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Safety and hygiene interventions to protect learners in the school environment: PPE considerations for primary school learners in Zimbabwe.

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ABSTRACT

Many children in developing countries learn in unsanitary conditions, exposing them to diseases that threaten their educational performance and progress. As the world continues to evolve, and new challenges emerging, there is need to review measures taken in mitigating the spread of disease and injury of learners as they clean the school environment. This study discussed potential hazards learners encounter and measures that are being implemented to safeguard the health and safety of learners during school cleaning activities. It also focused on generating prototype designs for personal protective equipment (PPE) that are appropriately sized, provide enhanced protection for learners, and are better suited for the specific activities involved. The study was underpinned by Bronfenbrenner's bio-ecological model as well as Dunlap's Protection Theory. A multiple-site case study, mixed methods approach was used to study four rural and four urban primary schools in two districts in the Midlands Province of Zimbabwe. Purposive sampling was employed to select a sample of eight schools based on the extent to which learners are involved in cleaning activities as well as 16 teachers and 96 learners. Potential hazards identified during the study include respiratory infections, dysentery, cholera, diarrhoea, bilharzia, soil-transmitted worms and injuries as potential hazards in primary schools. The results indicated lack of PPE usage in most schools. Observations showed that during cleaning the majority of learners either wore school uniforms or substituted them with old clothes. For the schools that had any, the PPE was adult sized and not suitable for primary school learners. The study recommends that government put in place legislation that would guide schools in safeguarding the health and safety of learners during cleaning activities; schools enable learners, teachers, and community members to work together in an effort to promote health and safety issues at their school; schools engage in small fundraising projects, that would enable them to acquire PPE for the learners. Ensuring the availability and usage of appropriately sized PPE can help mitigate potential risks and promote a safe learning environment for all primary school learners. To this end, appropriately sized PPE designs for learners were created. These included gloves, face mask, apron and overalls for full body protection, easy-to-bend cleaning boots and detachable leg pads.

KEYWORDS: Health and safety hazards, Personal Protective Equipment (PPE), Intervention, Water, Sanitation and Hygiene (WASH), Learners

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Introduction

Attending school in a clean and safe learning environment is every child's right. However, many children in developing countries are exposed to unsanitary conditions, exposing them to risks of contracting diseases that hinder their educational performance and progress. The World Health Organisation (WHO, 2004) notes that a healthy school environment can improve children's learning, thereby contributing to their development into productive members of society. Unfortunately, even in the best of times, children are little germ factories as they easily contract and spread infections to their peers and families. Therefore, promoting healthy practices and taking steps to better protect young people from health risks is important for the prevention of health problems in adulthood, and for countries' future health (Taghizadeh, et al., 2016; Workman et al., 2022).

Fotso (2016) argued that; quality education for all, as envisaged in the Dakar Framework for Education of 2000 and SDG 4, cannot be attained without ensuring healthy and safe school environments. However, addressing the problems in child health remains one of the greatest challenges, especially for policies and programs related to the Millennium Developments Goals (MDG) in developing countries. In order to overcome child health problems some African countries have taken Water, Sanitation, and Hygiene (WASH) programmes as a matter of policy priority.

A number of studies have revealed that countries such as Botswana, Angola, Ethiopia, Uganda, South Africa, and the Democratic Republic of Congo are implementing WASH in school programmes with a focus on the provision of sanitation and hygiene facilities and bringing awareness to school children (Bolatova, et al., 2021; McMichael, 2019; McGinnis, et al., 2017). Reports from the above studies indicate that the ministries of education of these countries, with the support of organisations such as UNICEF, World Vision, Save the Children and the World Bank have achieved a measure of success, however, countries like Mozambique and Malawi, having adopted the WASH in Schools policy, have no space in their school curriculum to promote hygiene and sanitation in schools (Mberengwa, Galeforolwe & Silo, 2010; Sibiya & Gumbo, 2013). Schools in these countries face challenges that include the use of blocked toilets, poor ventilation, and the prevalence of flies due to ineffective cleaning. Only the survey carried out by Mberengwa et al. (2010) mentioned the presence of cleaning staff in the schools under survey.

