MATHEMATICS LABORATORY: A TOOL FOR MANAGEMENT OF PANDEMICS
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ABSTRACT
The paper investigates how tools in a mathematics laboratory can be used in the management of pandemics. Mathematics laboratory is a place where students and teachers explore various mathematical concepts using varieties of activities and instructional materials. The Mathematics laboratory houses of tools such as models, graphs and charts, that play great roles during pandemics challenges. The paper also enumerated types of pandemics, ways of eradicating pandemics and examined management of pandemics using mathematical tools. The paper made conclusion and finally proffers suggestions for further research work.

Keywords: Mathematics, laboratory, mathematics laboratory, tools, pandemics.

Introduction
Most developing and developed nations of the world are plagues with some various problems probably social, economics, educational and pandemics. These problems and challenges may be tackled through the proper teaching and learning of mathematics. Mathematics is a branch of science that deals with knowledge acquired in measurement, numbers and quantities. Mathematics is a tool which its knowledge and skills are the bedrock of all societal transformation and transfer of ideas to reality (Ebisine, 2013). Mathematics is an indispensable part of education either formal or informal, which may be from pre-primary, primary and tertiary levels. Mathematics as a subject requires one to have four basic steps which are: process of solving problems, ability to think, to be patient and ability to continuously work (Amani, 2015). The mathematics process is both creative and explorative process.

The teaching and learning of mathematics can be conveniently be taught and learnt with the help of instruments or tools. Mathematical instruments or tools are devices that can be used to study or practice mathematics. These tools or instruments are kept in a place called mathematics laboratory. Mathematics laboratory may be defined as a place or a room where students can learn, practice and explore various mathematical concepts and verify different mathematical facts and theories using varieties of activities and tools (Galadima,

Yusha'u & Umar, 2018). The proper use of mathematics laboratory as tools for learning mathematics may enhance students' performance, if properly put into use. Mathematics and mathematical tools play a great role in managing pandemics especially by using mathematical models. Pandemics is a disease that can spread across a large area having devastating effect on the health of the population and even killing most of the people. According to the World Health Organization, defined pandemic as global epidemic that may spread to more than one continent.

Importance of Mathematics
Mathematics serve as a building block of other professions. The professional and vocational that make use of mathematics as a tool are numerous.

Abubakar(2001) in Samson(2018) enumerated some of the benefits of mathematics as follows:
Medicine: Medical field makes use of mathematics in tremendous way. They make use of arithmetic, ratio and proportion.
Algebra: Rate of spread of disease. Graph as a trend of response of patients to treatment. Concentration of drugs is a form of application of rate of proportion. They make use of indices, logarithm and scientific notations in communicating extremely large or extremely small numbers.
Weather Forecaster: They study weather related factors, the trend of weather over a period. By this the forecast how the weather condition of an environment will be using the data collected overtime and concept of probability.
Cryptographer: Cryptographers make use of coding and decoding which is a concept of computing. Symbols and numerals are used to represent information. According to (Abubakar, Wokoma & Afesuane, 2011) this skill has been made used of in banking operations, Automated Teller Machine (ATM), revenue, pay payments and utility payments.
Banker: Mathematics, calculations is the preoccupation of banking activities, Numbers and numerations are main working tools. Transactional and financial activities will be almost impossible without mathematics.
Scientists and Technologies: Mathematics is the queen of sciences and king of the arts. As technological advancement depends on science so also science depends on mathematics for survival and growth. The principal tool of science is mathematics. Science and technology make use of all aspects of mathematics perhaps more than any other field and discipline.
Sports: The arrangement of turns of the team to compete a game requires some mathematical knowledge. Counting points and scores are mathematical concepts. Scores and points are determined numerically.
Teachers: In the classroom the teacher keeps many records about learners. The record on scores in assessment, the daily marking and weekly closing of the class attendance registers

of pupils. Ranking students score to measure comparative level of achievement is a mathematical concept of ordering of numbers.

