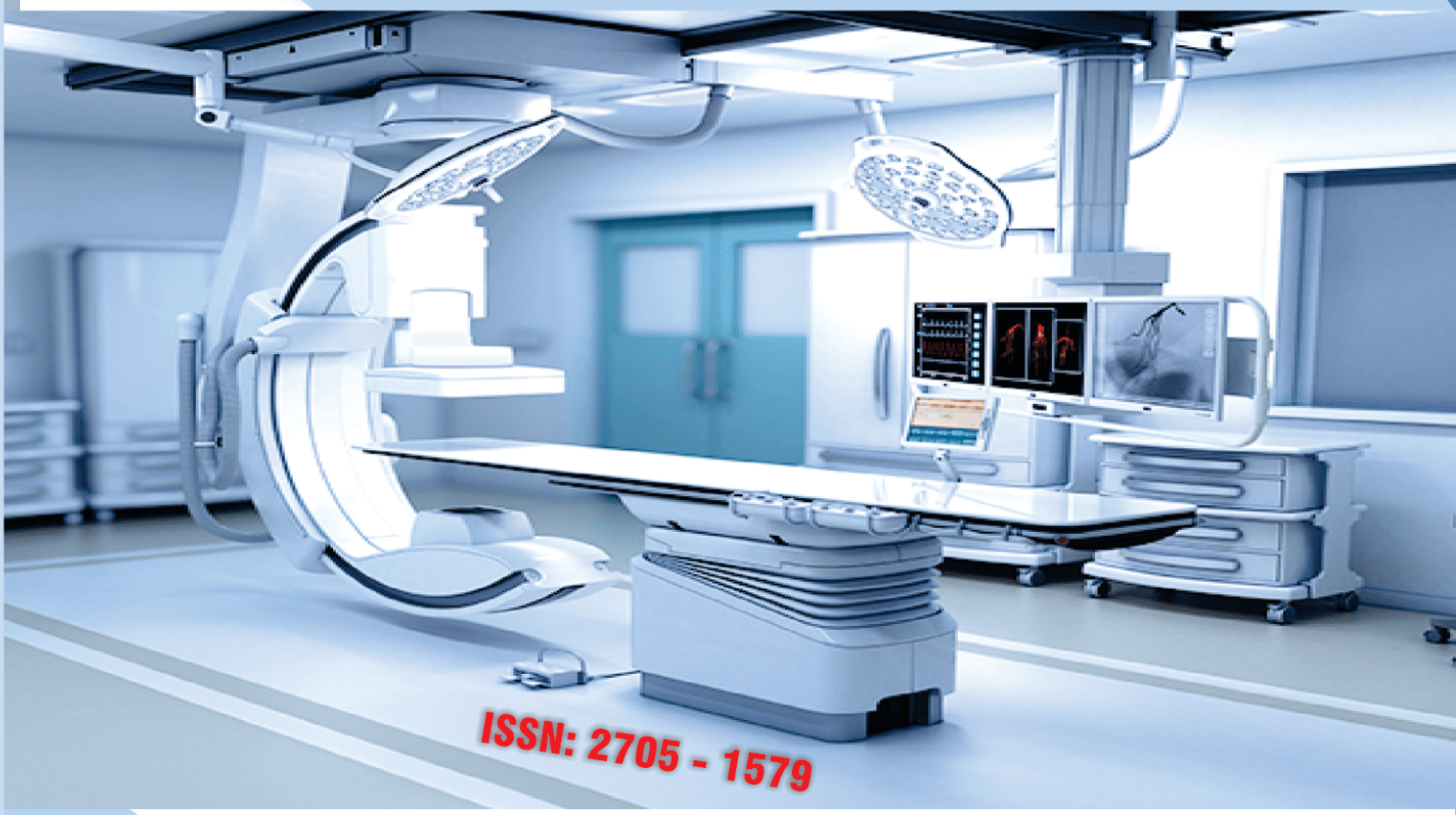
STEM JOURNAL OF ANAMBRA STAN (STEMJAS) VOLUME 3(2); 2022

