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Students' Voices on How to Educate Communities about the Prevention of COVID-19 Using Robotics and Technological Innovation: A Transdisciplinary Research Approach

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Abstract: Disruptions are costly in higher education. They deprive students of the opportunity to engage in different learning opportunities. COVID-19 was a real disruption to teaching and learning in higher education globally and—as this study reports—hindered students from engaging in community projects. The purpose of this research was to explore the views of undergraduate students in the School of Health Care Sciences (SoHCS) and the Faculty of Engineering, Built Environment and Information Technology (EBIT) on the use of robotics and technology in educating communities about COVID-19 and to describe their thoughts on the use of robotics and technology in educating communities about COVID-19. Participatory action research (PAR) was used for this study since students from the SoHCS and EBIT were invited to be active participants as future professionals. Twenty-seven students participated in ten interviews. The responses were analyzed using ATLAS.ti for qualitative content. Data reduction, coding, and decoding analytic processes were used to analyze and interpret each of these qualitative data forms. Five themes emerged from this study: COVID-19 and community challenges and behavior; COVID-19 communication; COVID-19 knowledge and understanding; COVID-19 myths; and COVID-19 robotics and technology education. The findings of this research are already being used in the development of multidisciplinary interventions using technologically advanced and relevant tools in educating communities about health.

Keywords: *Robotics, Technological Innovation, Multimedia Technology, Community, Community Education and Community Engagement*

Introduction

The disruption that COVID-19 brought to higher education and community engagement activities, in particular, has also brought forward some innovative learning opportunities. The University of Pretoria is premised on three pillars: teaching and learning, research, and community engagement. The "White Paper for Post-School Education and Training" by the South African Department of Higher Education and Training (DHET), issued in 2014, mandated that all universities in South Africa should focus their activities on these three pillars. Community engagement is defined as a planned, purposeful application of resources and expertise in teaching, learning, and research (University of Pretoria 2019b). It aims to achieve mutually beneficial outcomes that are consistent with the institution's vision and mission.

The onset of COVID-19 meant that students could not go out and engage the communities. This posed a serious problem as the communities needed even more education about COVID-19 than they would about any other disease outbreak. Looking at the standard operating procedures (SOP) for preparedness, detection, and response to the coronavirus in South Africa (Department of Health 2020), it is clear that health-care workers have been provided with guidelines on how to handle suspected and confirmed cases of COVID-19. The document continues to outline how the human remains of the deceased are to be handled, as well as the decontamination procedures to be followed. Education on COVID-19, as was presented on various media platforms, focused more on infection control and the prevention of the spread of the virus. What seems to be absent is educating the community on the different aspects of COVID-19. Another omission was the active involvement of the students. Taking these points into consideration, this study was aimed at involving students from the School of Health Care Sciences (SoHCS) and the Faculty of Engineering, Built Environment and Information Technology (EBIT) as future professionals and members of the community to explore how robotics and technology could be used to educate communities about COVID-19.

The University of Pretoria is advanced in the use of robotics and technology, which have become the driving force in teaching and learning due to the COVID-19 pandemic. Some of the robots enhancing teaching and learning at UP are Libby, in the University's Merensky Library, and Stevie, in the Intensive Care Unit at the Steve Biko Academic Hospital, the University's main clinical training facility for students in health sciences. A robot in the same hospital assists with the speedy dispensation of medication. Furthermore, EBIT runs Robot School as a community engagement project for secondary school learners.

The research question was "How can the message of COVID-19 be conveyed to communities using robotics and technological innovation? What are the views of undergraduate students from the SoHCS and EBIT on the use of robotics and technology in educating communities about COVID-19?" There were two research objectives: to explore the views of the undergraduate students of the SoHCS and EBIT on the use of robotics and technology in educating communities about COVID-19; and to describe their thoughts on the use of robotics and technology in educating communities about COVID-19.