Economics: from the elementary to advanced stage of the study of economics, mathematics as a tool is inevitable. The concept of arithmetic, algebraic graphs and calculus are used in some topics. The Gross Domestic Product and the total volume of trade are measured with arithmetic. Statistical parameters are used in decision making, budgetary allocations, fiscal policies and planning in every sector of the economy.

Researchers: Researchers need mathematics and statistics as tools necessary at various stage of the work. It is needed in sampling, analyses and report findings. There could be no proper way of understanding some research reports when they are not quantify with numbers.

Daily man's activities: Everybody make use of mathematics daily. In expressions involving distance, cooking, time we make use of measurements, approximation and time are applied. Commitment to mathematics teaching and learning will surely provide an effective skill in all levels of national economic man power.

Mathematics Laboratory

Mathematics laboratory is a place or room where mathematical activities take place, Students and Teachers use tools or equipments. Students in the mathematics laboratory learn and explore various mathematical concepts and verify different mathematical facts and theories using varieties of activities and material (Loh, 2011). Dalen (2011) defined the mathematics laboratory as a unique room or place, with relevant and up-to-date equipment known as instructional materials, designated for the teaching and learning of mathematics and other scientific or research work, whereby a trained and professionally qualified person readily interact with learners on specified set of instruction.

A mathematics laboratory can also be defined as a place where one can find tools/equipments, games,puzzles, and other materials for carrying out activities in the teaching and learning of mathematics. Mathematics laboratory may also be classified as collection of all mathematical tools in a place called classroom, or corner of the classroom or room.

Odogwu (2015) identified the following importance of mathematics laboratory in the teaching and learning of mathematics include, among others, the following:
1. It provides a focal point within the school for mathematical knowledge and inspiration.
2. It provides facilities for incorporating experiments and practice in learning of mathematics and its applications.
3. It is a centre for mathematical information. The information to be provided will include models. Diagrams, visual representation of mathematical concepts CD, games and other material that will be useful in the teaching and learning of mathematics.

4. It is a place for practicing cognitive and psychomotor skills in mathematics like ability to construct, measure, arrange, observe, classify, interpret and generalize.

The use mathematics laboratory helps to integrate theory and practical work in mathematics teaching/learning. Mathematics laboratory may have some or all of these advantages to include:

1. Some information about mathematical concepts are verified, by means of experimentation through practical work, thereby leading to skills acquisition and knowledge.
2. Mathematics laboratory can serve as a store for keeping such equipments or tools.
3. Abstract and difficult concepts are brought to limelight as a result of using real materials.
4. There is always hands-on-equipments by the students which could encourage personal learning.

The following are some disadvantages of mathematics laboratory. They are:

1. Mathematics Laboratory could be expensive to establish.
2. Carrying out the activities can be labourious and time consuming.

Structure of Mathematics Laboratory

Odogwu (2015) stated that mathematics laboratory should have the following facilities:

1. Adequate storage facilities with access to common materials such as graph paper, scissors, paste, drawing board, cardboard, papers, cello tape, rubber bands etc.
2. Easily moveable furniture with flat surfaces that can be combined or pulled apart as required for different projects.
3. Plenty of display space and variety of surfaces on which to display students' work.
4. Provisions for models making to enable students cut, drill, glue, paint, solder and assemble.
5. Availability of tap water and wash hand basins both for the experiment and for tidying up after activities.
6. Sufficient electrical equipments.

Activities that can be carried out in the mathematics laboratory include but not limited to some of the following:

i.   Constructing magic squares of 3 by 3 and 4 by 4.
ii.   Comparing the probability of an event experimentally.
iii.   Verifying, using the method of cutting, pasting and folding of papers to form angles.
iv.   Confirming angles on the same segment of a circle are equal.
v.   Comparing the volume of a cone and cylinder with the same base radius by using practical means.
vi.   Examine the properties, perimeters and areas of plane shapes.

vii. Investigate the formula for finding sum of the interior angles of an n-sided polygon.

viii. Investigate the area of a circle.

ix. Investigate the formulae for finding volumes of 3-dimensional shapes practically.

x. Investigate the area of circle practically.

