Production of an Innovative Fibreglass Mobile Sink Basin: An Intervention for Hand Washing in an Era of Pandemics

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ABSTRACT

The aim of this study was to embark on an innovative project on the production of a mobile sink basin made of fibreglass as an intervention for hand washing. To provide a detailed description of the tools and materials, techniques, and stages in the production process of executing the artefact, an arts-based descriptive research method under a qualitative research approach to obtain data primarily through interviews, observation, and photographs. Prior to the production of the fibreglass mobile sink basin, information was garnered from fifty-five (55) students from the Kwame Nkrumah University of Science and Technology on the essence of hand washing and the need for innovative projects that could be used for handwashing. The study found that the fibreglass mobile sink would be useful for hand washing and proper hand hygiene at home, as well as in schools, healthcare facilities, workplaces, marketplaces, and emergencies, to limit and prevent the transmission of infectious diseases. In the face of the global COVID-19 pandemic and future pandemics, the study suggests that the development of a mobile sink basin would encourage people to practice hand washing due to its convenience, accessibility, and portability. The study recommends that the Ministry of Health in Ghana must seek for funding avenues and liaise with Art institutions in organizing competitions amongst students and staff for innovative projects in Art specifically targeted at arresting the daunting health-related issues such as hand washing to curb the spread of infectious diseases.

Keywords:Fibreglass, Handwashing, Hygiene, Mobile Sink Basin, Infectious Diseases

1. INTRODUCTION

Infectious diseases continue to be a major problem in developing countries. In the developing world, the leading infectious causes of death are respiratory tract infections, diarrheal diseases, tuberculosis, malaria, and AIDS, which together represent 90% of deaths with the remaining 10% attributed to tropical diseases and various other infections (Muhlberger et al., 2003). Hands are an essential element of the human body. The majority of daily actions are carried out using one's hands. Infections are most commonly transmitted through the hands and fingers. During our regular activities, our hands come into contact with objects that have been contaminated with numerous germs. Transmission of hand-borne illnesses is responsible for auto-infection via the fecal-oral pathway seen in threadworm infestations or through food handlers. Even if it does not appear so, hands become soiled. If we don't wash our hands frequently, microscopic bacteria and viruses can attach to them and make us sick. Hand hygiene interventions can help to promote equality and empowerment by allowing women, girls, and individuals with disabilities, older adults, and other groups to take on new leadership roles rather than being passive recipients of predesigned interventions. This is vital and has a direct impact on many people; for example, children and adults with disabilities account for an estimated 15% of the world's population (UNICEF, 2020).

Making hand washing programs and policies inclusive and respectful of all individuals, on the other hand, does not happen by accident. It necessitates purposeful effort and the involvement of certain groups. Programs must prioritize equity, which includes designing and situating hand washing facilities that are accessible and user-friendly to all. According to the WHO/UNICEF Joint Monitoring Programme, 31% of schools educating roughly 570 million children

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globally lack access to safe drinking water. Potable water is not provided in about half of the schools in Sub-Saharan Africa. More than 620 million students worldwide do not have access to basic sanitation at school, and 900 million do not have access to basic handwashing facilities at school (WHO & UNICEF, 2018).

School children's health and academic outcomes suffer as a result of a lack of washrooms and hygiene education. Widespread health consequences, such as diarrhoea, intestinal worms, and respiratory infections, contribute to school absenteeism and increased drop-out rates, whereas having handwashing and water and sanitation services in schools has been shown to result in a significant improvement in school attendance and teacher-pupil interaction time (WASHplus, 2016; Willmott et al., 2015).

Hand hygiene messages should be delivered in a way that includes those who have difficulty seeing, hearing, understanding, or moving, and handwashing pictures should reflect the genuine diversity of communities (Wilbur, 2020). Handwashing support actions can begin before a kid is even born by installing a handwashing station, which sets the foundation for the child's early handwashing. Handwashing by caregivers as a step before picking up an infant can have a huge impact on neonatal survival and subsequent development during the neonate period (the first 28 days of life) (Rhee, Mullany&Khatry, 2008).

