public education efforts to change the narrative of disability being a curse and educate people on how to support people living with physical disabilities. For instance, 'living with a person with a disability,' an awareness campaign focused on sensitization, was proposed by the participants as a strategy to promote the common use of shared facilities. The participants explained that one obstacle that makes it difficult for people with disabilities to use certain facilities is that those facilities are unhygienic. For example, a person with a disability who participated in the stakeholder meeting asked, 'How do you expect me to crawl and enter a toilet so dirty with faeces scattered everywhere?' People with disabilities are at the greatest risk when conditions like these exist because they are more likely to contract health-related illnesses like cholera and diarrhoea.

A common strategy among the participants was to make existing WASH facilities more accessible and to build accessible WASH facilities. In the short term, enhancing the accessibility of buildings through the installation of ramps and rails, among other accessibility features, would significantly improve the overall usability of WASH facilities for people with disabilities. This is consistent with the idea of sustainably adapting buildings to meet the needs of the current environment while preserving the buildings (Badawy *et al.* 2020). Long-term strategies such as the construction of specialized WASH facilities, public WASH facilities that are accessible to the public, and specialized educational institutions, were among the strategies that were put forward.

Strategies under training are also considered relevant to addressing WASH issues among persons with physical disabilities. For example, one of the unique measures was to train care staff to aid persons with physical disabilities in inclusive schools during their use of WASH facilities. Because of this, people with disabilities would rely less on their instructors and friends to support them, and as a result, they would experience fewer negative effects such as stigma. In addition, participants advocated for an increase in the amount of collaborative supervision and monitoring of WASH activities in educational institutions. Stakeholders have suggested from Ghana Education Services and Disability-related Organizations that they are not involved in the majority of activities relating to WASH. An approach based on collaboration would enable them to contribute to and provide feedback on implementing policy changes that would significantly enhance the government's response to WASH.

Future research may shed light on how the effects of several strategies that are easy to implement but not very effective add up compared to the effects of strategies that are effective but hard to put into practice.

5. LIMITATIONS

This research has certain limitations that should be acknowledged. First, a concept mapping methodology is a one-of-a-kind approach designed to capture diverse stakeholder perspectives. Unfortunately, despite attempts to ensure a representative sample, we have unequal stakeholder and gender representation. Considering the topics from a few stakeholders' perspectives and leaving out some of them can be considered a limitation. The results may be skewed towards the category of stakeholders who participated. It would have been ideal to employ a gender lens to analyse the generated strategies. Unfortunately, because we did not undertake gender-specific group concept mapping, we cannot offer sex-disaggregated data and cluster maps. Nevertheless, a gender lens might uncover certain gender-related narratives and contribute to reducing gender marginalization in WASH.

6. CONCLUSIONS

Our study has provided valuable insights into the perspectives and recommendations of stakeholders regarding the provision of WASH services for students with physical disabilities in primary schools. In addition, this research identifies several crucial areas for improving WASH among primary school students with physical disabilities (e.g., guidance and counselling, public sensitization, local government intervention, etc.). In the short term, the GO-zones provide policymakers with the most viable choices for enhancing WASH in educational institutions. For the long term, however, we advise using results from the pattern matches since they include the most relevant strategies proposed by stakeholders with more extensive knowledge of WASH and disability. Furthermore, we advocate for further engagement with a broader group of stakeholders through the life of WASH policies and programmes. Through broader consultations, stakeholders can contribute to developing, monitoring, and implementing effective WASH programmes. In addition, policymakers and development organizations may use the study's overarching themes and statements to understand better and address WASH issues. For example, for a deeper understanding of how children with physical disabilities perceive WASH concerns, future research might benefit from using strength-based art-based methodologies, such as drawing. This can further elaborate on the themes generated in this study.

DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

CONFLICT OF INTEREST

The authors declare there is no conflict.

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