Bello and Adamu (2019) itemized the primary functions of mathematics laboratory. To include:

1. Make mathematics teaching and learning interesting and purposeful for students.
2. Provide activities that arouse the curiosity of the students and maintain their interest in learning.
3. Enable students to develop prosper skills in handling equipments and gadgets.
4. Make students appreciate the practical applicability of the mathematical principles and laws.
5. Concretize the abstract mathematical concepts.
6. Help the students develop powers of observation, analysis and drawing inferences.

Some of the equipment/tools found in a Mathematics Laboratory. Some of the equipment are:

1. All 2-dimensional and 3-dimensional shapes.
2. Geo-board designed to contain most plane shapes.
3. Concrete materials. Containing items like beads, pebbles, scissors, razor blade, weights etc.
4. Pictures and charts
5. Mathematical models
6. All carpentry tools
7. Probability kits, also containing, draft game, ludo game, playing cards
8. Mathematical textbooks, past questions, answers and mathematical dictionary.
9. Posters, calendars, journals and newspapers.
10. Computers, cameras, internet facilities, printers, photocopying machines and thermometer.
11. Drawing instruments
12. Weighing and measuring instruments
13. Black board mathematical set.
14. Clinometer for measuring angles of elevation and depression.
15. Wall graph board
16. A world globe
17. Balance beam
18. Polygons of different varieties
19. Wall clock
20. Paints of different colours, gums and cello tapes.

Pandemic

Merriam – Webster reports that "Pandemic" is the seventh most frequently looked-up word in its online dictionary this year. A pandemic is a wide epidemic that occurs over a wide geographical area and affecting an exceptionally high proportion of the population. A pandemic is basically a global epidemic that spreads to more than one continent (Dan, 1919). Consequently, the following are the different types of pandemics ever occurred world-wide (Alen, et al., 2017).

1. **Avian and other Zoonotic influenza**: Avian influenza is an acute viral disease of the respiratory tract. It is a severe zoonotic disease with pandemic potential in the presence of sustained human-to-human transmission.
2. **Cholera**: Cholera is an acute diarrhoeal infection caused by ingestion of contaminated water or food.
3. **Lassa Fever**: Lassa fever is a viral haemorrhagic fever with symptoms similar to those of Ebola virus disease, is endemic in much of West Africa and usually sparks a seasonal outbreak from December to March. Humans usually become infected with Lassa virus from exposure to urine or faeces of infected mastomys rats.
4. **Leptospirosis**: Leptospirosis is a bacterial zoonosis transmitted via contact with rodents, domestic animals and contaminated water. The disease is an emerging public health problem.
5. **MERS:** Middle Eastern Respiratory Syndrome (MERS) is a zoonotic, severe viral lung infection, with high case fatality rate. It is global threat to human health and it is important to understand the nature of this disease and the ways to prevent, respond to, and control outbreaks of MERS.
6. **Meningitis:** Meningitis is an inflammation of the meninges, the lining surrounding the brain and the spiral cord. Public health concerns mainly focus on the bacteria neisseria meningitides, as it can cause large-scale epidemics.
7. **Pandemic Influenza:** pandemic influenza acute viral disease of the respiratory tract. Pandemic influenza occurs when an influenza virus that was not previously circulating among people and to which most people have no immunity emerges and transmits among people.
8. **Plague:** Plague is a zoonotic disease with severe clinical presentations caused by the bacterial yersiniapestis.
9. **Rift valley Fever:** Rift valley fever is cause by a virus transmitted by mosquitoes and blood feeding flies that usually affects animals, but can also involve humans. In humans, the disease ranges from a mild flur-like illness to severe haemorrhagic fever that can be lethal.
10. **Yellow Fever:** Yellow fever is an acute viral haemorrhagic disease, found in tropical regions of Africa and the Americas. It is an important public health concern due to devastating outbreaks it can cause and the risk of international spread.
11. **Seasonal Influenza:** Seasonal influenza is an acute viral disease of the respiratory tract transmitted via aerosols or contaminated surfaces from infected people.