Literature Review

COVID-19 in South Africa

On March 11, 2020, the World Health Organization (WHO) declared the COVID-19 pandemic a "global emergency" (2020). The speed at which the virus spread impacted social and economic aspects of everyday life across the globe. On March 11, 2020, COVID-19 was characterized as a global pandemic by the WHO (Cucinotta and Vanelli 2020). The Corona Virus Disease 2019 (COVID-19) was first reported in South Africa in KwaZulu-Natal on March 5, 2020. To ensure that the health facilities would be able to handle the increased number of patients, the South African government declared a national state of disaster on

March 15, 2020 (Broadbent, Combrink, and Smart 2020; Stiegler and Bouchard 2020). On March 26, 2020, South Africa went into total lockdown for thirty-five days, and by May 1, 2020, the country had shifted into the COVID-19 Risk-adjusted Strategy. This strategy represented a system that distinguished between five levels of restrictions, from the highest (alert level 5) to the lowest (alert level 1) (Wiysonge 2020). Alert level 5 was the most restrictive on the African continent and one of the most restrictive in the world.

On June 1, 2020, the national restrictions were lowered to alert level 3 (Dong, Du, and Gardner 2020). On August 17, 2020, South Africa moved to alert level 2, and on September 21, 2020, to alert level 1 (Van Schalkwyk 2021). The relatively young population of South Africa and the strict lockdown measures are some of the reasons that explain the low mortality rate (Ellis 2020).

Following the declaration of the national state of disaster, the University of Pretoria decided to suspend all academic activities during the week of March 16, 2020. When the nationwide lockdown came into effect on March 27, 2020, the campuses of the University of Pretoria were closed to both students and staff. Only final-year students in the program requiring clinical training were permitted to return to campus under alert level 4. Universities were allowed to return only 33 percent of their students under alert level 3. Universities were allowed to use their discretion within the directive guidelines to plan the return of students and staff to campuses (Van Schalkwyk 2021).

Community Engagement in Higher Education in South Africa

The National Development Plan (NDP 2030), a vision for 2030, describes education as an essential tool through which society can develop the ability to solve their problems, eliminate poverty, and reduce inequality and through which communities can develop competitively. To further support the inclusion of community engagement as a focus area for universities, the NDP 2030 described higher education as the major driver of information and knowledge systems, linking it with economic development. As an educational practice, community engagement has evolved from community service, academically based community service, and service-learning (Bender 2008). Through community engagement activities, students are equipped with skills to address societal problems and ways and means to "feed-forward" in their communities (Hughes, Smith, and Creese 2015).

Community engagement becomes possible through a two-way education process, where the community teaches students about their needs and wants and vice versa. The education of communities, as part of the University of Pretoria's three pillars, is usually undertaken when students embark on community engagement projects and interventions. Bidandi, Ambe, and Mukong (2021) further support the inclusion of community engagement at the university level as one of the strategies to transform higher education. It forms a fundamental part of teaching and learning and research as it informs both (Bidandi, Ambe, and Mukong 2021). As a model for teaching and learning, community engagement integrates academic knowledge with socially responsive clinical skills (Jansen et al. 2017).

Higher education in South Africa adjusts its strategic goals and curriculum efforts, thereby instilling a sense of social responsibility in graduates. Therefore, higher education institutions must produce graduates that can contribute to nation-building. The Education White Paper 3: A Programme for the Transformation of Higher Education (Department of Education [DoE] 1997) viewed community service as integral to a higher education curriculum. The document called on higher education institutions to "demonstrate social responsibility and their commitment to the common good" (DoE 1997). It calls for graduates to be equipped with the skills and knowledge to uplift society (DoE 1997). Community engagement was integrated into teaching and learning, and research in higher education in South Africa through this White Paper (Van Schalkwyk and Erasmus 2011).

Community engagement in higher education is further confirmed as a core domain through the White Paper for Post-school Education and Training in South Africa (DHET 2014). The University of Pretoria included a compulsory undergraduate module, namely, Community-based Project Module (code: JCP), for students enrolled in EBIT, which entails students working at least forty hours in the community and reflecting on their experiences. The reason for creating a separate community engagement module in EBIT was mainly due to the large number of students enrolling in the faculty annually (the enrolment in 2020 was 1,909 students) (Jordaan 2014). One of the main objectives of the module is to enable students to learn to solve problems in real-life situations (Jordaan 2012). In the SoHCS, the Integrated Healthcare Leadership (IHL) module was integrated into the curriculum in 2015. This module focuses on interprofessional education and leadership in a community setting. As in the case of the community engagement module in EBIT, students in the IHL module are afforded the opportunity to learn as they help communities solve real-life problems.