Zimbabwe has also made some efforts to improve sanitation in school environments by amending the Education Act in 2006 to make provision for WASH in schools. The measures implemented, however, still fall short in terms of addressing sanitation and hygiene challenges emanating from learners' involvement in cleaning activities in the school environment (Madani, 2019; Ohwo 2019). According to a report by the DFID, the Ministry of Health and Child Welfare (MoHCW) estimates that currently, only 30% of Zimbabweans have access to basic sanitation. The erratic water supplies being experienced currently in homes as well as in schools in Zimbabwe's rural and urban areas have led to blocked or poorly functioning and unclean toilets as well as poorly maintained school environments (*Business Times* 2023; Taonameso, Mudau, Traoré & Potgieter, 2022; Majuru, Suhrcke, & Hunter, 2016). In line the above, Human Rights Watch (2023) in concurrence with WHO (2017a) observed that water and sanitation are linked to hygiene and safety, so when one is compromised, hygiene and safety become a concern. Despite these threats to learners' health and safety, it appears that WASH programmes currently being implemented in Zimbabwe do not adequately address the above-mentioned risks mentioned above.

Based on the researcher's observation, learners in Zimbabwean schools use old clothing and remove their shoes when carrying out cleaning activities in an effort to save their uniforms from damage and dirt, disregarding the potential harm to their health. This is a risky practice as in their study, Gunhu, Mugweni and Dhlomo (2011), concluded that children who came to school barefooted were more susceptible to WASH-related diseases transmitted in faecal and urine matter such as dysentery, cholera, diarrhoea and bilharzia as well as soil-transmitted worms (Kumar, Kumar, Singh, Jiyaullah, Kumar, 2018; UNDP, 2015). According to Khan, Khan, Khan, Iqbal, Ullah, Ghaffar and Ullah (2019) an estimated 47% of children between 5 to 9 years old of age from developing countries are infested with the three main types of soil-transmitted hookworms, round worms, and whip worm. In Zimbabwe, more than 40% of diarrhoea cases in school children results from contamination at school than home (UNDP, 2015).

Considering the risks paused to learners during their cleaning roles, it is self-defeating for the country to spend resources through WASH programmes if the potential risks are not addressed. In Zimbabwe, the question of health policies in learning institutions has always been addressed half-heartedly (Nziramasanga Commission, 1999). The reluctance to deal with health and

safety issues decisively could be attributed to a lack of data on which to base informed decisions or uncertainties surrounding the importance of ensuring good health and sanitation to the total development of the child. In the case of schools, toilets, classrooms, and playgrounds are not considered factories, and in Zimbabwe, there is no regulatory framework governing their use and care to ensure that they do not pose hazards to learners. There are no specific laws documented for the learners carrying out cleaning duties in schools, as schools are governed by the public health laws of the country (Rutter, 2011).

If measures are not taken to mitigate the risk of contracting diseases and sustaining injuries faced by learners as they clean school environments, their education potential will be severely undermined. It is, therefore, necessary that schools be capacitated to safeguard the health and safety of school environments for the benefit of the learners (ED Covid-19 Handbook, 2021). This study, therefore, sought to establish possible hazards encountered and to suggest PPE designs that would inform efforts to formulate strategies to mitigate health and safety risks in primary schools in Zimbabwe.

Review of Literature

In Zimbabwe, learners are increasingly at risk of contracting diseases like respiratory infections, dysentery, cholera, diarrhea, bilharzia, soil-transmitted worms and injuries emanating from their involvement if cleaning activities at the school are conducted without appropriate PPE. This is a matter of great cause for concern as sick children tend to perform poorly in their studies. The Government of Zimbabwe (GoZ), various Non-Governmental Organisations (NGOs), and school authorities have been implementing various interventions pertaining to the promotion and improvement of hygiene and sanitation facilities, such as WASH, without taking into consideration the health and safety risks that the learners face during routine cleaning duties at school. This situation creates a conducive environment for the spread of disease. As a consequence, learners can contract diseases that compromise their safety, health, and educational performance. In light of the foregoing, schools in Zimbabwe need to safeguard and protect the health and safety of learners, particularly where there are risks of contracting disease and injury in the school environment.

