International Journal of Education, Learning and Development
Vol. 11, No.4, pp.58-68, 2023
Print ISSN: 2054-6297(Print)
Online ISSN: 2054-6300 (Online)
Website: https://www.eajournals.org/
Publication of the European Centre for Research Training and Development-UK

Functional Science Education: The Role of Science Educators in Post Covid - 19 Era

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doi: https://doi.org/10.37745/ijeld.2013/vol11n45868 Published April 14, 2023

Citation: Umar U., Umar .A., Mohammed U., & Abdulmumini G. (2023) Functional Science Education: The Role of Science Educators in Post Covid - 19 Era, *International Journal of Education, Learning and Development*, Vol. 11, No.4, pp.58-68

ABSTRACT : *It is widely agreed by many that COVID-19 has had a significant impact on education on a global scale. It has impacted virtually every facet of society, including social, cultural, economic, and educational factors. Changes in teaching objectives and methodologies are the main ways that COVID-19 has affected science education. This study explored the vital roles science educators' would play in the post-COVID era. The study found out among others that science educators perform a variety of important roles in the post-pandemic environment, including those of science communicators, critical thinkers, knowledge creators, disruptive innovators, advocates against misinformation, and future-ready educators. The study recommended among others strategies on the basis of worldwide research outcome of science education on how to improve science education in the post COVID-19 Era; for science teachers to be able to contribute to research-based and evidence-based practices in their areas of expertise, teachers should also be supported financially through research grants and financing.*

KEYWORDS: Post COVID-19, science education, science educators.

INTRODUCTION

The COVID-19 (Coronavirus disease 2019) pandemic has drastically altered many societal aspects. Its effects have wreaked havoc on a number of areas, including the political, economic, environmental and educational aspects. World Health Organization (WHO) on 11th March, 2020 declared COVID-19 as a pandemic. Most people infected with the virus will experience mild to moderate respiratory illnesses and recover without requiring special treatment, older people, and those with underlying medical problem like cardiovascular disease, diabetes, and cancer are more

likely to develop serious illness. The COVID-19 epidemic has now brought our globe to a standstill and had unimaginable effects on our daily lives (United Nations World Tourism Organization, 2020). As a result, the pandemic pushes changes in the educational system. Schools, teachers, and students must adjust to the demands of online learning. The traditional face-to-face classroom must make way for virtual classrooms, especially for teachers (Rogayan Jr. & Dantic, 2021).

A nation cannot develop in isolation of its citizens. Hence, the qualitativeness of its citizens strongly depends on the quality of education acquired. According to Ebuta (2017), Education is an instrument for national development which is a veritable means of socio-economic growth. All over the world, education is a powerful instrument of change. Importantly, a functional education and not just obtaining a certificated qualification is the bedrock in reference.
Therefore, science education is the study of inter-relationship between science as a discipline and the application of educational principles to its understanding, teaching and learning. Science education plays a crucial role in navigating the post-COVID age. Regarding the COVID-19 pandemic, the concepts based on science and research are crucial inputs for policymaking and governmental directives. Hence, Science educators have a new and important role to play in the era following the COVID-19 pandemic. In the wake of the Covid-19 pandemic, science educators have a unique opportunity to help their students understand the science behind this global event. They can also help students develop the critical thinking.

In navigating a new normal post-COVID era, science educators have been instrumental in ensuring that students receive high-quality science education. In the past, science educators have been responsible for teaching the principles of science and engineering, and preparing students to work in these fields. In the current era, they must also help to rebuild trust in these disciplines. Education reform will be necessary to fulfill the future demand for skills. Enhancing people's scientific literacy and fostering innovative talent in the sciences and technologies are significant responsibilities of science education (Ottesen, 2021). Science education is considered to serve an increasingly significant role in strengthening people's scientific literacy, particularly in light of COVID-19 (Reiss, 2020a). The medical and health professions are referred to as "frontliners" since they fight the virus head-on. Teachers, meanwhile, are viewed as "backliners."For improved preparedness, prevention, and reaction in health emergencies and pandemics, teachers must convey to students concepts and ideas about everything from the fundamental description of a virus to its mode of transmission.