COVID-19 and Robotics

Scientific evidence indicates that robots in education enhance cognitive and social skills (Alimisis 2013). In higher education institutions, cognitive and social skills are necessary as learners actively construct public entities through different approaches. Three main approaches are identified in robotic teaching and learning (Alimisis 2013). The first and most common is the theme-based curriculum approach, where special topics are integrated into the curriculum through inquiry and communication. Secondly, there is the goal-orientated approach, in which a robotics tournament for students is held. A third approach is a project-based approach (Alimisis 2013). This article reports on a project-based robotic education approach, where students worked in groups to explore and describe how robots and technology might be used in this regard to provide community education during the COVID-19 pandemic as part of community engagement.

During the COVID-19 pandemic, robotics has advanced in its applications. At the University of Pretoria, where the study was based, three robots were already in operation: one in the University of Pretoria's Merensky Library on its Hatfield Campus and two in the Steve Biko Academic Hospital, the University's teaching hospital for its health sciences students

(one in the Intensive Care Unit and one in the Pharmacy Unit). The main task of the Merensky Library's robot was to answer queries or process data from surveys that it could carry out (University of Pretoria 2019a). The robots in the Steve Biko Academic Hospital assist with improved treatment and services for patients. The robot in the ICU is operated through instant live discussions and daily communication between ICU teams in Germany and South Africa (University of Pretoria 2021).

Researchers use the word "robotic" as an area related to information engineering, computer science, and other technical fields. A robot is indicated as an "actuated mechanism programmable in two or more axes with a degree of autonomy, moving within its environment, to perform intended tasks" (Ivanov et al. 2019; Zeng, Chen, and Lew 2020). Gradually, researchers classified human–robot interaction (HRI) into the following categories: robot-centered approaches, human-centered approaches, and robot-crobot-cognition-centered approaches (Dautenhahn 2007; Zeng, Chen, and Lew 2020).

The management of COVID-19 created a variety of challenges for hospitals and public health agencies. During the COVID-19 pandemic, robotics, artificial intelligence (AI) and digital technologies provided significant assistance to be applied and to make a long-term impact in the computing of pandemics. Many challenges in the management of COVID-19 for both public health agencies and hospitals have been caused by the pandemic's unexpectedly large and widespread impact (Zhao et al. 2021). The COVID-19 pandemic required advanced robotics and AI-based applications of social distancing, minimizing person-to-person contact, ensuring rapid diagnosis, providing sanitation, and tracking the spread of the virus. Most of the technologies used in the pandemic were adapted from pre-existing technologies (Zhao et al. 2021).

From service robots to disinfectant robots, hospitals frequently utilize technology to deal with a wide range of infected patients (Khan, Siddique, and Lee 2020; Wang and Wang 2021). The ever-increasing trend in the demand for medical robots was predicted by the International Federation of Robots (IFR). Complex and precise tasks can be carried out by physicians and medical staff with the help of robots. Robots also lower the workload of the health professional, thereby improving the effectiveness and efficiency of health-care facilities (Khan, Siddique, and Lee 2020).

The COVID-19 outbreak has identified a new area of use for robots where robots can be used to continue work (Yang et al. 2020). Various robots could be used in hospitals to aid in the fight against COVID-19. These include robots in receptionist areas, in the nursing station, in the ambulance area, in the telemedicine area, in the hospital serving area, in the cleaning area, in the spraying and disinfestation area, in the surgical area, in the radiology area, in the rehabilitation area, in the food area, and in the outdoor delivery area (Khan, Siddique, and Lee 2020; Wang and Wang 2021)

Khan, Siddique, and Lee (2020) concluded that the medical robot's classification is done using application-based categories. This includes every aspect of hospital services, from cleaning to highly sophisticated surgical functions. Many opportunities are available in the design and

operation of medical robots, such as a cyber-physical system (CPS), power management using optimized algorithms and renewable sources, as well as fault-tolerant control and dependable architectures for reliable and safe operation within health-care facilities.

COVID-19 has been a driver of technology innovation and can create new high-touch and high-quality services. Technological innovation and robotics could play an important role in providing medical services during an outbreak or public health emergency. Using AI technological innovation and robotics in such emergencies minimizes the exposure of health-care workers and the health system to the virus (Bhaskar et al. 2020).

