International Journal of Multidisciplinary and Current Educational Research (IJMCER)
ISSN: 2581-7027 ||Volume|| 2 ||Issue|| 4 ||Pages|| 01-20 ||2020||

Designing Innovative Starter and Plenary Activities To Whip Up Basic 8 Learners' Interest In Mathematics And Science Lessons At Fosco Demonstration B JHS.

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ABSTRACT : This study was taken to address the problem of learners' gross disinterest in science and mathematics learning at Fosco Demonstration B Junior High School at Assin Foso in the Central Region of Ghana. Master Maxwell Kobina Essel, a student-teacher, who went to the school for his in-school practice identified the problem and together with his supervisor, Miss Ruby Jecty, undertook an unobtrusive observation to examine the pupils' interest level and participation during the facilitation of both courses. It was observed that out of a class population of 50, only about 12 pupils, who had been identified from the primary school to have a special liking for mathematics and science were fully engaged in the lessons. The others were either dozing, absent minded, chatting or engrossed in other things. Having reached a compromise with the authorities of the school, a pre-intervention test was carried out immediately after a science and mathematics facilitators had a lesson with the learners on different days. The results of the pre-intervention test were abysmal, depicting learners' of disliking science and mathematics lessons. Two experts from Foso College of Education, Miss Judith Asabil for Science and Miss Mary Acquit for Mathematics were consulted and after each one of them had a turn in supervising their lessons respectively in the school, concluded that the mathematics and science teachers both had impressive content knowledge which makes them unconsciously take control of the lessons with little or no attempt in allowing the learners take control of their own lessons. Both of them suggested that if strategies were innovative enough to arouse their interest before the start of the lesson and reflections on lessons were made with the learners after each of these lessons, some positive outcomes might be realized. The suggestions informed the student-teacher to use the action research design with observation and test as the instruments. As the researcher and his supervisor were working on the introduction and literature review, the experts designed innovative starter and plenary activities to be implemented as innovative strategies to remedy the problem. Going by P-D-R together, all four of us took up roles to perform during the intervention period. The intervention took three weeks, three days in each week. Both Miss Judith Asabil and Miss Mary Acquah took turns to take the learners through starter and plenary activities while Master Maxwell Kobina Essel facilitated the main and assessment and together all three of them did the write-up of proceedings with concentration on learners' interest and participation. The study identified that in relation to lack of interest in science and mathematics lessons, lessons are not fun and learners are not involved among others, were the major causes but innovative starters and plenaries could be used as strategies to overcome learners' lack of interest in science and mathematics lessons at Fosco Demonstration 'B' Basic School in the Assin-Central Municipality

KEYWORDS: innovative; starter; plenary; mathematics; science

I. INTRODUCTION

Mathematics and science remain the underlying rock of the fast growth and development of our modern society in all walks of life. The world as a 'global village' could not be realized without the key role of mathematics and science.(www.academic partnership.uta.edu) Rural areas are being connected to cities and towns by high ways and the use of fast communications and technologies. Searching for 'Truth' is the objective of every Scientist and Mathematician through specific observation, experimentation and evaluation of collected information in a scientific way because what has been called the 'truth' is never true unless it stands the test of experiment. Many nations across the globe including Ghana are making ardent effort in encouraging science and mathematics education and improvement of technology. (www.skidos.com) Science and Mathematics affect each individual's personal life to reflect on a healthy lifestyle, their civic lives, so that they take an informed part in social decisions and their economic lives, where they need to be able to respond positively to changes in the science-related aspects of their employment. In Ghana for example, governments are taking frantic steps to increase the flow of specialist scientists, technologists and engineers and so young people with a *special talent* in science are being identified as

Early as possible through a variety of STEM programs. (www.yourarticlelibrary.com) Though there are no clear-cut procedures to identify these young scientist, facilitations of school science lessons can explicitly engage today's learners in innovative ways, not to lose their interest but to unearth STEM hidden potentials, enhance competencies and equip them with positive responses to the country-wide misconceptions perpetuated by cultural and religious beliefs. Unfortunately, however, school learners are being turned off school STEM lessons, yet the same learners are often engaged by science outside the classroom. Science in science museums, hands-on centers, zoos and botanical gardens is often seen as exciting, challenging and uplifting .(www.linkspringer.com) Newspapers and magazines offer rich sources of science information including debates about controversial current issues. Multichannel television and the internet have spawned sources of high-quality and attractively packaged information about science and issues of relevance to young people. Learners accumulate a lot of science informed experienced through experiential learning often outside formal schooling, yet science educators tend to ignore the crucial influences that experiences outside school have on learners' beliefs, attitudes and motivation to learn. (www.uew.edu.gh) Out of classroom contexts can add to and improve the learning of science in several ways. They can promote the understanding and integration of science concepts. Falk and Dierking reviewed studies that show that science museum visits can lead to improved understanding of such classic school science concepts as force and motion, an improvement measured by tests of knowledge before and after visits. They are also an opportunity to engage in science activities that would not be possible in the school laboratory either because of safety considerations or because they are too complex. (www.sciencedirect.com) Examples include launching rockets, performing ecological surveys, observing the night sky, and large scale experiments with combustion. How these activities contribute to learners' knowledge of the processes of science is still not clear. And they can provide access to rare material and to 'big' science. Science museums, botanic gardens, zoos and science industries provide opportunities for learners to see yesterday's and today's science in use. Artefacts and collections, and the stories associated with them; help teach about the ways in which scientific and technological knowledge has been generated and about the social enterprise in which those who engage in this work operate. Here too, the exact contribution to school science is unclear. Such activities also provide opportunities for science activities which are less constrained by school bells and lesson times. Work can be more extensive and there are more opportunities for learners to take responsibility for themselves and others, to work in teams and to consider their effects on the environment. (files.eric.ed.gov)

