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The Role of Science Education in Secondary Schools in Curbing Covid-19 Pandemic

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ABSTRACT

Science Education equips individuals with skills, knowledge and ability to handle societal challenges such as Corona virus pandemic. The role of education to ensure effective community engagement for curbing COVID-19 impartation on society includes knowledge, self-efficiency and trust. Functions of science education to students and society were ex-rayed. COVID-19 impact on science education and education in general was examined. School closure was employed as a measure to shut down the spread of the disease. The roles of science educators in the pandemic period among others include how history of science traced other pandemics and how they were able to tackle and downplay political ambitions of the government over the pandemic. Awareness campaigns on mitigation of COVID-19 impact revealed efforts of many countries to fight the monster – COVID-19.

KEYWORDS: *Science education, Pandemic, COVID-19, Crisis*

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INTRODUCTION

Science Education is the application of educational theories in the endless search for knowledge giving rise to the development of the cognitive, affective and psychomotor domains by the means of systematic processes of careful observation, deduction and testing (Clement, Bellow and Sanusi, 2017). They posited it is a sure tool for the promotion of development of any state because the application or its knowledge enables the society to solve the challenges that faces humanity such as Corona virus pandemic popularly called covid-19. The first known patient of Coronavirus started experiencing symptoms in Wuhan, China on 1 December 2019. Since then, there have been over 800,000 reported cases around the world (Ozili, 2020). According to Olubusoye and Ogbonna (2020), the sudden drop in revenue comes just when fiscal resources are urgently needed to contain the COVID-19 outbreak and stimulate the economy, creating a financing gap that threatens to destabilize the government's fiscal position. Since 27th February 2020 when the issue of covid-19 entered into Nigeria, the Nigerian economy and education appeared to have entered turbulence. Thirteen days after its importation from Italy, precisely March 11 2020, the World Health Organization (WHO) declared covid-19 a global pandemic. The Covid-19 pandemic has caused unprecedented panic and disruptions both for the public and private sectors. The crisis is considered an existential threat to the global economy with governments and businesses grappling with the effects. There has been growing apprehension as to the eventual impact of the pandemic especially for economies and education. While the health impact of the crisis is substantial, the economic effects are no less devastating especially for businesses (Lola, 2020).

Education systems, especially Science Education should be part of the response to prevent, limit or slow the spread of the virus and curtail its impact. COVID-19 is spread through liquid particles containing the virus that are generated by breathing, speaking, shouting, singing, coughing, and sneezing (Loedan, FitzGeraid, & Grosser, 2020). It simply means that it spreads by droplets of water particles coming out of the human body. Large droplets settle rapidly. Smaller liquid particles dispersed as aerosols stay air

The range of ways in which Science Education might support a campaign to limit the impact of a virus like covid-19 requires investigation into processes that might be undertaken and the materials and instruments these would need. For this reason, closer collaboration between Science Education and health sectors should prove fruitful; and joint interaction between Science Education, Health and other relevant government departments would be needed to explore the potential for collaboration.

In its Managing Epidemics handbook of 2018, the WHO sets out a basic framework or model for a comprehensive outbreak response at an individual country level. This model is a standardized basis for managing an epidemic in every country and is necessary for international cooperation. The framework provides a starting point for identifying areas of

outbreak response in which educational institutions as well as science education can play a role.

WHO (2018), identifies four key response roles educational institutions using education departments especially schools would apply in relation to the WHO outbreak disease responses. Educational institutions would play a role in outbreak response by (A) 'Coordinating Responders', (B) 'Health Information' or (C) 'Health Interventions' but could play an important role in (D) 'Communicating Risk'.

Role of education institutions

According to the WHO, community engagement needs to be achieved through dialogue. The following three elements are important to ensure effective community engagement (WHO, 2018: 39, 40–41):

1. **Knowledge**: communities must know what the disease is, how it is transmitted, and how to protect against it.
2. **Self-efficacy**: communities must be able to implement control measures. As in covid-19 for instance, access to soap and water, to gloves, sanitizers, to waste management, ability to wear face-mask, maintaining social distancing, avoiding handshake.
3. **Trust**: this is an important influence to ensure that communities heed public health advice.