Against the aforesaid, the study sought to answer the following questions: What health and safety hazards are prevalent in the primary school environment in Zimbabwe? What protocols and measures have been implemented to ensure the health and safety of learners in Zimbabwean primary schools during

cleaning activities? and Which PPE designs can effectively safeguard primary school learners in Zimbabwe against potential health and safety hazards during cleaning activities at school?

Theoretical underpinnings

This study is guided by Bronfenbrenner's bio-ecological model (Bronfenbrenner, 1994), whose fundamental principle is premised on the suggestion that interactions between an individual and their environment shape the development of that individual over time. In this study, active members within the school system in the form of teachers were crucial because they implement the curriculum and train learners on the extra-curricular activities which encompass the cleaning work learners perform in the school. In this study, The Utility or Protection Theory by Dunlap (1928) which supposes that clothing had its origin in attempts to protect the body from injurious or unpleasant features of the environment, was used to complement Bronfenbrenner's theory in guiding this study. Dunlap observed that clothing can serve as protection from the elements and can enhance safety during hazardous activities.

Clothing can also provide a hygienic barrier, keeping infectious and toxic materials away from the body and providing protection from ultraviolet radiation as well as insulating the body against cold or hot conditions (Dunlap, 1928). It also provides a barrier between the skin and the environment that can protect the wearer from rough surfaces, rash-causing plants, insect bites, splinters, thorns, and prickles (Newburgh, 1968; Steele, 2000). The current study addresses how learners dress when they engage in activities that help maintain the school premises in condition of good repair and cleanliness.

Health and the safe school environment and education

The need to ensure healthy and safe school environments is recognised and articulated in international protocols such as the United Nations Convention on the Rights of the Child (1989) and The African Charter on the Rights and Welfare of the Child (1990). Both protocols emphasise the need to treat learners with humanity and respect for their inherent dignity by protecting them from all forms of physical and mental harm, abuse, negligent treatment, maltreatment as well as exploitation. The foregoing is consistent with UNICEF's notion of child-friendly schools, which calls for the need to safeguard the right of learners through a healthy and safe school environment. Idakwo and Baruwa (2022) in agreement with Goodman (2021) observe that when parents entrust

their children into the hands of educators, they expect them to play an in-loco parentis role, by protecting learners from harm during those hours that they are under the authority and care of the school.

Children worldwide require special protection from longstanding as well as emerging risks such as exposure to hazardous chemicals (Global Alliance for Disaster Risk Reduction & Resilience in the Education Sector, 2022). Children's vulnerability is exacerbated by the lack of protective policies and public health interventions. More efforts to ascertain children's environmental health risks and develop policies and programs to mitigate such exposures are needed at all levels (UNICEF, 2022). WHO asserts that a contaminated environment can favour the sprouting of disease, or exacerbates health problems. WHO mentions that short-term health effects such as infectious diseases, respiratory infections, or asthma can reduce the number of days that learners can attend school. In addition, some health effects such as cancer or neurological diseases may be delayed until much later in life, as established by Moelyaningrum et al. (2023), Gebrehiwot, Geberemariyam, Gebretsadik & Gebresilassie (2020), and Chard et al. (2019). Most of the health problems affecting school students can, however, be preventable by promoting proper hygiene practices through family and adopting good health education (Hazazi, 2019).

Caruso et al. (2014) conducted a study that assessed the impact of a school-based latrine cleaning and hand washing program on pupil absence in Nyanza Province, Kenya. The findings showed that the provision of low-cost, locally available materials alongside low-intensity teacher training improved latrine conditions that were identified as important for the dignity and wellbeing of those learners; and investments and strategies needed to be put in place to make school sanitation environments clean and safe for school children. The researcher has observed the tenets of this study and how it was structured and identified a glaring absence of specificity in PPE during the cleaning activities, which was a primary life-training activity given to learners.