Methods

Research Design

Participatory action research (PAR) was found to be appropriate for this study since students from the SoHCS and EBIT were invited to be active participants as future professionals. This research design is said to be grounded in experience, to be action-orientated, and founded on the principle that those who have experienced the phenomenon are the most qualified to investigate it (Botma et al. 2010). According to Babbie (2020), PAR allows the researcher to serve as a resource for those being studied, while the participants have the opportunity to act effectively in their own interests. Botma et al. (2010) describe the aim of PAR as raising consciousness, inspiring action, and producing knowledge. Cook et al. (2019) describe the focus of PAR as placing the relational process at the center of the research practice. This research design brings people of varied knowledge, experiences, and perspectives together to achieve non-hierarchical endeavors.

Conceptual Framework

The study was underpinned by a multitiered public health model, as Pulia et al. (2020) described it. The model is well known for its use in the public health sector to plan interventions relating to the management of communicable and non-communicable diseases at both the acute and the chronic stages. The model comprises multiple interconnected levels of care provision, which include primary, secondary, and tertiary levels of prevention. In the current study, the identified model was used to guide education or the communication of messages on COVID-19 using robotics and technological innovation strategies at different stages of the pandemic and in different community settings.

Research Participants

The participants in this study were invited from the SoHCS in the University's Faculty of Health Sciences, as well as students enrolled in the Community-based Project Module in EBIT. These were students who were involved in community engagement projects according to their level of study. Students from different educational backgrounds were invited to participate in focus group interviews (FGIs). The students had some experience of how communities were experiencing the COVID-19 pandemic. With their exposure to the use of robotics and

technology as part of teaching and learning, they were regarded as being in the best position to explore how communities could be educated on all aspects relating to COVID-19. Purposeful sampling was used, which is also referred to as judgmental or selective sampling. This allowed the researchers to select knowledgeable participants about the investigated matter (Gray, Grove, and Sutherland 2017). They were afforded the opportunity to reflect systematically on their own lives during the COVID-19 pandemic and generate knowledge collectively.

Ethical Considerations

The study was granted approval by the Research Ethics committees for the Faculty of Health Sciences (463/2020) and EBIT (EBIT/185/2020). The researchers, furthermore, took into consideration the need to respect human subjects, as stipulated in the "National Health Act, 2003" (Department of Health 2017), and only involved students who had volunteered to participate in the study.

Data Collection

The idea of bringing together students from the SoHCS and EBIT was strategic as COVID-19 was a health challenge. The use of robotics and technological innovation seemed to be a possible solution to augment community engagement activities. The plan was to have heterogeneous FGIs. Questions were open-ended and intended to stimulate informal discussion with participants with a view to understanding their perceptions of how robotics and technological innovation can educate communities about COVID-19.

Focus group interviews are a form of communication or engagement, meaning that, in line with PAR, the members of the group must respect each other and value one another's expertise and lived knowledge. Due to lockdown regulations and the need to maintain social distancing, the plan was to facilitate and audio record FGIs online. Data was collected between December 2020 and April 2021.

Different authors recommend different group sizes and number of groups in a study. The initial plan was that any group composed of a minimum of four and a maximum of eight students from different disciplines and faculties would be acceptable. Liamputtong (2011) presents the argument that smaller focus groups (four to six members) allow participants to engage more actively with the topic than larger groups (more than twelve) when managing the discussion is problematic. An interview guide was used to facilitate the FGIs. It was, however, not easy to have students from different programs find time to log into the online focus group meeting at the same time. It will be noted in the data analysis section that FGIs were conducted where possible, while in cases where this was not possible, individual interviews were conducted.

Results

A total of thirteen interviews were conducted, ten in 2021 and three in 2020. A total of twenty-seven students participated in the interviews as theoretical saturation had been reached. The study was transdisciplinary and conducted across faculties, as it was aimed at heterogeneous

FGIs, with students from both EBIT and SoHCS. This was achieved in some interviews but not in all. Reasons were identified as challenges with different lecture times and other academic commitments of the students.