Schools can provide access to reliable information resources, strengthening household and community capability and retaining trust in government during the crisis.

A national public covid-19 education awareness campaign championed by Science Educators at schools and circuit/district offices could involve the following elements. Some of these activities may be taken forward depending on the time available for preparation, consultation and implementation. Science Education can:

1. Create capacity at District and Circuit Offices communication with schools, school management and closure, teacher infections and learner infections, testing protocols.
2. Create capacity for School Management Teams how to take care of/manage and isolate students with fever and respiratory symptoms until collected from school.
3. Create capacity to include a science curriculum component for teachers to take into classrooms with a background information and support to facilitate a lesson on covid-19.
4. Create awareness of self and family care and protection information for learners with campaign materials and activities to provide information about covid-19 that are related to relevant subject areas in the curriculum.
5. Create capacity and awareness campaign for parents on how the schools will be responding to covid-19 given some clear information about protection of themselves and family members and how schools can respond.
6. Science Education awareness campaign for custodial staff providing self-care and role in sanitizing the school environment.

School closures do not remove learners from the risk of infection. Social sources of infection in the neighborhood are therefore a matter of concern. The activity patterns of children in the community, and who their care givers are, are relevant information.

Functions of Science Education to Students and Society

Science education makes this clear to students and individuals. The students that go to school on a bus are using the product of science and technology. The infrastructures, the smart phones, computers are products of science and made to better the life of man. The environment with trees and sunlight, the trees turning the sunlight to food and oxygen for the survival of man is depicting science. Whether it is natural or manmade, every aspect of a man's life is a wonder work of science, from his internal body system to his physical environment. All these when properly channeled and directed goes a long way to ease the problem of man especially during this pandemic era.

Science education inculcate in individuals spirit of scientific inquiry and scientific method. The ways scientific thoughts, methods and enquiry are used to decisions matter a lot. This may not necessarily be a conscious thing but may arise from curiosity or necessity. In the face of a hard time like now with covid-19 pandemic, the process of enquiry may be more direct. Ask questions, try and find answers to these questions, make explanations and connect these explanations to previous knowledge and get these communicated. When scientific questions are combined with research to construct a hypothesis and carry out experiments to test the hypothesis, results are got and conclusions are drawn. These conclusions are communicated and solutions sought. It is in the process of finding solution that discoveries of how to handle the hard pandemic period could be discovered.

Using critical thinking brings about problem-solving; an evidence to create solutions and make decisions. Critical thinking and problem solving are important skills Science education inculcates in the students in their course of learning. They are the tools for decision making in and after school. The processes of observation, manipulation, execution and evaluation students pass through as they carry out experiments in class can be applied to challenging situations as is obtained during corona virus pandemic. Science is that important subject that gives people the critical thinking skills needed to solve everyday life problems. Science education universally has the potential to instill in students the lifelong skill that will help them generate ideas, weigh decisions intelligently, teaching them technological literacy that gives them the knowledge they need to succeed in and outside school.

How does COVID19 impact education?

While covid-19 is primarily affecting public health, spillover effects can already be observed in education as a whole, and science education in particular; stemming largely from extended school closures. The following are among the key issues to consider:

By current World Bank information gathering, at the time of writing this note, 150 countries are reporting school closures. These numbers have increased rapidly since late February.

School closure decisions have to balance different factors.

On one hand, despite the low rates of infection among children, school closures are a critical pillar of the social distancing tools to mitigate the spread of the disease and

avoid an acceleration of cases that will put a strain on health services. Its effectiveness as a measure to slow down the spread of contagion will depend on the exact timing of the closures, the age structure of the population and the length of the closure.

Recent guidance from the United States Center for Disease Control (US-CDC) suggests that school closures do serve a purpose, in particular if COVID-19 cases are school-based, to allow for decontamination and contact tracing. It also recognizes its importance as a tool to increase social distancing.