In order to solve the social, economic, and environmental aspects of these global concerns, science education potentially well positioned to promote new generations' understanding and engagement. Science education bridges the gap that persists between natural sciences and social sciences (Rogayan Jr. & Dantic, 2021).

Science educators undoubtedly fill a vital role in the socio-ecological system. Bourn, 2016 stressed the importance of teachers as social change agents and excellent global learning facilitators. He argued that educators can make a positive difference in people's lives and are inherently suited to serve as community leaders and sources of knowledge about current events. Scholarly literature also enumerated the social roles of teachers specifically Science teachers. Teachers have a crucial role in community development, societal improvement, national progress, and global sustainability in addition to serving as educators and knowledge disseminators. Similarly, (Rogayan Jr. & Dantic, 2021) stressed that, the epidemic has disturbed a number of societal aspects, including science education. Science educators have a crucial role before, during, and after a pandemic to maintain educational continuity, help reduce viral transmission through science education and information sharing, and participate as proactive community members by filling the various responsibilities. In order to understand the crucial responsibilities that science educators might play in the post-COVID environment. This paper therefore discussed the important roles that science educators can play in helping to rebuild trust in science and promoting functional science education in the post Covid-19 era.

Challenges Brought by Covid-19 to Science Education in Post Covid-19 Era

The World Health Organization (WHO) classifies COVID-19 as a global pandemic that has a significant impact on human development and global trends (Friedman, 2020), a famous writer in the United States, argues that this epidemic represents a dividing point between B.C. (Before Corona) and A.C. (After Corona). More than 180 nations around the world have suspended classes due to the COVID-19 outbreak, preventing students from participating in regular learning. The effect of COVID-19 on education has received timely response from numerous organizations and research institutions (Wang & Yuan, 2021). Humans have actively fostered the social, political, economic, and educational recovery during routine pandemic prevention and control after the fundamental pandemic was under control. As a result, it might be said that we are now living in the post-COVID-19 age.

United Nations Educational, Scientific and Cultural Organization (UNESCO) issued Education in a Post-COVID World: Nine suggestions for civic action. The commitment to strengthen education as a common good, extending the definition of the right to education to include the value of connectivity and access to knowledge and information, valuing the teaching profession and teacher collaboration, promoting student, youth, and child participation and rights, and protecting the social spaces provided by schools as we transform education are among the nine ideas for the development of education in the post-COVID-19 era (UNESCO, 2020).

Changes in teaching objectives and methodologies are the main ways that COVID-19 has affected scientific education. According to UNESCO, all nations should work to improve their scientific literacy education in the post-COVID-19 period. Science education should also extend beyond knowledge and understanding of the subject matter to include capacities and skills. The importance

of including scientific literacy in the curriculum was also emphasized by UNESCO. The timing is right for in-depth curriculum reflection, especially as we battle the denial of scientific knowledge and actively combat false information. Consequently, it is crucial to encourage students' scientific literacy in the post-COVID-19 era. To do this, education systems worldwide must implement appropriate curriculum and teaching and evaluation strategies. Also, it is crucial to create an educational ecology that can steadily raise students' levels of scientific literacy. To this purpose, kids should be able to study in suitable ways in informal learning environments like families, museums, and other social networking organizations (UNESCO, 2020). In terms of teaching strategies, the post-COVID-19 era would have a huge impact and shift on traditional teaching strategies and also have a considerable impact on the teaching strategies of science education. Exploring a mixed-science education pattern is crucial as online teaching resources advance because it can promote personalized learning and extend learning time and opportunities (Erduran, 2020). To support this statement, it was observed that during the covid-19 children from different social background were seen using their games and parents phones to stay updated with teaching and learning processes. This led to more exposure of children to scientific and technological process of teaching and learning. This is a tip from role of science in teaching and learning process. The fact that children were exposed to science through technological devises there is every need for coordinated teachers' insight towards teaching and learning, that is exploring the role of science educators to teaching and learning.