EDITOR-IN- CHIEF: PROF. RITA N. NNOROM

STEM JOURNAL

OF ANAMBRA STAN (STEMJAS)

Volume 3(2); 2022



ISSN: 2705 - 1579

EDITOR-IN-CHIEF:
PROF. RITA N. NNOROM

STEM JOURNAL

OF ANAMBRA STATE

(STEMJAS), 3(2); 2022

ISSN: 2705-1579
Published & Printed by:
FAB ANIEH NIGERIA LIMITED
Fab Anieh House
Opposite COFI Premium Lounge
Okpuno, Awka
Tel: 08035619395
gmail: fabprezz82@gmail.com

EDITORIAL BOARD

Officers of Science Teachers Association of Nigeria, Anambra State Chapter

Dr. C.U. Ezenduka	-	Chairman
Mr. Ray Nwokike	-	Vice Chairman
Mr. K.N.C. Ezeokeke	-	Secretary
Ngozi Nwoka	-	Assistant Secretary
Dr. Ndu B. Okafor	-	Financial Secretary
Dr. N.N.C. Samuel	-	Treasurer
Prof. N.P.M Esomonu	-	Editor-In-Chief
Mr. Clement Okpala	-	Science Fair Coordinator
Mr. Solomon Okoli	-	Asst. Science Fair Coordinatior
Mrs. Grace Okpata	-	P.R.O. I
Mr. Izunna F. Nwachukwu	-	P.R.O. II
Dr. Mars C. Anaekwe	-	Immediate Past Chairman
Dr. Chinwe B. Njelita	-	Immediate Past Secretary
Ray O, Nwokike	-	Immediate Past Editor-In-HIEF
Prof. E.O. Akuezuilo	-	Member Board of Trustee
Prof. Edwin Akusoba	-	Patron

EDITORIAL

The task of effectively applying Science, Technology, Engineering and Mathematics (STEM) education research of utmost importance to STEM educators and other stakeholders, even the survival of any nation depends on the sustainability of its STEM education programme.

Currently, we are facing the challenges of COVID-19 pandemic. Our country Nigeria did not anticipate such disease and as such caught up with the pandemic. Hence the un-preparedness of our nation led to the closure of public places including schools.

Therefore, Science Teachers' Association of Nigeria (STAN) Anambra State Chapter dedicated this 2nd Biennial State conference hold on decencies 8th-9th, 2021 at Federal Science and Technical College, Awka, Anambra State, Nigeria to COVID-19 and Emerging issues in STEM Education.

The editorial board had welcomed our members whose papers - articles were extracted from conference.

Happy Reading.

Prof. Rita N. Nnorom
Editor-In-Chief

CHALLENGES OF TEACHING BASIC SCIENCE AND TECHNOLOGY WITH HANDS-ON ACTIVITIES DURING THE COVID-19 PANDEMIC ERA.

[1]O.F. Uzor, [2]G.U. Nwankwo, [3]G.C. Obiefuna, [3] J. I. Oliobi
[1, 2,3] Integrated Science Education Department
[1, 2,3] Federal College of Education (Technical), Umunze, Anambra State, Nigeria.

Abstract

This paper took a critical look at the challenges of teaching Basic Science and Technology with hands-on activities during the Covid-19 pandemic era. It looked at teaching as a process in which one individual teaches or instructs another individual. Teaching is considered the act of imparting instructions to the learners in the classroom situation. Teaching has its unique nature and characteristics. Hands-on activities are a form of education in which students learn by doing. This paper looked at the benefits of hands-on activities in teaching Basic Science and Technology. The different examples of hands-on activities were also discussed. Challenges Hampering the teaching of Basic Science and Technology with hands-on activities during the Covid-19 pandemic era were also discussed. The researchers recommended some solutions such as Active field trips, Reawakening of students' academic interest, Provision of accessible Technology, inculcation of digital literacy, and financial intervention by the Government, as a way forward to the effective use of Hands-on activities in the teaching of Basic Science and Technology in Covid-19 Pandemic Era.
Keywords: Basic Science, Technology, Hands-on Activities, COVID-19 pandemic era.