The reports note that a closure of 4 to 8 weeks might be required in case of substantial community spread. On the other hand, extended interrupted education that disengages students from the learning process has the potential cost of reversing gains in learning results. An even higher cost comes from the disengagement of students with learning challenges (academic, socio-economic, students with special/diverse educational needs or persons with disabilities) who may not effectively cope with remote learning strategies or cannot access the information (see next section). Where school feeding is the norm, closed schools might preclude students getting school meals unless alternative arrangements are in place. In secondary schools, longer school closures could result in an increased risk of dropout for youth, particularly from lower income groups. School closing also impact labor supply as they increase the burden on parents who need to stay home or find new arrangements if children have to stay at home; even worse if playground and children centers are closed.

In countries where the breakout is isolated, some governments have opted to close schools in the immediate location or region or schools have self-selected themselves to close as a precautionary measure or to sanitize before returning kids to the classroom. Portugal, Spain, and India are examples of countries that used regional closures as an attempt to contain or slow the spread.

The Role of Science Education in the Time of Covid-19

Covid-19 has dealt with millions of people globally. The attempt of public and private sectors are geared towards bringing down the effect of the virus on humanity. Among the sectors worst hit by the pandemic is education. Science Education finds a way of contributing to education in the era of pandemic.

The history of how past pandemic was handled can point to not only the development of scientific explanations in time but also the societal contest that experienced them (Erduran, 2020). History abounds with lots of lessons about pandemics in terms of their societal, ethical and scientific and medical dimensions.

The study of the past of science can help improve the present scientific concern on the nature of COVID-19 and provides directions on how to tackle it. The knowledge of the history of science results in a better understanding of the scientific knowledge that is accepted. It can provide an in-depth understanding of the methods used by scientists in the past to handle previous cases of pandemics (Reiss, 2020). Different types of history according to Allchin (2003) in Reiss 2020 can be used to convey the nature of science more effectively and not that we need more history in science education. Science stories transmit both knowledge and values (Milne, 1998 in Riess 2020)

The most obvious way a science educator could relay the role of history of science in a time of covid-19 is by considering past pandemics. Paulson (2013) noted that tuberculosis (TB), an infectious disease, has killed most humans over the centuries and only few students are aware of it. World Health Organization (WHO) reports that over a million people a year die from tuberculosis (WHO, 2020), and about a quarter of the world's population has latent tuberculosis. Tuberculosis primarily spread by inhalation of tiny water particles with the bacteria, when a tuberculosis patient coughs, sneezes, shouts etc. This is also the route through which covid-19 spread but tuberculosis does not spread through contact with surfaces as covid-19 does. Bovine Tuberculosis spread from cattle to mammals including human beings. Spreading of tuberculosis from cattle to humans has similarities with the importance of animal-human transmission for covid-19 (Reiss, 2020)

The dreaded influenza pandemic caused by HINI virus of 1918-1919 infected about five hundred million people (about one-third of the world's population then) and about fifty million lost their lives to it. Covid-19 death rate is highest in younger people of 5 years, 20-40 years and 65 years and above (Reiss, 2020)

There are other pandemics that have ravaged the world such as syphilis and Severe Acute Respiratory Syndrome (SARS) yet life still continue even with their presence.

Similarities exist between the way previous pandemic of influenza was handled and the way current attempts are being made to tackle COVID-19. In influenza and COVID-19 pandemics, public gatherings were banned, masks used, schools and businesses shutdown, healthy hygiene practices recommended, makeshift hospitals built and unsuccessful desperate attempts made to manufacture vaccine.

Science Education through their teachings down play the political ends of the government over the pandemic which the society has used to set a backdrop of mistrust in science. There is every need to educate the future scientists and the general public with evidence-base reasoning and critical thinking as well as action oriented and socially responsible citizenship. There is an urgent need to empower students with a curriculum and instructions that adopt scientific habits of mind. According to Erduran (2020), this empowerment and impartation of knowledge can occur through informal learning with families and other social networking institutions adopting different scientific literacy methods, establishing it across societies.