Microorganisms are believed to be ubiquitous, which means they can be found anywhere. They can be present in the air, soil, bodies of water, and even heated foods. As a result, they are easily transmitted from person to person. Because humans are social beings, we frequently find ourselves in public areas where pleasantries must be shared in the form of handshakes, hugs, and holdings, among other things. No single person may claim to be completely sterile at any moment because it is likely that the clothes or objects used to clean ourselves contain a number of these bacteria. In this line, the goal is not to eradicate all microorganisms, but to lower them to levels that are not hazardous to the human system. Therefore, the purpose of this study was to produce an innovative mobile sink basin from fibreglass to aid in hand washing. This easy-guide to the production of the mobile sink basin is to help in their possible mass production in homes, schools, laboratories, hospitality facilities, restaurants, and public bus terminals to reduce the spread of infectious diseases, especially in this era of pandemics.

1.1The Art of Hand Washing

Hands are the primary means of transmission for many infectious diseases, especially among those who live and work in close quarters, such as those in dorms, barracks, camps, gatherings, churches, and markets. Inanimate things also serve as a breeding environment for microbes, which act as a vehicle for infectious disease transmission. How important is hand washing to individuals and the nation as a whole? According to the study conducted, diseases influence the world in unequal ways. Infections cause 62 percent of all fatalities in Africa and 31 percent of all deaths worldwide (Waterkeyn& Carin, 2005). At the same time, infectious diseases account for only 5% of all deaths in Europe. Furthermore, 50 percent of all food-borne illness outbreaks in the United States are the result of improper hand washing (Mead et al, 1999). However, a study revealed that if we practice proper hand washing with soap and water, we can save most people's lives every year and reduce diarrheal disease by roughly 40%. Because hand washing is a socially acceptable action, the behavior of personal adoption of hand washing has been criticized as untrustworthy (Judah et al, 2009).

Similarly, handwashing with soap is one of the most effective techniques to avoid becoming ill and spreading illness in public places like a workplace or marketplace (CDC, 2016). In a public location, the danger of disease transmission is generally substantial since individuals are in close quarters and share eating places, workstations, bathrooms, and other germ-infested areas. Workplaces, whether formal (office) or informal (roadside stand), can be breeding grounds for viruses and bacteria that can survive on common surfaces for extended periods and spread between humans through direct or indirect contact (University of Iowa, 2013; Reynolds et al., 2015). Office surfaces have high bacterial counts, with shared spaces such as break rooms, kitchens, and toilets having the highest germ concentration (DeNoon, 2012). Similarly, informal workplaces, such as food booths, are important sites for disease transmission (Soon, Baines, & Seaman, 2012). Handwashing is one of the most effective ways to remove germs, reduce illness, and prevent the transfer of germs to others. Handwashing helps prevent diarrhoea and respiratory infections, and it may even help prevent skin and eye diseases.

Mobile wash basin is a portable and movable sink, having a bowl-shaped plumbing fixture, used for washing hands and dishes. It has various parts as the sink, tap, soap dispenser, and the drainer. Mobile wash basin is mostly used at the hospitals, schools, laboratories, restaurants, bars and banking halls among others. Curtis and Caincross (2003) suggested that hand washing with soap, particularly after contact with faeces can reduce diarrheal incidence by 42-47 percent and supported by Clasen et al. (2007) that, a 30% reduction in respiratory infections is possible through hand

washing. They also indicated that, several countries have launched mass media campaigns in an attempt to promote prioritization of hand washing on the public health agenda.

1.2The Application of Fiberglass as a Material

Fiberglass is a typical type of glass fiber-reinforced plastic. Fiberglass is a plastic reinforced with glass fibers in a resin matrix. The fibers can be stacked randomly, flattened into a sheet known as a chopped strand mat, or woven into glass fabric. The plastic matrix could be a thermoset polymer matrix based on thermosetting polymers such as epoxy, polyester resin, or vinyl ester resin, or it could be a thermoplastic matrix. Because of its radio frequency permeability and low signal attenuation qualities, fiberglass is frequently utilized in the telecommunications industry for shrouding antennas (Mayer, 1993). Due to the ease with which it can be molded and coated to match existing structures and surfaces, it can also be used to conceal other equipment where signal permeability is not required, such as equipment cabinets and steel support structures. Sheet-form electrical insulators and structural components often found in power-industry goods are two further applications. Because of its lightweight and durability, fiberglass is frequently utilized in protective equipment such as helmets. Many sports employ fiberglass safety equipment, such as goalkeeper and catcher masks.