Introduction

Education is among the sectors with the devastating impact of the COVID-19 pandemic. Before the pandemic, the Nigerian education system adopted a purely, face-to-face approach coupled with hands-on activities to teaching and learning basic science and Technology in primary and secondary schools. With the emergence of the lockdown condition and school closure, following the COVID-19 pandemic, both teachers and learners were helpless about how to continue learning using hands-on activities in the face of the pandemic. The covid-19 pandemic has presented challenges to the teaching of Basic Science and Technology using hands-on activities. Covid-19 has changed how teachers engage with their Students practical wise.

However, with the gradual reduction in the cases of covid-19, hands-on activities should be reinforced in the teaching of basic science and Technology. This is because students learn in a variety of ways. Therefore, it is recommended that teachers use different teaching styles to meet students' needs while teaching basic science and Technology. For many students, hands-on activities are the primary way through which they can successfully learn. Likewise, there are many careers for which engaging with education through the practice of its required skills and competencies is essential before entering the field. In this paper the researchers will be talking about different concepts relating to the topic being considered.

Definition of Hands-on Activities

According to the Merriam-Webster dictionary, hands-on means providing direct practical experience in the operation of something. In line with this definition, hands-on activities are forms of activities characterized by active personal involvement. Hands-on activities mean learning by experience. Students learn better when they can relate to a subject practically instead of simply listening to a teacher or an instructor teaching about a given concept. Hands-on activities can be activities like making a pin-hole camera using cardboard paper, making an analogue clock from a paper plate, moulding cups and plates using paper mache and lots more.

According to Greg Timmons (2018), Students learn better when they can relate to the subject in a personally meaningful way. He further stated that learning happens when the brain is engaged in making connections and creating a familiar pattern. This is to say that Hands-on activities create an avenue for the student's brain to build and establish facts upon.

Meaning of Teaching

Teaching like education is variously defined by different people to suit their perception of the word. Teaching according to Clark and Starr (1970) in Isola Rajagopalan (2019) is an attempt to help people acquire some skills, attitudes, knowledge, ideas and appreciation. Teaching can also be defined as engagement with learners to enable their understanding and application of knowledge, concepts and processes. It includes design, content selection, delivery and assessment. To teach is to engage students in learning; thus teaching consists of getting students involved in the active construction of knowledge. A teacher requires not only knowledge of the subject matter, but knowledge of how students learn and how to transform them into active learners. (www.sun.ac.za/English/learning- Teaching).

Given the above definition of teaching, the more perfect and realistic way to get students involved in the active construction of knowledge is by teaching with hands-on activities. Teaching with hands-on activities will allow students to touch, feel and internalise the knowledge being taught. Teaching with hands-on activities gives room for maximum participation of students.

Nature and characteristics of Teaching

1. Teaching is a complete social process: Teaching is undertaken for the society and by the society.
2. Teaching is giving information: Teaching tells students about the things they have to know and students cannot find out themselves. Communication of knowledge is an essential part of teaching.
3. Teaching is an interactive process: Teaching is an interactive process between the student and the teaching sources, which is essential for the guidance, progress, and development of students.
4. Teaching is a process of development and learning.
5. Teaching causes a behaviour change.
6. Teaching is an art as well as science.
7. Teaching is face to face encounter.
8. Teaching is observable, measurable and modifiable.
9. Teaching is a skilled occupation: Every successful teacher is expected to know the general methods of teaching-learning situations.
10. Teaching facilitates learning