The results are presented in relation to the questions used in the interview guide. The following ten questions were used to guide the focus group discussions and individual interviews:

Table 1: Questions to the Participants

1	What have you heard about COVID-19? What are the myths that you have heard about COVID-19?
2	What do you understand about the concepts of robotics and technological innovations?
3	There is a concept that prevention is better than cure, which is emphasized at the primary care level. What do you understand about it and in relation to COVID-19?
4	What are the things that you consider to be problematic for communities with regard to COVID-19?
5	How knowledgeable do you think the communities are about COVID-19?
6	Taking into consideration the three levels of prevention, what do you regard as being the needs of the communities?
7	How do you think robotics and technological innovations can be used to educate communities about COVID-19?
8	Since you are not able to go and engage with the communities due to the need to maintain social distancing, what other ideas do you have that can be used to educate communities about COVID-19?
9	Do you have any questions for me/us?
10	Do you have any other input on the topic?

The information gathered during the interviews was very rich and highly valuable as it addressed the aim of the study. Through analysis, five themes emerged, with fifteen sub-themes and 246 quotations across the data sets. The analysis was assisted by ATLAS.ti version 9.1, a computer-assisted qualitative data analysis software package. The themes and subthemes are presented in Table 2.

Table 2: Summary of Themes and Subthemes

Themes	*Sub-Themes Created from Codes*
COVID-19 and community challenges and behavior (17 pages)	a. Change: resistance (24) b. COVID-19 challenges in the community (7) c. COVID-19 challenges (5) d. Prevention measures (23)
COVID-19 communication (9 pages)	a. Communicate by social media (16) b. Communicate using workshops, television, and posters (12) c. Empathy is required from people in authority (9)
COVID-19 knowledge and understanding (9 pages)	a. Knowledge of COVID-19 (15) b. Lack of understanding of the protocols (17)
COVID-19 myths (15 pages)	a. Education vs threats and commands (4) b. Knowledge of robotics and technological innovations (38) c. Myths about COVID-19 (23)
COVID-19 robotics and technology education (7 pages)	a. Application of robotics and technological innovations (11) b. No access to technology and no electricity (9) c. Technology for the community (8)

COVID-19 and Community Challenges and Behaviors

The first theme relates to COVID-19 and community challenges and behavior. Four sub-themes support this theme: change: resistance, COVID-19 challenges in the community, COVID-19 challenges, and prevention measures. The themes and sub-themes are discussed in the order in which they are listed in Table 2.

Change: Resistance

Participants report that it is difficult for people to change. As COVID-19 brought major changes to normal human behavior, it was initially resisted. The following extract illustrates some of the resistance from the community: "It was too big of a change for people to actually take it seriously because they don't like changing" (FGI 3 participants, Line 79).

During the interview, some participants also highlighted the influence of the generational difference on how change is perceived. A participant commented: "So maybe if the third generation understands the influence they have on the community, then it might change most people's thinking. Because the third generation is the 'I don't care group' uh I am not going to listen to you because times are changing, we only live once" (interview, Line 176).

COVID-19 Challenges in the Community

The following extract from the FGI shows that some communities are not fully complying with the regulations that are aimed at preventing the spread of COVID-19: "We have the community members that are not complying with the COVID-19 regulations, so they are still going on and having functions and gatherings, not wearing masks, and then there's also in certain communities overpopulation" (FGI 3 participants, Line 39). One participant affirmed: "With so many people confined to one community, there isn't enough space for everyone to isolate social distance" (FGI 3 participant, Line 41).

COVID-19 Challenges

Participants seem to understand that community challenges are linked to change. Some people struggle to adapt to change:

> And I think also as individuals, as human beings we have a problem of adapting to new things, you know? It was not easy for people to live a life of masks, doing things online. Other people couldn't even use the Zoom app, so it was a struggle. Other people don't have network, other people are struggling with airtime, you know? A lot of things, so it was a challenge. (FGI 3 participant, Line 96)

Another participant shared a similar understanding, as is evident from this verbatim quotation: "In the social aspect, people were wanting (sic) to socialize with COVID-19 and

the use of alcohol in a social setting to higher spreading, yeah that's what's problematic in communities I think" (FGI 3 participant, Line 75).