An example of learners' lack of protection when carrying out cleaning activities in the school is depicted in Figure 1 below.

Figure 1: A hazard encountered during cleaning activities
Source: https://www.gettyimages.com/photos/children-cleaning-classroom).

As depicted by Figure 1, the learner has no footwear nor face masks to protect itself from dust. The learner uses its hand to protect itself from potential hazards caused by dust. In most Zimbabwe schools, especially those located in remote or rural areas, school floors are not tiled or carpeted, but rather dusty a common feature in most schools in Zimbabwe that expose learners to similar circumstances like the one depicted in Figure 1.

Potential health and safety risks in the school environment

Most schools in developing countries have inadequate sanitation facilities as such expose learners to contract various diseases. According to WHO (2019) due to their size, physiology, and their growing participation in cleaning activities in the school, learners are particularly vulnerable to environmental hazards. Causal factors are mainly the use of contaminated or unsafe water, poor hygiene, and inadequate sanitation practices. These infections result in learner absenteeism due to illness (Pradhan et al., 2020; Ranga & Majra 2020; Meher & Nimonkar, 2018). A contaminated environment favors the sprouting

of disease such as respiratory infections, dysentery, cholera, diarrhea, bilharzia, and soil-transmitted worms (WHO, 2019). Such short-term health effects can reduce the number of days that learners can attend school. Most of the health problems affecting learners can, however, be preventable by promoting proper hygiene practices through family and adopting good health education (Hazazi, et. al., 2019).

Some suggested measures

The use of PPE is an admission of failure to find another way of carrying out a task that would eliminate hazards (Woods, 2009). There are some situations in which learners cannot be separated from the hazard such as exposure to dust and sunlight when cleaning the classrooms and grounds. Exposure to splashes and detergents when cleaning toilets, and exposure to injury, require PPEs. Even where engineering controls and safe systems of work have been applied, some hazards might remain. These include injuries to the lungs through inhaling contaminated air; the feet from sharp objects; the eyes, from flying particles or splashes of contaminated liquids; and the skin, from contact with contaminated fluids and rough surfaces (ILO, 2023). Where there is a likelihood of splash from bodily fluids, for example, during toilet cleaning activities, relevant protection must be used (NSW Department of Education, 2020). Today, failure to protect learners is viewed as insensible because there is a large amount of specialised knowledge and technology available in the field of PPE (Sudheshna, 2023).

Personal Protective Equipment

This study looked at PPE and its impact on school health and safety. For the purposes of this study, personal protective equipment includes items such as work suits, protective gloves, eye protection, respiratory protection (e.g. face masks and shields), sunhats, and footwear. The type of PPE worn should be based on factors such as anticipated risk of exposure to infectious or communicable disease, possible injury, as well as suitability for the wearer (ILO, 2023). While conversations around PPE in the educational environment primarily focus on the use of face masks as a preventative measure, PPE that may be considered for use within school environment vary, to include mitts, gloves, aprons, hats, overalls, work suits, masks and footwear. The success of PPE in guarding an individual against hazards depends on more than availability of the equipment. Although the need for protective equipment in hazardous situations is known, willingness to wear the clothing is not consistent among users. Reasons for non-compliance range from lack of comfort, incorrect fit, restriction of movement

by workers, and expensive equipment by employers (Sudheshna, 2023). In this regard PPE can be tricky for younger children as adult-sized equipment that is often available do not fit well on child-size bodies.