Emergence of COVID-19

The outbreak of Coronavirus disease (COVID-19) shocked the world, causing great destabilization in every sector. Nigeria recorded an imported case from Italy on February 27, 2020. Contagious diseases of global health importance disrupted the usual norms of close physical contact since the disease transmits through contact with the individual who already contracted the disease. This led to a mass close down of all schools in Nigeria which took effect on March 23, 2020. Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) provisionally named 2019-nCoV is the causative agent of the recent global pandemic COVID-19 with an increased fatality rate. It is depicted as a public health emergency of global concern by the World Health Organization (WHO). This contagion initially emerged in Wuhan city, Hubei Province, China on December 8, 2019, which caused pneumonia-like symptoms in a cluster of patients. Shibi Muralidar et Al (2020).

The outbreak of Covid-19 followed by the disruption of close physical contact became a big challenge in the teaching of Basic Science and Technology with hands-on activities. Basic Science and Technology is a critical subject for students to learn while they are in school because it plays such an essential role in everyday life and leads to many possible career choices in science courses. This has always been the case, but it is even more important in the high-tech age we live in. The world today needs students with at least elementary knowledge of the principles of science and its application to solve real-life problems. Applying hands-on activities while teaching Basic Science and Technology is the only sure way to achieve this goal.

Teaching with hands-on activities as shown by most empirical studies provides evidence for the assumption that conducting hands-on activities leads to positive motivational outcomes. For instance, Middleton (1995) asked teachers and students to distinguish what they believe makes mathematics classes motivating. Both groups referred, besides other factors, to hands-on aspects as facilitating motivation. Similarly, Renner et al. (1985) interviewed students about their feelings regarding learning activities like laboratory work. They identified laboratory work as being ‘interesting’ as compared to other more ‘boring’ instructional formats like watching films or listening to the teacher. Therefore, this paper is aimed at identify the challenges of teaching Basic Science and Technology during the Covid-19 pandemic era and how to tackle them.

Benefits of Hands-on activities in teaching basic science and Technology

Experts believe that by involving students in hands-on activities while teaching basic science and Technology, the following stand as the gains.

- **Critical thinking:** The ability of the students to think critically is significantly enhanced. In essence, teaching with hands-on activities enables the students to use their ability to reason, making them active learners rather than passive recipients of the information.

- **Less Dependence:** Hands-on activities encourage the students to think independently, and reduce their dependence on authority. This type of learning changes the role of the teacher from information dispenser to co-explorer of knowledge. Evaluation of student learning is richer because students get to show what they have learned. Learning by doing provides better results over time as students move through school and on to their careers. Greg, T (2018)

- **Increase motivation to learn:** Numerous studies indicate that it increases the students' motivation to learn and enhances their perception. This teaching method will bring pride and ownership to their learning experience.

- **Makes students creative:** Creativity is a muscle. Just like other muscles, it needs to be regularly exercised or else it will become harder and harder to be creative. Hands-on activities give the students one more opportunity to exercise their creative skills so that they don't lose them.

Makes learning to be more engaging: When students are forced to do something, they are engaged in active learning. They are practising their skills and they are putting their knowledge to the test. Most importantly, they are actively creating knowledge, instead of passively consuming it. In this way, learning becomes more engaging and more attractive.

- **Increased retention:** Hands-on activities leads to increased retention. As anyone who has ever learned a skill or learned information can attest to, the more practice you get, the better you will be at that skill, and the better you will be able to retain the information. Martin (2020).

- **Development of skills and a lifelong love of learning:** When students learn in this way, they gain valuable skills—in critical thinking, communication, collaboration, and creativity—which we sometimes call the 4 C's of 21st-century education. But in reality, these skills have proven essential for all generations. Because when students learn from doing something and are motivated to explore and discover new things, they more readily develop a lifelong love of learning, Greg (2018).

Examples of Hands-on activities in the teaching of basic science and Technology

Many hands-on activities are available for teaching basic science and Technology. These hands-on activities should be added to the basic science and technology curriculum.