The populace thinks that all who died during the COVID-19 was caused by Corona virus. Many people died without the clear-cut diagnosis of COVID-19. Science educators need to help the students to realize that somebody dies and is shown by testing to have COVID-19 does not necessarily mean that he dies of COVID-19 infection. About a quarter of those who dies across the globe test positive for tuberculosis or some other diseases but the great majority of such people do not die because of coronavirus infection leading to overestimation of mortality rate of COVID-19.

Science Educators aid the students come to know the indirect consequences of COVID-19 on mortality. Some may not have known that fewer people go to hospital for treatment because they are afraid of being diagnosed of Corona virus. Others have great anxiety and other serious mental challenge with outcomes that lead to suicide. Lower

level of exercise plus increased food consumption as well as increase in domestic violence, all leading to increase in mortality rate. When all these happen, people assume that it is the Corona virus that causes the deaths. So science educators bring to the knowledge of the students the indirect effects COVID-19 has on mortality.

Sadati, Lankarani and Lankarani (2020) point out that one of the most important consequences of the COVID-19 outbreak has been the social anxiety the pandemic created globally. The science educators have to educate the society that we are going to stay longer with the Corona virus just like every other disease such as malaria and other illnesses. After all, Erduran (2020) revealed that the COVID-19 pandemic can potentially last for an extended period of time and its consequences on contemporary science and society is likely to be felt for a long time.

How can Science Education mitigate COVID-19's impact?

A. Enhancing Preparedness while keeping schools open

Most governments rolled out awareness campaigns through schools and other platforms on hygiene and sanitation to students. In **Afghanistan**, the Ministries of Education and Health launched a hygiene good practices awareness campaign through schools, television, and social media platforms. In **Finland**, while most schools are closed and remote learning and teaching is taking place with the support of educational technology, kindergartens continue operating with preventive measures and are open for families who need childcare. In addition, primary schools must organize contact teaching for those grades 1-3 students whose parents work in critical positions such as health, education, logistics, supermarkets etc. In **Russia**, Moscow city and Moscow oblast moved to a free regime of school attendance. If families want to stop attending schools, they are free to do so. The compensation is providing distance education through technology. In **Ethiopia,** the Ministry of Education distributed communication material to students and parents on how to reduce risk of exposure.

In low capacity countries, (those that battled with Ebola outbreak in 2014-15 can serve as examples), governments can use the education physical and human resources to address the epidemic. Given their level of education and profile within communities of low literacy, science educators can serve as advocates and resources that would increase awareness and provide guidance. For example, in Liberia and Sierra Leone teachers were trained on protocols for screening of children for fever once schools resumed. They also benefit from teachers expanding awareness about the causes of infection and symptoms.

Limit physical contact by reducing social and extra-curricular activities. Many countries restricted or cancelled extra-curricular, athletic, or community activities as a measure of reducing physical contact. This has been rolled out by individual schools, regionally, or nationally by governments looking to enforce social distancing. In countries across Europe and the Middle East, governments have enforced a ban on gatherings with large numbers of participants, including sporting and non-essential academic events. For example, in **Belarus**, where schools remained open, social interactions are limited– including also mass gatherings and interactions during school breaks.

B. Using distance learning to mitigate loss of learning

While schools are closed, many countries have turned to distance learning as a means of mitigating for lost time in continuing education services. Some countries are simply putting resources on their website, and making available more products, but not necessarily online classes. Others, like **Spain**, are asking teachers to prepare online content and offer online classes. Both the teachers and the students are not very familiar with the tools and this seem to be driving more challenges than success to learning. **China** for example, with robust connectivity, is offering distance learning successfully whereas others with limited penetration of internet, cell phone, or television (e.g. **Vietnam, Mongolia**) are finding it difficult to reach all students equally. In addition, many countries have challenges in ensuring that education services are equally accessible to all students especially those with disabilities.

Providing resources to work at home can now be done using different technological options. But access to connectivity and different type of devices, for example ensuring accessibility for students with disabilities, vary widely across income levels. Hence, a key challenge, and is now creating further inequalities.