Fiberglass is stronger than many metals by weight, non-magnetic, non-conductive, transparent to electromagnetic radiation, can be molded into complicated shapes, and is chemically inert under various conditions. Because of its lightweight, inherent strength, weather-resistant finish, and range of surface textures, fiberglass is an extremely adaptable material (Phelps Industrial Products, 2022). Aircraft, boats, autos, bathtubs and enclosures, swimming pools, hot tubs, septic tanks, water tanks, roofing, pipelines, cladding, orthopedic casts, surfboards, and external door skins are all examples of applications. It is impact and corrosion-resistant, with a moderately good strength-to-weight ratio. It is highly adaptable and can be formed into a variety of shapes, adding to its utility in the home. Fiberglass is employed in a variety of household products and industries because it is a low-cost, extremely flexible material (Today Industry, 2018).

2. MATERIAL AND METHODS

The study used a qualitative approach with a descriptive research method to provide a full description of the step-by-step process of producing a mobile sink basin with fibreglass as the main material for production. The arts-based research approach was adopted for the study. Because of its longevity, lightweight, inherent strength, fire resistance, and stiffness, fiberglass was chosen for the production of the artefact. Furthermore, the best feature of fiberglass is its capacity to be molded into a variety of intricate designs. Detailed accounts of the tools and materials, procedural steps and finishing of the mobile sink basin using the fibreglass have been given. The essence of the project aimed at producing an innovative mobile sink basin was based on an empirical inquiry involving 55 purposively sampled students in the Kwame Nkrumah University of Science and Technology, Ghana.

3. RESULTS AND DISCUSSION

The study participants shared their views on the factors that hinder the washing of hands amongst many people in Ghana. The factors cited included negligence, unavailability of either water, soap, an appropriate place to wash hands and no vivid reasons (represented as none on the pie chart).

From the pie chart below, 35.8% did not wash their hands due to mere negligence, 60% did not wash their hands due to unavailability of appropriate hand washing facilities and about 4.2% had no reason for not washing their hands. The majority of respondents (60 percent) stated that, while they would have liked to wash their hands in some places and at particular times, there was either no soap, water, or an acceptable area to do so. According to some of the respondents that belong into this unavailability category, they occasionally couldn't wash their hands after entering toilets with sinks due to the poor condition of the sinks that were accessible. This response is consistent with the findings of Borchgrevink et al (2013), who discovered that sink cleanliness influenced most people's hand washing behavior. They found that 73.9 percent of respondents would wash their hands if the facilities (sinks) were clean and in good repair. The remaining respondents gave no specific explanation for not washing their hands. As a result, the researchers suggest that hand washing facilities, particularly outside of houses, and simple neglect on the part of participants, and possibly some persons in general, are to blame.

Figure 2 represents the responses as to their preference for either a bowl filled with water or a movable sink basin for hand washing. It was observed that, out of 55 participants, 52 (94.5%) participants preferred to use the movable sink whilst 3 (5.5%) participants preferred to use a bowl with water. According to the results, the majority of study participants (94.3 percent) stated they would prefer the moveable sink, while only a few said they would stick with the bowl with water. The majority of the reasons given were those of hygiene and health. Most persons agreed that there was a high risk of cross contamination with the bowl of water, where individuals could take up microorganisms from other people during hand washing. However, with the movable sink, everyone gets to wash their hands under running water, which is more effective; so, the food code specifies that hand washing should take at least 20 seconds and involve running water (Green et at., 2006). The few folks who preferred the bowl with water did so because they were unsure how the mobile sink would work.

In an attempt to solve this concern, the researchers proposed creating an artifact that could be used for hand washing in places other than washrooms. The movable sink basin was to be developed in such a way that it could be put at various vantage points in various locales, so that those who had problems with the lack of washing facilities would no longer have that problem. This manner, it can be placed wherever they can use it whenever they want. As a result, the researchers sought to determine if the respondents knew what it was and if they had used anything similar before. As can be observed, only a few of the respondents had used something similar in the past. It is also clear that most of the study participants were unfamiliar with movable sink basins and how to use them. As a result, if the mobile sink was manufactured, there would be a great deal of sensitization and education on its use and benefits.