- **Setting up Experiment:** Hands-on science experiments are fun and keep students actively engaged. Here is a simple hands-on experiment for elementary students that examines what items will float and sink.
  For this experiment, all you need is a bowl of water, a cork, a stone, a coin, and a grape. Have students first predict what items will float and what items will sink in the water. Then have groups of students observe as they place the items in the water one by one (Janelle, 2014).

- **Taking a field trip:** Heading out to see the things you'have been studying in person is one of the best hands-on learning activities around. For example, the hands-on activity for the topic" resources from living things" which is one of the topics considered in classic basic science for junior secondary 3, is a visit to a poultry farm. At the farm, the students are expected to observe the activities being carried out in poultry, list some of these activities, and identify two products from poultry birds which are highly useful to man (Akintelure, *et al,* 2016).

- **Building of a model:** So much of what we deal with in basic science and technology cannot be seen and so models are a powerful tool in the science classroom that helps us represent, describe, explain and reason about the material world. Models slow students' thinking down and encourage them to think deeply and imaginatively about scientific ideas. Asking students to create models helps make their thinking visible, giving teachers insight into their current understanding and misconceptions (thescienceteacher.co.uk).

- **Writing an ABC book:** ABC books provide students with a framework for summarizing facts and details. This framework helps kids stay on track and flesh out the details of the summary without feeling overwhelmed. Not only that, but ABC books are a fun project for students of all ages and one that might even get your reluctant writers excited. Kris Baked (2019). For example, a student writing an ABC book for basic science might choose Nutritional Deficiency Diseases as his topic, with pages such as:

  K is for Kwashiorkor
  R is for Rickets
  S is for Scurvy
  P is for Pellagra.

- **Playing of games:** Games make a fun, low-key way to learn new topics or review concepts. Some of the key benefits of simulation games as a teaching and learning strategy identified are that they can help learners to obtain genuine information; develop intellectual and social skills; understand how certain concepts are structured and worked in the 'real' world. It can also assist in learning from colleagues and understanding the teachers better and clearer. Furthermore, it encourages creative expression, and problem-solving, in complex situations and experiential/active learning; provides immediate and conceptualized feedback; adapts to the level of the individual while providing support and is thus learner-centred. Sowunmi, V.O and Aladejana, F.O (2016).

- **Creating of a presentation:** Oral presentations make a fantastic alternative to written assessments. Preparing the presentation provides an opportunity for students to review. Presenting it showcases what they learned (and may highlight areas you need to go over again). Students can assemble an oral presentation with or without a presentation board, or they can try their hand at PowerPoint, a slideshow.

- **Making a paper mache:** Paper mache is a composite material involving paper pieces or pulp. Paper mache is a fun craft that's appropriate for all ages and is a very good hands-on activity for teaching basic science and Technology. One of the best things about paper mache is that students probably have everything they need to create the masterpieces lying around them. They can create pretty much anything using paper mache techniques, Osborne, S. (2019).

Challenges Hampering the teaching of Basic Science and Technology with Hands-on Activities During the Covid-19 Pandemic Era.

The COVID-19 pandemic has already had devastating impacts that are likely to have long-term educational and economic consequences. The crisis has exacerbated already-widespread educational deficiencies. Some of these challenges are:

- **Stoppage of field trips due to covid-19 pandemic: Fi**eld trips are a long-standing tradition in education, especially in the teaching of basic science and Technology but the outbreak of covid-19 pandemic had made field trips to be non-existent.
- **Dampening of students' interest to learn:** The paramount need that has emerged from covid-19 is to preserve students'' motivation, engagement and interest as well as their connection with the school, particularly when schools are closed for long periods. The outbreak of covid-19 has seriously dampened students' interest in education.
- **Limited access to Technologies:** The outbreak of covid-19 came with the explosion of virtual learning through zoom and other internet devices. The question is how many students have access to these Technologies? Most of the hands-on activities can be practised using Technology devices. Many students including their teachers lack access to the internet and internet-enabled smartphones.
- **Lack of digital literacy:** It is one thing to have digital devices, it is another thing to have digital literacy. Many students and teachers lack this skill. In this pandemic era, the lack of digital literacy poses a great challenge to the effective integration of Hands-on activities in the teaching of basic science and Technology.
- **The problem of extreme poverty:** The covid-19 pandemic had exacerbated the already dire living conditions of many students and teachers. Having the knowledge of the necessary hands-on activities for teaching basic science and Technology without the money to purchase the materials is a great challenge.