The Faculty of Science, Engineering, and Built Environment at Deakin University, Australia have regulations for their learners that are pertinent to this study. The workshop rules for the learners are meant to protect them from situations that may cause physical harm to their bodies. Some of the rules are: Rule (v) stating that learners must wear the correct protective equipment for the work being done. The point to note is that protective equipment in this instance is very particular to the environment dictated by the type of activity learners engage in. Rule (ix) prohibits the wearing of loose clothing as loose clothing can be a danger to the learner as this might get caught on the tools being used leading to injury of the learner. Rule (x) stipulates that safety shoes or enclosed shoes must be worn in the workshop. Such rules should be extended to leaners of primary schools when they embark on cleaning activities under different situations. The OSHA Technical Manual (1999 p. 37) stipulates that "it is important that PPE users realize that no single combination of PPE is capable of protecting learners against all hazards," therefore, it is advisable to use protective equipment in conjunction with other protective methods.

Types of personal protective equipment

Since learners are exposed to many potential hazards, protection can be provided through a variety of PPE, such as mitts, gloves, aprons, hats, overalls, work suits, facemasks and footwear. Eye/Face Protection is equipment (including clothing) designed to provide protection to the face and eyes during exposure to such hazards as flying particles (dust), liquid chemicals, or splashes from contaminated water which could be potentially injurious to the eyes or face (Habybabady et al., 2018). Hand protection includes equipment and clothing designed to provide protection to the hands during exposure to potential hazards such as sharp objects, abrasive surfaces, temperature extremes and chemical contact. Hand protection is selected based upon hazard type and performance characteristics of the gloves (NSW Department of Education, 2020). Leg and foot protection is also noted encompassing equipment designed to provide protection to the feet during exposure to situations with the potential for foot injuries such as falling or rolling objects, chemicals, or piercing objects through the sole or uppers. Not only is protection provided against potential hazards of utmost importance, but footwear should be functional, comfortable, and durable (WHO, 2018).

The head protection involves equipment designed to provide protection to the head during exposure to potential hazards such as falling objects, striking against low hanging objects, or intense ultra-violet rays (Nill, (2019). There is also the full body protection. For instance, the cleaning of toilets requires full body personal protection since cleaning involves use of water and chemicals and exposure to fecal matter, making learners susceptible to infections and diseases (Sudheshna, 2023). Where splashing may occur, such as in the cleaning of toilets, a full-length waterproof PVC apron and rubber boots should be worn. An apron is an outer protective garment that covers primarily the front of the body. It may be worn for hygienic and safety reasons as well as in order to protect clothes from wear and tear (Nill, 2019).

Methodology

This study employed the convergent, concurrent nested mixed methods approach which employed the qualitative research method as the main while the quantitative research method was used for answering different research questions (Rahman, 2020). The approach combined the strengths of the quantitative and qualitative approaches in a way that improved research quality by taking advantage of their complementary strengths. The approach also allowed source and method triangulation, which enriched and strengthened the research results (Dawadi, Shrestha & Giri, 2021; Creswell & Poth, 2018).

The study purposively sampled district and school lists with the assistance of District Education officers. Two districts were selected in a way that ensured the representation of rural and urban districts. The sample comprised of two rural and two urban schools from each district. In each selected school, six Grade 5 and, six Grade 6 learners (three girls and three boys) were selected as most of the cleaning duties were allocated to learners in these grades. Of the 16 teachers responsible for allocating duties, one female and one male from each school were selected while all heads of the selected schools automatically participated in the study. To ensure anonymity schools were coded A to H and teachers were coded as T1-A (teacher 1, school A to T2-H (teacher 2, school H).

The researchers collected both quantitative and qualitative data concurrently, but independent of each other to ensure that there was no chance that one approach influenced another. The qualitative phase focused on the meanings allocated to the actions attitudes towards school cleaning activities, and discovering patterns of meaning through analysis of school documents on health and safety activities in the school environment; semi-structured interviews with

school heads and teachers; focus group discussions with learners; examination of physical artifacts and observations. The researcher sought consent from the respective Ministry, Provincial Education Directorate, District Education Offices as well as the Heads of the target schools. Consent on behalf of the learners, who were minors, was sought from the school heads. The data was separately analysed, and the findings were combined during the data interpretation phase only (Dawadi, Shrestha & Giri, 2021; Creswell & Creswell, 2018).