Role of Science Educators in the Post Covid-19 Era

Science education has been impacted by the current COVID-19 epidemic, among other societal aspects. Science educators have a crucial role before, during, and after a pandemic to maintain educational continuity, help reduce viral transmission through science education and information sharing, and participate as proactive community members by meeting the various responsibilities mentioned (Rogayan Jr. & Dantic, 2021).

Science Communicator

A science communicator is one essential function of a science teacher. Several educators agree that this position should be more prominent in the post-COVID environment. By communicating and elaborating on basic and intelligible scientific concepts, science teachers can close the communication gap between the public and the scientific community. This could be accomplished through academic training, the creation and distribution of policy briefs, research presentations, or even open forums (Rogayan Jr. & Dantic, 2021). With regard to pandemics and other health-related concerns affecting society, teachers should communicate science in a clear and accurate manner so that students and members of the community may understand it. The teachers' method of disseminating information that has been supported by study and science may assist students make wise decisions and the community respond positively to a given situation (Reiss, 2020). A significant role in promoting scientific literacy being provided by science teachers. Teachers can create materials that employ everyday language to help students comprehend technical terms and

scientific jargon better as science communicators. Also, a science teacher must locate resources to educate his or her children on safety measures against viruses that can spread disease (Rogayan Jr. & Dantic, 2021).

Therefore, to ensure that the community has access to crucial information, science teachers must freely share their insights and learnings during and after COVID 19. This information may in fact be beneficial and encourage folks to respond in a more organized manner through offering their support to community members which children are part of.

Critical Thinking

The role of teachers in evaluating factual data and information to reach an unbiased conclusion and appraisal is addressed by critical thinking. Teachers may provide students with opportunities to study about topics beyond the virus itself, such as how the economy and pandemics are related and how those linkages function, using current events in our own communities as examples. A good critical thinker can draw reasonable conclusion, and discriminate between useful and less useful details to solve problems or make decisions.

Therefore, science teachers have identified the critical thinking as a crucial function that they have taken on with vigor in the wake of the COVID disaster. Since the pandemic, it has been highlighted that teachers' role in examining factual evidence and information to make an objective assessment and appraisal should be improved. Teachers need to think critically and move beyond their subject-matter expertise (Rogayan Jr. & Dantic, 2021). Students can understand how science, economics, and politics are interconnected thanks to the COVID-19 pandemic (Reiss, 2020a). Korkmaz et al., (2017) emphasized that, the importance of teachers developing their students' computational thinking abilities was underlined. These abilities include creativity, algorithmic thinking, teamwork, critical thinking, problem-solving, and communication. He also suggested that teachers may ask students high-order thinking questions about social issues like pandemic emergence in order to improve their critical thinking skills.

Critical thinking is one of the key purposes of education to generate dependent and rational thinkers and efficient citizens in today contemporary world (Haghparast et al., 2014). In modern society, which constantly grapples with important developing concerns, educators must be critical thinkers. Teachers, on the other hand, ought to act in the same capacity toward the broader public and students. In the context of education, teachers are necessary to foster critical thinking. Therefore, science teachers can support students in forming conclusions, improving their evaluation of evidence, separating fact from fiction, and developing their critical thinking abilities.

Knowledge Creator

Knowledge creation means continuous combination, transfer and conversion of different knowledge. This study also recognized the knowledge creator as a role. The primary responsibility

of science teachers is to conduct inquiry-based research utilizing the fundamentals of the scientific process. To identify best practices, promote evidence-based procedures, and advance student learning during the epidemic and after it, science teachers need to be involved in and support research, assessment, and strategic planning activities (Toquero, 2020).

The relationships between science, technology, and society (STS) must be taught more actively by science teachers, who also need to identify reliable information sources. This argues that science instructors should employ research-based teaching as a method of instruction when presenting specialized lessons on science and society. Scientific research articles, widely read newspaper stories, scientific papers read at conferences, published monographs, and policy briefs can all be used as trustworthy and reputable sources (Rogayan Jr. & Dantic, 2021). Relatedly, research work has been done during the lockdown using electronic resources, available databases, and online meetings using several video conferencing applications (Ray & Srivastava, 2020).