Having discussed the challenges hampering the integration of Hands-on activities in the teaching of basic science and Technology in the covid-19 pandemic era, what is the way forward?

Recommendations for the effective use of Hands-on Activities in Teaching of Basic Science and Technology in the Covid-19 Pandemic Era.

- **Active field trips**: students and teachers should be allowed to go for Field Trips with strict observance of covid-19 protocols.
- **The reawakening of students' academic interest:** Special academic rallies and seminars should be organized for students to reawaken their dampened interest and motivation for learning basic science and Technology.
- **Provisions of accessible Technology:** The government and school management should make the Internet and other Technology devices available for students and teachers for effective integration of Hands-on activities in the teaching of basic science and Technology in the covid-19 pandemic era.
- **Digital Literacy Needed: D**igital literacy for students and teachers is increasingly recognized as an indispensable tool for the integration of Hands-on activities in the teaching of basic science and Technology in the covid-19 pandemic era. www.hrw.org/news
- **Financial intervention by the Government:** The government's financial intervention at this time of covid-19 will go a long way in lifting the hitch facing the integration of Hands-on activities in the teaching of basic science and Technology.

Conclusion

Hands-on activities are a form of education in which students learn by doing. Students learn better when they can relate to a subject, when it is personally meaningful and when they can see, and touch the matter under consideration. For a great impact to be made in the teaching of Basic Science and Technology, hands-on activities must be used in its teaching. Having discussed the different examples of hands-on activities available for the teaching of Basic Science and Technology, the challenges brought about by covid-19 pandemic in the teaching of Basic Science with Hands-on activities, and the recommendation for tackling those challenges, it calls for the joint efforts of the government, teachers, parents and students to make basic science the taproot of all sciences.

References

Akintelure, B.B., Kuku V.O, Ohuro J.A, & Mahmud A.M (2016). *Classic Basic Science for Junior Secondary Schools*. Lagos: Thursmay Publishers ZA Bayo.

Franklin, S. & Peat (2005): Virtual versus Real; an argument for maintaining diversity in the learning environment. *International journal of continuous Engineering education, 15, (1-2);* 67-68.

Greg, T. (2018). Hands-on learning; a quick summary of everything you need to know. Retrieved from Blog/ Social studies.com on 5th December 2021.

Isola R. (2019). Concept of Teaching. *International Journal of Education, 7, (2);* 5-6.

Janelle, C. (2014). Improving learning with hands-on classroom games and activities. Retrieved from www.techhub.com/classroom on 6th December 2021.

Kris Bales (2019). How to use ABC Books all the way through High school. Retrieved from https://www.thoughtco/use-abc on 6th December 2021.

Martin, L (2020): The importance of Hands-on learning in a child's education. Retrieved from the friends'' central school blog. 4th Dec 2021.

Sean, A. (2020). How to Teach. Retrieved from wikiHow.com on 4th December 2021.

Sherri Osborn (2019): Learn how to paper mache. Retrieved from lubbil.ngonin24.com on 5th December 2021.

Sowunmi, V.O. & Aladejana, F.O. (2016): Simulation games and improved basic science teaching in the Nigerian lower primary schools. Retrieved from www.researchgate.net/publication on 6th December 2021.

Vogt, H., Upmeier, Z.U., Belzen A, Schroer T & Hook I (1999). Aspects of biology education which makes biology classes more interesting from a student's perspective. *Eurasia Journal of Mathematics, Science & Technology Education,* 8, (3); 201-205.