Results

The study gathered that the cleaning activities learners engaged in schools included sweeping and mopping classrooms, sweeping the school yard, picking up litter, slashing grass and cleaning toilets. In response to the question on how frequently learners carried out various cleaning activities, one teacher expressed the general view held by all teachers when he said:

> *Normally, from day-to-day, especially cleaning of the classrooms and the toilets and they have duties allocated by the teachers in charge* ***(T1-A)****.*

Judging by the frequency of activities and the observations made by the researcher, learners were largely responsible for sweeping and mopping of classrooms, cleaning of toilets, cutting of grass and maintenance of school grounds. The frequency was justified by the teachers as being beneficial to learners. One teacher indicated that:

> *We make students clean their classrooms because a clean environment facilitates healthy learning among learners. It also makes learners responsible and disciplined regarding their learning spaces* ***(T2-G).***

This response concurs with the views expressed by learners in relation to the benefits of carrying out school cleaning activities. The following are some of the views expressed by learners:

> *We learn to keep our environment clean; so that we do not catch diseases; So that we can learn to clean our classrooms;* ***tigogona kufamba munzira yakachena*** *(so that we walk on clean paths); We know how to do housing chores.* ***(Learner A)***

These views are in line with the observation by Taghizadeh et al. (2016) who said promoting healthy practices in children is important for the prevention of health problems in later life, and for the countries' future health and, that by Yang (2012) who says cleaning activities have been found to promote a sense of responsibility and eco-consciousness among learners and are beneficial to their growth and development.

A contaminated environment can facilitate the occurrence of disease, or exacerbate health problems. This can lead to immediate health consequences, like infectious diseases, respiratory infections and injuries. Consequently, this can reduce the number of school days attended by learners and have detrimental effect on their academic performance (Moelyaningrum, et. al., 2023; Gebrehiwot, et. al., 2020). In view of this assertion, questions were asked to determine potential hazards in the school environment. The views of respondents on the hazards prevalent in schools, are shown in the responses below. In the same vein, a Teacher School B cited that:

> *It is very possible for learners to be exposed to contaminated fluids at pick time as toilets get congested and naturally there are spill-outs that pupils may get into contact with.*

This view was substantiated through observations that showed that some learners urinated and defecated on the floor as well as behind the toilet as they failed to await their turn to use the toilet during break time. Such an environment, exposed learners to WASH-related diseases transmitted in fecal and urine matter such as dysentery, cholera, diarrhea and bilharzia (Khan, et. al., 2019).

Through the interviews, the study also gathered that learners believed they were exposed to various diseases as they undertook cleaning activities at school. For example, one Grade 6 pupil said:

> *We pick litter every day and we are exposed to disease since we pick up dirty tissues thrown around with bare hands.*

This practice was witnessed by the researcher in all schools. One teacher, however, reported that in an attempt to reduce exposure to health hazard, sometimes they were forced to tell learners to cover their hands with plastics when cleaning the school environment. This protective measure was inappropriate in that it only protected learners from just touching dirt and no other hazards as there was no guarantee that the plastics were not torn and that they fully covered the hands. The response, however, showed that teachers were aware of the need to protect learners from harm (Sudheshna, 2023).

Another hazard cited by teachers was that of dust inhalation during sweeping. In agreement with this opinion learners, through FGDs, indicated that they were prone to inhaling dangerous dust particulates created as they swept classrooms using traditional African brooms which necessitated bending as the brooms are short. Bending brought the learners closer to the source of the dust thereby increasing the chances and amount of dust inhaled. While school cleaning is a

necessity, constant sweeping of classrooms and school grounds exposes learners to dust that may cause sneezing, coughing, eye irritation, asthma and throat infections. This may result in permanent illnesses (Habybabady, et. al., 2018; Mohammadi, 2018).