Teachers are those who are capable of creating valuable knowledge with and for others in a communal environment (Bulfin & Mathews, 2003). In order to be recognized as knowledge producers, idea incubators, and innovators, science teachers must constantly advance through professional development. The study will produce factual findings that can guide policymakers and compel government officials to take appropriate action in light of the current and future COVID-19 and other pandemic situations. Therefore, this relates to the role that science teachers play in generating new knowledge by doing research and applying the scientific method.

Advocate against Misinformation

This focuses on the duty of educators in speaking out against erroneous and deceptive information. Teachers can speak out against misleading information and fake news in the current digital world. By having scientific understanding, people would avoid receiving unreliable information that somehow causes catastrophic public panic and errors. Scientific educator, therefore, should promote the use of accurate, reliable, verified, and impartial information in reporting by teaching students how to distinguish fact from fiction, look into the information, and establish its validity. Unnecessary mistakes might be avoided if it is possible (Rogayan Jr. & Dantic, 2021). Misinformation may wreak havoc on public dialogue especially when spread online. Many people quickly accept the information they find online without even reading it again or double-checking it. Fake news is becoming a bigger problem as digital technology becomes more widely accepted (Lim & Tan, 2020). As a result, educators are seen as guardians against false information and fake news. Students need to be educated on the fundamental principles of telling real information from fraudulent. Hence, educators must train their students to be champions of media literacy, spokesman against false information, and representatives of digital citizenship.

Teaching students to evaluate press reports, viewpoints on false news and how to detect and combat them and critical reasoning about what others are saying should be a higher priority for

science teachers. Students will be able to determine if the information is founded on evidence or not in this way. Hence, teachers should encourage their students to consider disseminating information to the broader public. The COVID-19 pandemic offers a wide range of opportunities to impart sociological approaches of thinking, data analysis, and human practices to students.

Feature-Ready Educator

Science educators should have the skills to adopt multiple, highly effective learning technologies and adapt to diverse, evolving learning structures to assure that the use of technology adds value to the leaning process. This section explains how science teachers adapt to the complexity of the educational landscape of the present and the future. The scientific curriculum should be improved from being purely theoretical to being more pragmatic in its application, according to future-ready instructors. It is also paramount that, science and health lessons should incorporate COVID-19 good hygiene habits and sanitation. Health in policies is now a reality, albeit in the way it was intended, as it has evolved into a pervasive concern that supersedes all other concerns (Rogayan Jr. & Dantic, 2021).

Science teachers need to ensure that the science curriculum remains relevant in the post-pandemic setting, by consistently updating the science curriculum to reflect the most recent and upcoming demands. (Reiss, 2020) argued against making "knee-jerk changes whenever some new science-related concern develops" in regards to scientific curricula, teaching methods, and evaluation systems. Fear of the future, according to Cahapay, (2020) "arises from the past and the present and is a reflection of what has been collected until the present." Therefore, it is crucial to create readiness in situations like the current health disaster caused by COVID-19. With the assistance of the government and other stakeholders, schools need to develop more pandemic-resilient and future-ready curricula in light of what we saw during this worldwide epidemic in order to prevent learning losses.

Disruptive Innovator

A system that deviates from the norm and subsequently gets better with time can be changed and innovated by science instructors. This function is known as disruptive conduct. By introducing creative methods of information dissemination through the teaching-learning process, teachers can play significant roles in "educating the general public about the harmful impacts of the virus" (Rogayan Jr. & Dantic, 2021). Teachers can also redesign the current curriculum and incorporate innovations to make it disruptive-free and prepared for the future. Such a curriculum will be provided in the event of future pandemics. Schools must strengthen their curricula and make them more pertinent to students' needs outside of typical classroom settings (Toquero, 2020). Hence, science instructors should use geo-localization, big data, and health information systems to stop and track the course of the phenomenon being examined. These abilities can be taught to students as a part of the science curriculum by teachers. Moreover, the employment of robotics in science

instruction may become more important in the post-pandemic era. The use of mobile computing and augmented reality technologies in teaching, is also crucial.