Prevention Measures

Participants shared their experiences and understanding of preventing COVID-19. The following quotation summarizes the information shared by the participants concerning prevention measures:

> Prevention is better than cure, I think before you could go through prevention measures, people should actually believe that COVID-19 exists. So by you believing and knowing for sure that the pandemic is there, then surely you will apply prevention measures such as social distancing, sanitizing and wearing of a mask. So firstly, it's all about believing and trusting that the pandemic is there. (FGI 3 participants, Line 56)

This section concludes with the comment of a participant who agreed that COVID-19 can be prevented:

> What I understand is everything that we have been taught about, wearing a mask and just staying at home. That's kind of like just trying to prevent you from getting COVID-19, so it's better to not get COVID-19, to follow all these rules that have been given to us so that you don't get it. (FGI 3 participants, Line 29)

COVID-19 Communication

The second theme comprised three sub-themes: communicate through social media; communicate using workshops, television and posters; and empathy is required from people in authority. The sub-themes are discussed in the order in which they are listed in Table 2.

Communicate by Social Media

The idea of using social media for communication was indicated as a good platform for COVID-19 communication strategies. There is evidence in this study that social media is an effective platform, as participants indicated: "Well, if you are looking into doing something that does not involve actual contact, videos can maybe be made where you have everybody explain their part of that end, you put it together in a video and then you share this across social media maybe" (FGI 3 participants, Line 84).

One participant commented:

> We need to also target what are the things that are consuming people, the mediums that are consuming people. That's where we will be able to go in large numbers. Like for example, if we make sure that by each and every post on social media, there is always a post that says this, this is the awareness, this is the education information. (FGI 2 participant, Line 146)

In emphasizing the need for behavior change in the community, a participant (FGI 2) noted:

> We need to also target what are the things that are consuming people, the mediums that are consuming people. That's where we will be able to go in large numbers, like for example, if we make sure that by each and every post on social media, there is always a post that says this, this is the awareness, this is the education information. (FGI 2 participant, Line 146)

Aother participant stated: "Well, if you are looking into doing something that does not involve actual contact, videos can maybe be made where you have everybody explain their part of that end, you put it together in a video and then you share this across social media maybe" (FGI 3 participant, Line 84).

Communicate Using Workshops, Television, and Posters

The participants recommended conventional communication platforms such as television and posters. Many communities have access to television or radio, as suggested in the following extracts: "Going forward, new developments and everything about it should be in the channel, and the channel must also be advertised on TV that there is this channel about COVID-19. So when the President addresses the nation, he can also mention the channel" (FGI 3 participant, Line 128).

> It might be if we use something like TV or radio as means to get to them because does everyone has access to that? First of all, then the method of communication we want to use is it something that everyone will have access to or be able to see and to hear? (FGI 3 participant, Line 65)

Empathy Is Required from People in Authority

During the FGIs, the participants expressed the need for empathy to be shown by people in authority. Some of their self-explanations are authenticated by the following extracts:

> They should look at it in a collective manner that "I am not alone in this thing, we should be in this thing together, we should put ourselves in each other's shoes." If I feel like this thing is going to affect the next person, I should put myself in their shoes, and same applies to them. It should also be an issue of like we should also give the people who are in authority a bit of empathy and patience because they are also human beings as well. (FGI 2, participant, Line 177)

> You know beyond to be comforting, exactly. So being able to put people in the shoes of the people of authority and saying, "We are doing this together and not only me as I am carrying the responsibility of a million people in this country, but a million people carrying responsibility of all of us to move forward in fighting and combating this pandemic." (FGI 2, participant, Line 181)

COVID-19 Knowledge and Understanding

The third theme partly answers the research question, focusing on COVID-19 knowledge and understanding. This theme is supported by the following sub-themes: knowledge of COVID-19 and lack of understanding of the protocols. The results are authenticated and enriched by including verbatim extracts from the FGIs.

Knowledge of COVID-19

The participants reported that there is a misunderstanding about the COVID-19 pandemic. People are confused about the health regulations that have been introduced to deal with the spread of COVID-19. One of the participants expressed the following: "Lack of knowledge and also ignorance. That people don't understand why they have to sanitize, why they have to wear a mask, why they have to social distance. I don't think everybody really understands why they have to do that" (FGI 3 participant, Line 52). These sentiments are echoed by other participants, as highlighted in the following extract:

> I feel like it's not only just knowledge because people know that they need to wear masks but like, she said, they don't really understand why do I actually have to do this and everything because they are still confused with what's really going on with the whole COVID-19 situation. (FGI 3 participant, Line 54)

Lack of Understanding of the Protocols

The final comments on this issue also affirm that the community still lacks adequate knowledge about COVID-19: "Maybe they live with a granny or someone who is older and who might not even be able to understand this coronavirus thing, but they can, maybe, help the elderly people" (FGI 3 participant, Line 69). A participant from another FGI confirmed the views expressed by other participants: "I think, first, we need to understand the needs of that community because sometimes if people don't really understand the seriousness of COVID-19, they might not actually take it seriously, no matter what attempt we make" (FGI 3 participant, Line 63).