Several learners in the four rural schools under study were observed walking barefooted as they cleaned toilets. The explanation for this practice proffered by learners during FGDs was that they did not want to spoil their shoes through contact with filth and contaminated water. This scenario created an environment that is conducive to transmission of disease and possible injury. As pointed out by Kumar et al. (2018) and UNDP (2015) barefooted children were more susceptible to WASH-related diseases transmitted in faecal and urine matter such as dysentery, cholera, diarrhoea and bilharzia as well as soil-transmitted hookworms, roundworms, and whipworms (Khan et. al., 2019). The practice of cleaning toilets while barefoot could be one of the reasons why in Zimbabwe, more than 40% of diarrhoea cases in school children result from contamination at school than home (UNDP, 2015). When asked about the prevalence of injuries, T1-H, had this to say:

> *Any cases of cuts, bruises, piercings, naturally in a school environment we would have that, young ones as they clean, play around so sometimes they develop bruises and cuts.*

In two rural schools, learners were observed weeding around the school yard as well as cutting grass. During these activities, learners were seen chasing each other while carrying hoes and grass sword and some of the tools were left lying all over the grounds as the learners engaged in horse-play posing possible risks to the learners.

In order to assess the measures being implemented by the schools to safeguard the health and safety of learners. The researcher asked about efforts being made by schools to protect learners from school-based hazards. Although all school heads acknowledged the need to prevent possible infections, injuries, and accidents, they all sighted financial constraints as a limiting factor towards the acquisition of PPE. Regarding the protection learners received school heads respectively said:

> ***Just to make sure they are given cleaning detergents but sometimes we are in short supply of them; as you can see they are just by themselves; we do not have any PPE; we don't have; unfortunately, none.***

Only school heads E and F confessed to having some gloves and gumboots in their schools. The PPE was said to have been supplied by Ministry of Primary

and Secondary Education for use on the Presidential cleaning campaign programme. Unfortunately, the PPE was not really functional because, as argued by the heads, the items provided by the ministry were oversize. As a result, they were cumbersome and uncomfortable for the learner (Sudheshna, 2023; Burns, 2000). Examination of the physical artifacts available in schools E and F substantiated the claim made by the participants about incorrectly sized PPE. However, despite the indications by the school heads, observations made by the researcher and responses from FGDs showed that learners from all schools wore face masks when performing cleaning tasks. Even though the learners regarded the facemasks only as protection against Covid-19 face masks also protected them against dust inhalation.

In school H, learners were observed wearing either slippers (patapata) or canvas (tennis) shoes when cleaning toilets. Being made from absorbent fabric, the footwear would be wet by the end of the cleaning activities, thereby exposing the learners to communicable diseases. The need for protection was advocated for by Dunlap (1928) in his Protection theory when he observed that practically man is not equipped with a natural protective coat so he must devise his own, hence the use of personal protective equipment (PPE). This theory links very well with the need for PPE which is being reinforced through the ED Covid-19 handbook (2021).

The respondents' answers as well as observations made indicated that more efforts to ascertain children's environmental health risks and develop policies and programs to mitigate such exposures are needed at all levels (UNICEF, 2022). The views from participants showed that primary schools in the Midlands Province of Zimbabwe do not consider the significance of the potential hazards that learners are exposed to as they interact with the environment (Bronfenbrenner's Ecological theory), neither do they take into consideration the need to provide them with protection. Adherence to Dunlap Protection theory would ensure that learners would be afforded protection crucial in enhancing their safety during hazardous activities, provide a hygienic barrier, as well as keep infectious and toxic materials away from their bodies. It is, however, to note that for the PPE to be effective, it should come in child sizes and be appropriate for the task being carried out.

Conclusion

The findings confirmed that there are several potential health and safety hazards that primary school learners can encounter when carrying out cleaning activities in both urban and rural schools. During these activities, learners were susceptible to WASH related diseases transmitted in faecal and urine matter such as, dysentery, cholera, diarrhoea and bilharzia as well as respiratory diseases. Learners were also exposed to possible injury when they cleared the school grounds using grass swords and hoes.

The paper also noted that the major deficiency in ensuring the health and safety of learners during cleaning activities is the lack of lack of, or inability of school authorities to supply PPE to the learners. This lack was attributed to lack of resources by all the respondents. The PPE in stock in some schools was issued without considering its relevance and applicability to primary school learners as all the items were too big for learners. This essentially means that learners were exposed to risks and hazard, such as respiratory infections, that could affect them for their whole lives as they continued to work without protection.