Some African countries (**Kenya, Rwanda, South Africa, Senegal, Botswana, Gambia**) can start preparing now as there is reasonable school connectivity and there are devices (tablets) for kids to take home. In most countries, however, students have some access to mobile devices and optimizing accessible solutions to these students should be the main emphasis. In Nigeria, only few private and public schools engaged in online learning. Although there is plenty of digital content available, some of them became source of challenge, for they could not provide a well prepared pedagogical material to be available in a structured way such that could capture the attention of all students.

Partnering with some private sector

Providers to provide content already developed is a useful option to explore. A key element in the discussion of using smartphones is establishing partnerships with telecom providers to allow for zero charges for content downloaded from the Ministry of Education or any agency that hosts learning resources platforms. Television which can use captions to support various language learners and students with disabilities or sign language interpreters to reach deaf learners and radio options can still be used but they tend to be better suited for lower grades and should be prepared bearing in mind that they are being used by children and caregivers. Many countries have material available that can be rebroadcasted.

In addition to infrastructure and connectivity, science teachers' and administrators' familiarity with the tools and processes are also key factors in providing distance learning. **Singapore** is currently rolling out training for teachers on provision of online classes in anticipation of school closure. Some countries like **Lebanon** have opted to send kids home with lessons as homework, promoting independent distance learning with help from peers and parents that would then be reinforced once school resumed.

C. Use of education resources to support the general response

In environments of low capacity and weak infrastructure, some countries have used education facilities and staff to support the larger community during the crisis. For example,

in areas of low or no connectivity in communities, education facilities can be used as information hubs of medical holding centers once schools are closed. In these cases, attention is needed to define a clear path to returning the schools to their initial purpose once the crisis is over. Additionally, school administrators and science teachers comprise a cadre that can be trained during the school closure to help with some initiatives such as sensitization and other social activities (e.g., during the Ebola Virus outbreak in 2014, teachers in Guinea carried out advocacy work in their communities and supported contact tracing of Ebola patients.) Science teachers can adequately serve such purpose in COVID-19 pandemic.

Science Education Coping Strategies for Secondary School Students

The youngsters may be less susceptible to infection than older individuals but can spread the infection across board. Infections imported into schools from the community would be curbed if further transmission within schools is checked with rigorous measures implemented to reduce the risk of person-to-person spread. Larger school outbreaks are associated with increased community transmission, insufficient physical distancing, poor ventilation, and lack of masking (Lordan, FitzGerald, & Grosser, 2020). Schools that implemented transmission mitigation measures such as European countries seem not to have substantially contributed to increased circulation of the virus among local communities.

Infection can be silent if the immune system of the students are high. Minimizing the import of infections into the school can stem the spread of COVID-19. Daily symptom screening can identify individuals with COVID-19 at first presentation.

It has earlier been said that the environment with trees and sunlight manufactures food for survival of man. Science education teaches that proper combination of food in the right proportion gives a balanced diet. Eating of balanced diet nourishes the body, boosting the immune system that fights diseases including corona virus. So a student who feeds well may likely not be a victim of covid-19 because his immune system is strong to fight the disease.

Outbreaks in school can be minimized by limiting the students to the smallest possible number of persons in a class to ensure reduced person-to-person contact. A normal class of 30 to 40 students when reduced to 15 or there about distances the students from one another and reduces the possibility of the children having body contact. With appropriate physical distancing and good hygiene measures applied such as hand hygiene and ventilation, schools are unlikely to be more effective propagating environment that transmits covid-19.

Of course, when the class size is downsized, the implication is that more teachers need to be employed to take care of the leftover students. In effect, reduction in class size and employment of more teachers to handle science subjects will not only curb the spread of covid-19 but turn out to improve learning of sciences and enhances education in general.

Another way the science teacher can employ to curb the spread of covid -19 in schools is to cut down the number of the students that participate in the science practical laboratory class. Because the number of the students participating in the science practical classes are always large compared to the size of the laboratory, there is need to divide the students in small handful groups able to be handled by the science teacher; and sure so maintains social distancing. The students will be coming into the laboratory in batches for practical works.