Virtual learning and online teaching are emerging as novel platforms for science and engineering education, and it has fast-tracked the spread of educational resources worldwide (Hunter, 2015). The current state of things has also revealed an inevitable reliance on antiquated ideas and a reluctance to recognize the benefits that digital technologies and the internet could bring to student education and support cutting-edge pedagogy and established teaching methods (Evans et al., 2020).

Relatedly, the COVID-19 pandemic has caused an unexpected transition that calls for significant changes in assessment culture and adds a new dimension to instructors' assessment processes in scientific education (Manila et al., 2020). They recommended educational institutions to invest in infrastructures and technology that could facilitate learning and assessment even when face-to-face situations are impractical and guarantee high-quality instruction in a variety of settings.

Steps to Improve Science Education in the Post-Covid-19 Era

Increasing the Significance of Science Education to the Level of National Security

Industry is the backbone of the economy in any nation, and science education can cultivate talents to meet the demands of innovation in science and technology, expand human capital, and support the steady expansion of the national micro- and macro-economy. Croak, (2018) thought that increasing human capital can be accomplished by obtaining a degree in science. Croak looked into the relationship between the level of science education and factors like gross domestic product by gathering data from 87 nations between 2010 and 2018. (GDP). The findings demonstrate that productivity is significantly and favorably impacted by science education. Thus, the importance of science education needs to be raised to the level of national strategy and even national security in order to maintain a leading position in the industrial revolution, implement economic transformation, upgrading, and sustainable development, and safeguard national security.

Developing a Systematic Competency Assessment Standard

Wang & Yuan, (2021), has presented a master plan that intends to improve how schools, instructors, and students are evaluated, help accelerate education modernization, build education power, and create a robust education system that the public is happy with. They also emphasizes the importance of performing a thorough student quality evaluation, offering students' development assistance, maximizing the allocation of teaching resources, encouraging the orderly selection of classes and courses, and standardizing enrollment and school operations. Science education in the post-COVID-19 period will progressively shift its focus to the development of students' scientific literacy, guided by evaluation reform. Using more adaptable teaching strategies including project-based, large-unit, and large-concept learning, science education should support

the reform of teaching and learning based on assessment reform and foster students' scientific literacy, particularly higher-order thinking.

Therefore, science educators should establish a systematic competency evaluation standard and break down the colleges and universities' suggested multi-step objectives for the development of innovative talents into smaller, more manageable steps for primary and secondary schools.

Organizing an Initiative to Help Science Educators Enhance their Skills

The effectiveness of science education is based on the professionalism of the educators who deliver it. Wang & Yuan, (2021) stressed that, Government should establish an ability improvement project for science teachers, a successful training system for them, and strengthen the training of teachers with interdisciplinary backgrounds in particular in economically depressed areas and groups in order to ensure the high-quality implementation of science education.

Similarly, Wang & Yuan,(2021) Suggested that, following actions should be taken by education departments: integrating the teachers' cultivation and development system, ensuring their long-term development and potential exploitation; releasing the appropriate evaluation and incentive mechanisms, motivating and mobilizing all teachers to promote science education; establishing professional teacher training platforms, arranging for high-level experts and scholars to serve as tutors and lecturers, and attracting teachers from other countries to teach in these institutions.

RECOMMENDATION

Educational institutions should be informed on the vital roles of science educators in the post – pandemic era. In order to avoid and respond to upcoming pandemics as a learning facilitator, the administration should support science teachers' ongoing professional development initiatives. For science teachers to be able to contribute to research-based and evidence-based practices in their areas of expertise, teachers should also be supported financially through research grants and financing

CONCLUSION

The study looked at the crucial functions that science educators play in the post-COVID age.
The study discovered that science educators perform a variety of important roles in the post-pandemic environment, including those of science communicators, critical thinkers, knowledge creators, disruptive innovators, advocates against misinformation, and future-ready educators. The study also highlighted some challenges brought by the pandemic to science educators as well as strategies were also proposed on the basis of worldwide research outcome of science education and the analysis on how to improve science education in the post COVID-19 era.

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