COVID-19 Myths

The researchers used verbatim extracts to support the fourth theme, which addresses COVID-19 myths. This theme presents the following sub-themes: education versus threats and commands, knowledge of robotics and technological innovations, and myths about COVID-19.

Education versus Threats and Commands

Many participants indicated that education about COVID-19 is more about threats and commands than about teachings. A participant in FGI 3 explains this in the following extract:

> I think what we have a lot now is not necessarily education but it's more of commands and awareness. It's not getting people to know what is happening with this disease, so you know people are being commanded on what to do and what not to do, but they are not really being told the details. It's just awareness and commands, not really education. (FGI 3 participant, Line 104)

The following quotation further illustrates the point of threats and commands: "It's becoming a command [rather] than education, we are not being educated, but we are being commanded" (FGI 3 participant, Line 110).

Knowledge of Robotics and Technological Innovations

Participants highlighted that robotics and technological innovations are common in the twenty-first century. The following quotation reflects the knowledge and acceptance of technological advancement in this generation: "Robotics is something I am interested in but [I do] not have much knowledge about Fourth Industrial Revolution" (interview, Line 30–31). Another participant said the following in their own words: "I was saying robotics and technologic innovation, I feel, is just a simple way to make our lives easier, you know, when you look at the lives maybe our mothers were living in maybe 40 years ago and now, you can see there's improvement" (interview, Line 66).

Myths about COVID-19

During the interview, a participant expressed their feeling about myths about COVID-19: "So I feel like technology can really go a long way or provided that it's used correctly; otherwise we might end up having some myths like 5G technology causing COVID-19" (interview, Line 49). Such sentiments are shared by other participants, as indicated in the following extract: "I have heard a lot of mythical beliefs around COVID-19 that it's not a real, that it's a man-made, disease, and it's not something natural" (FGI 3 participant, Line 17).

COVID-19 Robotics and Technology Education

In this section, the results of the fifth theme are presented. Three sub-themes support the main theme: application of robotics and technological innovations, no access to technology and no electricity, and technology for the community.

Application of Robotics and Technological Innovations

The participants expressed concerns about the introduction of COVID-19 in robotics and technology education. The following verbatim extract reflects some of the concerns: "I really think it's going to be a challenge to introduce COVID-19 in a robotic and robotic and technological innovation, so yeah" (interview, Line 134). However, feelings of hope and optimization were also expressed, as reflected by the following quotation:

> I suppose part of the solution, probably not the best solution, would be to look into ways to have the robotics or whatever technology be sponsored by people who can afford it and take that into the communities. Let that spread, and then you share central building or community building so that people can come and see and learn from it if they can't access it themselves. (FGI 3 participant, Line 110)

No Access to Technology and No Electricity

This sub-theme that emerged during the FGI with reference to access to technology and electricity focuses on data: "There are places where they don't really have much access to technology and everything. So they can't, maybe they don't have TVs, they don't even have electricity, like those type of areas" (FGI 3 participant, Line 130). A participant in FGI 3 supports the claim that many South African communities struggle with access to technology and electricity:

> I just wanted to say I feel like it's also unfair if we are only using robotics and technology because South Africa, a large part of South Africa, doesn't have any devices, so how would we be communicating to them, to people that don't have these devices? It's important to go to the community as well, not only rely on robotics and knowledge. (FGI 3 participant, Line 108)

Technology for the Community

In emphasizing the challenge of limited access to technological devices, participants in FGI 3 noted: "Unless the sponsor could sponsor enough technology to spread into all the different homes, although I don't know how useful that can be" (FGI 3 participant, Line 118). The following excerpt affirms the idea expressed previously:

> I was thinking along the points of certainly less privileged communities, more rural communities that didn't have access to the technology or news outlet to even learn and understand what COVID-19 was and is, and that also led to the easiest spread of misinformation and the lack of understanding of why things like masks and social distancing were important and were needed. (FGI 3 participant, Line 98)