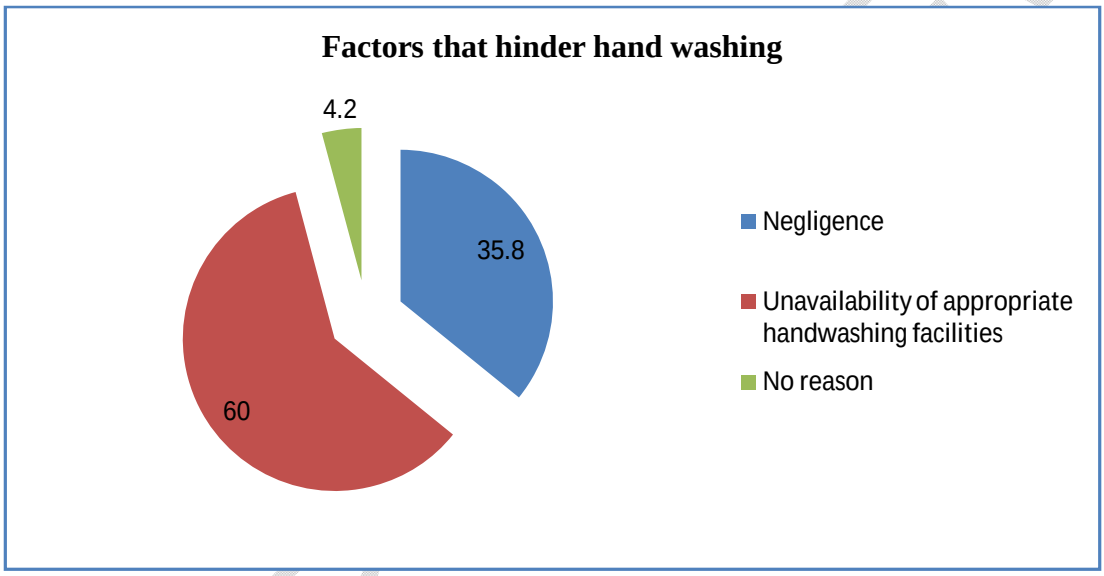

Figure 1: Factors that hinder hand washing
Source: Field work, 2021

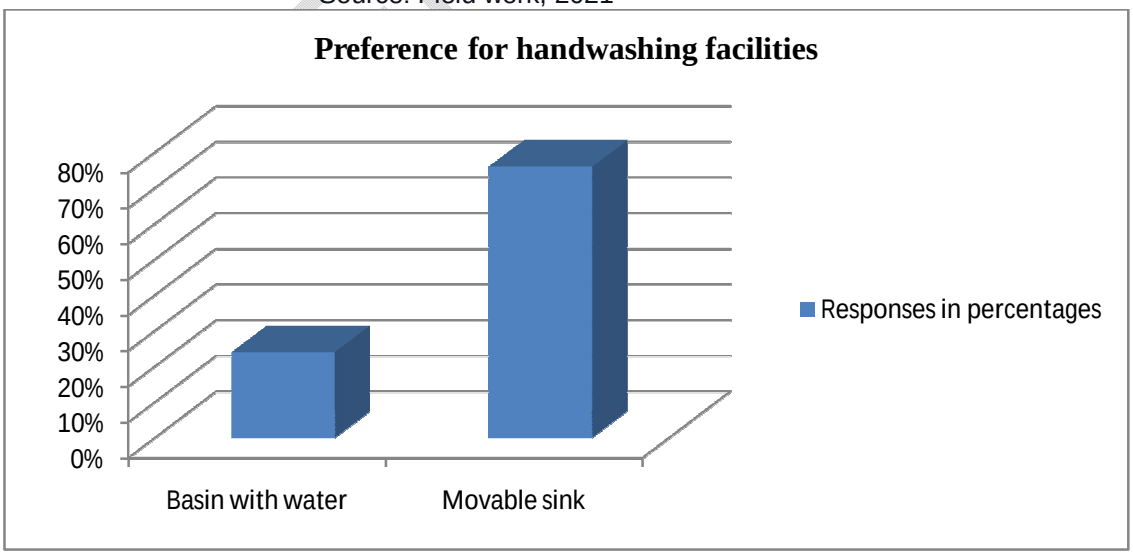

Figure 2: Preference for bowl with water or a movable sink

Source: Fieldwork, 2021

3.1Reasons for choosing a stable or a movable sink basin

From the 32% who chose stable over moveable, approximately 8% indicated the movable sink would require more work to dispose of the water gathered after usage, thus they would continue with the stable, which disposes of the water promptly through a drain. 12 percent of participants chose the stable hand wash basin for no reason, while 5.7 percent did so for economic reasons.58 percent of the 68 percent of participants who chose the mobile hand wash basin did so for specific reasons. The creation of moveable hand wash basin will aid and increase or promote hand washing while also making it more convenient.