12. **Zika:** Zika virus disease is caused by a flavi virus transmitted primarily by Aedes mosquitoes. It emerged in 2015/2016, and although typically a mild disease, consequences of the infection can be severe.
13. **Corona Virus Disease (COVID-**19): This is the most common virus disease that has a world wide devastating effects on human beings through body contact of an effected humans or wild animals.

Methods of Eradicating Pandemic Diseases
1. Handle and prepare food safely, because food can carry germs.
2. Wash hands often
3. Clean and disinfect commonly used surfaces
4. Cough and sneeze into a tissue.
5. Don't share personal items.
6. Get vaccinated
7. Avoid touching infected wild animals
8. Stay indoors when sick.
9. Quarantine and social distancing measures

Role of WHO during Pandemic
The World Health Organization (WHO) first developed, after consultation with hundreds of international public health experts, a global pandemic preparedness plan in 1999 and revised plan in 2005 and 2009. WHO provided support to countries' efforts to prepare for a pandemic. Most countries developed pandemic plans base on WHO guidance. During the pandemic, WHO continuously monitored the evolution of the pandemic, and developed guidance for member states to put in place appropriate measures including enhanced surveillance and advice monitoring, assessment of the pandemic characteristics, and recommendations on appropriate measures including medical and non-medical interventions (Anthony, 2017).

Management of Pandemics using Mathematical Tools
A mathematical tools is an instrument or device that can be used in the study or practice of mathematics. Various sizes of Mathematical kits can be used in probability which are applicable in resolving issues of pandemic. Balance beams can be used to solve simple equations and calculations can be used to solve problems involving large numbers dealing with addition, subtraction and division about the pandemic (Anthony, 2017).

Mathematical models are known to help determine potential intervention strategies by providing an approximate idea of the transmission dynamics of infectious disease and this is part of mathematical tools. A thermometer is used to indicate the temperature of the patient, which is a mathematical tool indicating on it a number line. A computer, which is one of the mathematical tools can be used in computer-based simulations and factor in complex parameters and this will give insight on such approaches informing policy decisions related to diseases such as COVID-19.

Mathematical functions can be applied as a tool to describe the dynamic of how infectious diseases propagate among people. Mathematical modeling generates a picture or a model of the dynamics of the disease, which can be visually represented by graphs charts and comparative tables. Models provide valuable inputs to visualize how diseases affect people. Insights available from models facilitate disease management protocols like mass vaccination drives, treatment patterns, and when the infectious disease is an unknown one, such as the present Corona virus pandemic, models become all the more vital for policy making. Models can help answer several questions impact policy. Mathematical models translate that idea into differential equations, which draw a relationship between a physical quantity and its role of change. Mathematical models have played a prominent role in transforming public health care. Equations can also be solved to understand how the number of infected people changes with time. Management of pandemics diseases using statistical tools are necessary at various stage of the process. It is needed in sampling, analyses and report findings (WHO, 2015).

CONCLUSION
The importance of mathematics and mathematics laboratory as a tool for management of pandemic cannot be overemphasized, especially in the era of science and technology during the time pandemic disease like COVID-19 is around the corner. Mathematical tools and models play great roles in tackling the challenges of the pandemics with the hope of eradicating the diseases. Specifically, the paper discussed the importance of mathematics, mathematical laboratory, pandemics and types of pandemics, the role of WHO and management of pandemics using mathematical tools.

Suggestions for further Research
1. The teaching and learning of mathematics should be made more practical and creative to encourage creativity among the students.
2. More researches in the areas of mathematics laboratory should be step-up at the tertiary institutions.
3. Pre-cautional measures should be taken about pandemic diseases as most of the diseases are still much around us, especially COVID-19 disease.
4. More researches should be encouraged and be carried out at all medical schools across the federation.
5. All stakeholders should intensify effort to spread the news about the pandemics to every nook and corner across the nation.
6. Philanthropic individuals can contribute financially to stop the spread of pandemic in their communities.

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