Discussion

The discussion is presented in accordance with the five themes that emerged from this study. Robotics and technological innovation can play a role in the prevention of COVID-19 in society. Technological intervention is crucial after observing that not all communities complied with the regulations to prevent the spread of COVID-19. This can be ascribed to the resistance to change and the challenge of adapting to change. Social media and other forms of media can assist in changing this behavior of the public. Prevention measures are essential to combat the spread of COVID-19, especially in the era of the evolving role of robotics in healthcare (Dautenhahn 2007; Khan, Siddique, and Lee 2020).

Social media, workshops, television, and posters are the various platforms that can be used to communicate COVID-19 strategies. The same media and social media that we advocate for was used as a platform to question COVID-19 regulations (Broadbent, Combrink, and Smart 2020). Empathy must be shown in messages, and support must be demonstrated by people in authority. Moreover, the correct information must be provided to the broader community to minimize a lack of understanding of protocols and confusion (Broadbent, Combrink, and Smart 2020). The way information is communicated also impacts on the understanding and knowledge of the broader community. Robots may assist with communicating protocols and information on COVID-19 to the wider community.

The variety of myths spawned with regard to the COVID-19 epidemic created uncertainty. Robots may be an option for the sharing of information, as they have proven to advance the heath-tech ecosystem (Wang and Wang 2021). However, the digital divide in the country and the lack of electricity and other support structures might hinder the rollout of such an initiative.

Conclusion

Students involved in community engagement projects in the SoHCS and EBIT were a part of this study. These students had already interacted with the broader community on various levels and understood the dynamics and views of society. They reflected on prevention strategies for the COVID-19 epidemic, addressing the issues through the model of Pulia et al. (2020), which includes the primary, secondary, and tertiary levels of prevention. The focus was on information sharing.

The topics they addressed were divided into five themes:

1. COVID-19 and community challenges and behavior
2. COVID-19 communication
3. COVID-19 knowledge and understanding
4. COVID-19 myths
5. COVID-19 robotics and technology education

The primary levels of prevention included the sharing of information. It was noticed that not all communities comply with the regulations for preventing the spread of COVID-19. This can be ascribed to a resistance to change and the challenge of adapting to it. Social media and other forms of media can assist in changing such behavior. Prevention measures are essential to combat the spread of COVID-19. The correct information must be provided to the broader community to minimize a lack of understanding of the protocols. The way information is communicated also impacts the understanding and knowledge of the broader community.

The secondary level of prevention included the importance of showing empathy in messages and demonstrating support by people in authority. The proliferation of myths with regard to the COVID-19 epidemic created uncertainty.

The third level of prevention focused on the use of robots. Robots may be an option for the sharing of information. However, the digital divide in the country and the lack of electricity and other support structures might influence the rollout of such an initiative.

In conclusion, the study highlights the importance of effective communication in disseminating information about COVID-19 prevention. The study suggests that social media and other forms of media can be powerful tools in changing public behavior. Public health authorities can leverage these platforms to share accurate information, address concerns, and engage with the community directly. The implications and applications of this study offer valuable insights into the role of information sharing, communication, empathy, and technology in COVID-19 prevention. By applying these findings, public health authorities can enhance their efforts to combat the spread of COVID-19 and engage with communities effectively. Additionally, the study's emphasis on student involvement highlights the potential of youth participation in community-based initiatives for health promotion and pandemic preparedness.

Limitations of the Study

Several limitations underlie this study. Firstly, this research is based on data from twenty-seven students from two faculties at a single university and would be improved by being conducted at more than one university countrywide. Secondly, the study was performed during the first COVID-19 lockdown. The nature of the lockdown prevented the researchers from reaching the students in person. Because of students' conflicting time schedules, it was challenging to arrange for students from the two faculties to attend sessions together in one session. Additionally, the study intended to use online focus group discussions to collect data. However, there were times when only one participant would log into the online platform, and the researchers ended up using individual interviews as a data collection technique. During the online focus group discussions and interviews, the participants could not provide information in response to some of the questions, especially those related to the theoretical framework.

Informed Consent

The authors have obtained informed consent from all participants.

Conflict of Interest

The authors declare that there is no conflict of interest.

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