3.2 Working Procedure

Tools and Materials: Fiberglass, clay, plastic of paris, hardener, polyester resin, silicon sealant, brush, sandpaper, hammer, chisel, nails, wheels, tap, and grinder.

Figure 3(a) Tools and Materials
Source: Fieldwork, 2021

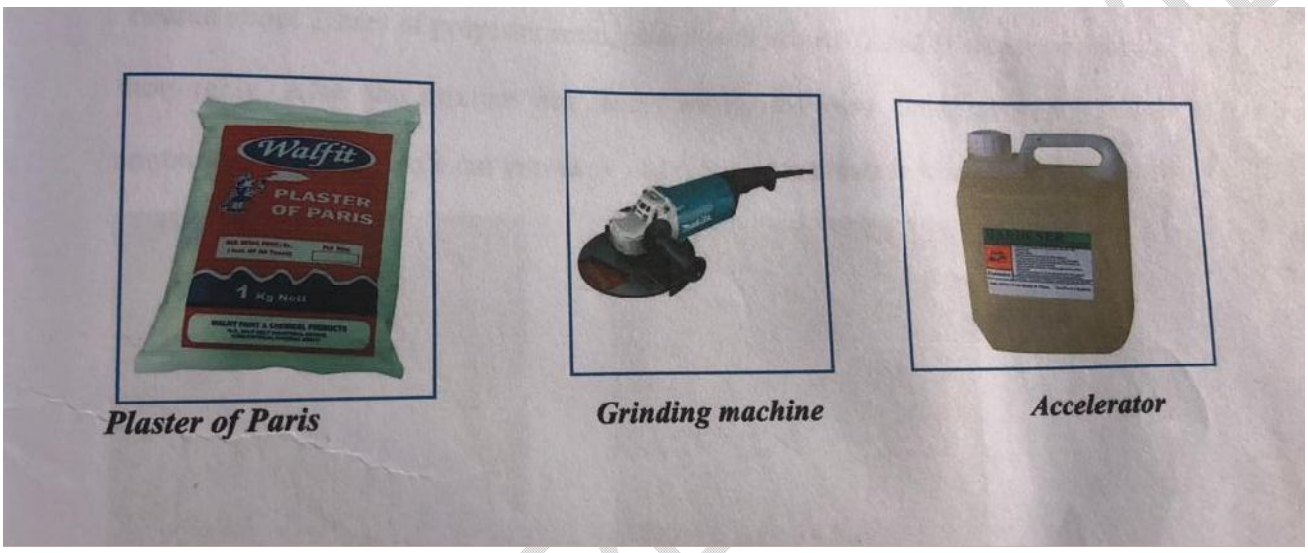

Figure 3 (b) Tools and Materials

Source: Fieldwork,2021

3.3 Preliminary sketches

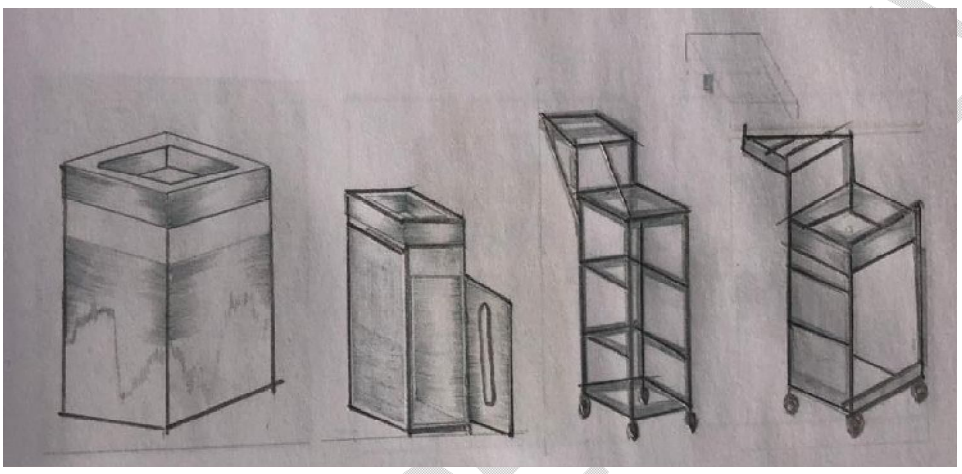

Figure 4: Stages of idea development
Source: Field work, 2021

3.4 STEP ONE

Poured about 2 litres of polyester resin, mixed

with about0.001mlof accelerator, and stir

thoroughly. After

the mixture was ready, we poured about 100 ml

of it into another container (it could be a bottle

cut into two). Add about 0.5 ml of hardener to it

and stirred vigorously. The image below

illustrates the mixture.