Recommendations

In light of the above conclusions, the study recommends that the government enact legislation that would guide schools in safeguarding the health and safety of learners during cleaning activities. There is also need for each school to draft its own priority list which it can execute within its budgetary constraints. It is advisable that schools enable learners, teachers, and community members to work together in an effort to promote health and safety issues at their school. The study also recommends that schools start with small fundraising projects, which are financially feasible, that would enable them to acquire PPE for the learners. Schools can then offer training to learners and the whole school and community on how to properly put on, use, and take off PPE gear as well as how to maintain and help preserve the supply. Below are suggested PPE schools should avail to learners.

Suggested PPE Prototype Designs

The prototype designs proposed here have been designed after observing the nature of cleaning activities in primary schools which involved sweeping, mopping and applying wax to classroom floors, cleaning toilets and school grounds. Each of these cleaning activities can have PPE that includes face masks, face shields, face shields with helmets, aprons, overalls, gloves and leg pads.

Dunlap (1928) posits that clothing can serve as protection from the elements and can enhance safety during hazardous activities, provide a hygienic barrier, keeping infectious and toxic materials away from the body and also provide a barrier between the skin and the environment. Where there is a likelihood of contamination, for example, during toilet cleaning activities, relevant protection must be used (NSW Department of Education, 2020). In developing face masks, easy to bend toilet cleaning boots, aprons, overalls, and glove designs, the size of learners and activities being carried out, were taken into consideration. With the school head's approval, appropriate body measurements were taken from five school learners in school.

Face protection

Face protection can only be ensured by wearing facemasks. A filter cloth can be placed between the top and lower parts of the mask. The filter cloth is there to filter through any dust particles in the air and allows the wearer to breathe filtered clean air. The mask makes use of press studs for fastening which can keep the mask securely in place for long periods.

Body protection

During toilet cleaning learners require full body protection since cleaning involves use of water and chemicals. The overall has zipper at the back to ensure that it does not irritate the learners as they work. The apron and overall can be made from PVC which is easy to clean, sanitise and dry for reuse. The material is also easy to manage as it is water resistant and firm providing learners with comfort, safety and protection from infectious diseases, bacteria and dangerous chemicals that might be used in the cleaning process (Habybabady et al., 2018).

Hand protection

Cleaning activities involve contact with dirt, grime, contaminated water and chemicals hence there is need to protect learners from these hazards by wearing a pair of gloves. The gloves in figure 4 have adjustable straps which will ensure a snug fit and prevent them from slipping off and water from entering. PVC gloves are water resistant and easy to clean and dry. PVC material is firmer than latex material and hence will also protect learners from getting pierced by blunt objects (NSW Department of Education, 2020).

PVC Gloves for cleaning in classrooms and toilets

Leg protection: Another area of the body that requires protection from injury that may happen as learners engage in maintenance work is the leg area. There

is need for learners to use safety shoes and leg pads. Learners can make use of their ordinary shoes but then wear leg pads over them. Leg pads protect the femur (thigh bone), tibia (shin bone), patella (knee cap) and fibula (leg bone) (Putri, 2013). The leg pads can be made from hardened cotton wadding or cane, cotton and leather materials. The leg pads may be Velcro or pin fastened so that they are secure.

Flexible leg protection

Another option to the overall is to use light PVC boots that end above the knee. Apart from the lite PVC material, the full-length boots can be made from a combination of synthetic fibres such as polyester, nylon and rayon. The reason of making the boots go beyond knee level is to protect the learners from water and chemical splashes that may occur during cleaning toilets. Strings can be attached to the boots so that users are able to fasten the boots securely for better utility and control. The materials used on the boots provide both protection and comfort, when standing, kneeling or bending. Canvas material that includes a blend of cotton and synthetic fibres may also make them firm and suitable to produce the boots.

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