An alternative to the use of person-to-person physical laboratory is the use of visual laboratory. In visual laboratory, practical works are performed online. The students watch the video tape at home and demonstrate what they have observed. In that way physical contact is completely avoided and social distancing upheld.

In the view of keeping the students socially distanced from one another, the students would be made not to go out on breaks to avoid social interaction or playing together. Every mass gathering in the school such as morning assemblies, moral instructions, clubs etc must be avoided.

Large school outbreaks can substantially be curbed through basic mitigation measures of hand hygiene. The science teacher can teach the students how to produce hand sanitizers and disinfectants in the laboratory. The school and the students would have enough of them for hand washing.

The way forward

Therefore, the following can be done to curtail or prevent the spread of the virus among the students:

- Engage the students in evidence based reasoning and critical thinking, and inculcate in them action oriented-based citizens.
- Empower the students to adopt scientific habits of mind to face the realities of life challenges.
- Impart of Science education be extended to non-formal learning environment, teaching them different ways of interaction which can serve as a pivotal in ensuring that a systematic approach to scientific literacy is achieved across societies.
- Digital and online lessons should accompany virtual classes. Therefore science teachers need to have interest to engage in webinars especially those from rural areas; so that students learning will not be hampered.
- The society should bear in mind that COVID-19 is not in a hurry to go. Like every other disease such as malaria and other pandemics it has come to stay and we must get back to work and school with some mitigation measures discussed above to continue from where we stopped and revive our school and the economy.
- History of science be embedded in the school science curriculum and this be thought in every stage of science education so that young and adults through history of science would come to know other pandemics and how they were tackled. Fear and social anxiety would disappear from the minds of the populace with the believe that the current pandemic is curbed.

Conclusion

COVID-29 crisis has caused unprecedented panic and disruption in the globe. Science curricular has a history of changing appropriately in response to important science related issues that arise in society which COVID-19 constitutes such an instance (Reiss, 2020). Science Education mitigated COVID-19 impart. Strategies such as limiting physical contacts and online lessons were applied to curb the impact of the pandemic.

References

[1] Allchin, D. (2003) scientific myth-conceptions. Science Education, 87,329-351.

[2] Clement, I., Bello, M & Sanusi, S. A. (2017). Science Education and Nigeria-National development effort: The missing link. International Journal of Education and Evaluation and 3(6), 46-56. www.ijardpub.org

[3] Erduran, S. (2020). Science Education in the era of a pandemic. How can history, philosophy

[4] Sociology of science contributes to education for understanding and solving the COVID-19 crises? Science and Education 29:233-235. https://doi.org/10.1007 /511191-020-00122-10

[5] Olubusoye, O. E. & Ogbonna, A. E. (2020). COVID-19 and the Nigeria economy: analyses of impacts and growth projections. CPEEL‟s Covid-19 Discussion Papers Series.

[6] Ozili, P. (2020). Covid-19 pandemic and economic crisis: The Nigerian experience and structural causes. See discussions, stats, and author profiles for this publication at: https://www.researchgate.net/publication/340439471.

[7] Paulson, T. (2013). Epidmiology: a mortal foe. Nature, 502, 52-53, https://doi.org/10.1038/50252a.

[8] Reiss, M. J. (2020). Science Education in the light of COVID-19. The contribution of history, philosophy and sociology of science. Science and education, 29:1079-1092 https://doi.org/10.10007/511191-020-00143-5

[9] Sadati, A. K., Lankarani, M. H. B & Lankarani, K. B. (2020). Risk society, global vulnerability and fragile resilience: Sociological view on the corona virus outbreak. Shiraz E-Medical Journal, 21(4), e102263. https://doi.org/10.5812/semj102263.

[10] World Health Organization (2020). Tuberculosis. https://www.who.int/news-room/fact-sheet/detail/tuberculosis. Retrieved 12 oct, 2020

[11] Lordan, R., FitzGerald, G. A. & Grosser, T. (2020). Reopening school during COVID-19.Science, *369 (6508) 1146*