Figure 5: A mixture of polyester resin and accelerator

Source: Fieldwork, 2021

3.5 STEP TWO

The researchers modelled the sink to the required size and shape and left it in a cool place for 24 hours. Figure 3 right depicts a modelled clay sink with a height of 15.1/8 and 18.1/8 width. Figure 4 is also the application of the silicon on the model and also the clay walls with the clay slip partitioning at the centre of the sink for easy removal. We left it for 24 hours to dry.

Figure 6: A modelled clay sink
Source: Fieldwork, 2021

3.6 STEP THREE

Apply silicon around the model (the number of hours the silicon will take to dry depends on its thickness around the model, also the thickness of the silicon depends on the amount of pressure you put on it when sticking it around the model). Because of the hot nature of the chemicals present in the silicon, prepare and apply a detergent solution that helps in sticking the silicon on the model which prevented the hands from peeling off.

3.7 STEP FOUR

For easy removal, design a clay wall with a clay slip to partition the mould.With 2 inches sable brush, gently apply the V to the silicon mould. After 30 seconds, we laid our strips of fiberglass on the silicon mould and dub the resin

mixture.

3.8 STEP FIVE

After mixing a little bit of resin and accelerator, add a measured amount of plaster of paris and a little bit of the hardener, stir until it is uniformly mixed, and apply it in the mould with the help of the brush as seen infigure5. After drying it for some time, take the mould off with the help of chisel and a hammer.

3.9 STEP SIX

After drying it for some time, take the mould of with the help of the chisel and a hammer. Measure and cut the plywood to the required size and shape. Join the parts together and fix the wheels with the help of nails and hammer. After that, cutting of the angle iron from one side to the other side of the cage. The next is to measure the angle iron for the down part as seen in figure 7 below.

Figure 7: A modelled clay sink without the mould
Source: Field work, 2021

Figure 8: Measuring of the iron bar
Source: Field work, 2021

3.10 STEP SEVEN

After cutting it was joined using the welding machine. After welding, it was groundinded, f. Forming the cage through the following means:Cut 2 inches flat bar.Weld the flat bar to the angle iron.After welding and grindeding.After welding, groundedinded part B, part B was joined to part A and was also groundedinded after welding.After grinding it was sprayed with red oxide to prevent the material from rusting.After spraying the red oxide then filler was applied.

Figure 9: Cutting of theflat iron bar

Source: Field work, 2021

Figure 10: Welding of the flat iron bar

Source: Field work, 2021

Figure 11: The base of the cage formed
Source: Field work, 2021

Figure 12: The finished artefact
Source: Field work, 2021

4.CONCLUSION

Throughout the investigation, the researchers discovered that negligence and a lack of hand washing facilities play a significant role in why people do not wash their hands as required. As a result, various infectious diseases have spread throughout the country. In order to address the issue of lack of facilities, the researchers created a mobile hand washing basin that will encourage the habit of hand washing while also making it more convenient. Handwashing has been established as a component for achieving adequate hand hygiene as well as a variety of health and development goals. Because handwashing with soap has numerous cross-cutting benefits, it is critical to incorporate handwashing promotion activities into interventions such as nutrition, early childhood development, health, and inclusion initiatives. Prioritizing handwashing within these activities will have a higher impact. Handwashing habit formation is transforming handwashing from a ~~behaviour~~behavior that people choose to engage in (intention) into an action that is an automatic response that does not involve the decision-making portions of the brain (habit). Handwashing would thus become a part of our everyday practice. In the face of the global COVID-19 pandemic, the data suggested that the development of a mobile sink basin would encourage people to practice hand washing due to its convenience, accessibility, and portability. It is also recommended that, initiatives such as the physical (hardware) and mental (software) components of handwashing ~~behaviour~~behavior change in order for handwashing to be broadly accepted and sustained. Government agencies, the commercial sector, non-governmental organizations, and academics all play essential roles in achieving universal, appropriate handwashing practices by incorporating into training and education of students.

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