What are Starter Activities? : Starter, appropriately used, means that learning can begin as soon as learners enter the classroom. They can be used to introduce new ideas or a new topic, or to re-cap/consolidate/reinforce prior learning. (http://www.teachit.co.uk, https://www.lancsng.fl.ac.uk) Tasks can also be displayed on the board or arranged on desks for learners to get on with straight away, whether the entire class is there or not. The importance of lesson starters are recognized as having significant and direct impact on the quality of the learning both within the starter itself and in the rest of the lesson. The use of the starter of the lesson to 'hook the learner' is developed in Philips (2001). He explores the 'tight' relationship between the initial activity and the ensuing lesson and enquiry. Philips describes the use of a wide range of initial stimulus materials (ISMs) such as visual sources, text and stories and music. The initial activity can not only arouse learners' interest at the start of the lesson but can also act as a 'connector' with other episodes and lessons. Starters also play a very important role in 'connecting the learner'. This is an essential aspect of planning since, in simple terms, we learn largely, though not exclusively, through what we already know. (http://content.yudu.com, www.jetprogram.org) asserts that with the introduction and warm-up of a practical lesson, carefully planned starter activities are important in teaching. These are used for a variety of reasons, but predominantly they develop early levels of engagement and motivation by injecting a sense of pace and challenge and, building on prior knowledge, provide a foundation for the introduction of new topics. Teachers use a wide variety of starter activities to achieve this aim, but they all have certain aspects in common: they should contribute directly to the lesson objectives; take account of the range of individual needs; show progression over time; have clear and concise instructions; and be referred back to at the end of the lesson for consolidating learning. (https://www.cambridgeenglish.org)
From the definitions and the explanations given so far, what then is a good starter? A good starter should have the delisted features; it must be,

- Short – probably no more than ten minutes
- Having lots of pace – mostly oral
- Very interactive - designed to engage and to focus attention
- Inclusive – designed to get everyone involved
- Motivational – designed to offer early success in the lesson.
  (https://worldsfun.cambridge.org)
  Examples of starters:
- Matching / sequencing exercises – e.g. match words with definitions, bingo, snap

- Examining an (intriguing) image with a related question summarizing – e.g. write down what you know about a topic in 3 bullet points, then reduce to words
- .Just a Minute' (tell your partner about a topic without hesitation, deviation or repetition)
- Questioning e.g. groups prepare short questions on a topic for another group; answer in role ('hot seating'); card loops; true/false statements
- Short videos/pictures
- Short poems/rhymes
  Mind mapping etc. (https://theidealteacher.com)

Plenary: An equally successful tool for enhancing learning is the plenary (as is the conclusion in a practical lesson). It helps learners crystallize, understand and remember what has been learned and provides a signpost for future learning. As with starter activities, teachers use a wide range of plenary activities. However, all plenary activities should be designed to suit the lesson and its ILOs and encourage reflection on what has been learned and how. Plenary do not have to happen only at the end of the lesson. They can fit in at point at which you want to check that learning has taken place ('mini plenary'), and to share understanding. *(www.lanscngfl.c.uk)* Plenary provide an opportunity to draw together, summarize and direct learning so that learners focus on what is important, what they have learned, the progress they have made and their next steps. Plenary can occur part-way through a lesson but should always feature at the end of a lesson. Debriefing is a very important part of a plenary as it encourages, explores and extends their learning. It is where what has been learned is established.

Fisher (2002) identifies three main intentions for the review:
Learners are asked to give answers, explain how they arrived at them and the skills they needed to use; in the

Process of explaining, learners have to develop and use appropriate language;

- They can then be encouraged to see how these processes can be used in other areas.
  One important aspect of the plenary is 'bridging', when the teacher makes a link between the learning in that lesson and learning in another or to the everyday real world. Mayer and Witt (1996) refer to the process by which learners apply what they have learned and the way they learned it to a new situation. In short, teachers planned for bridging so that learners may transfer what they have learned. Fisher (2002) develops the link between discussion, language and transfer, seeing the opportunity for learners' discussion, from planning through strategy to evaluation, as crucial for learners' development of the appropriate language. Planning for the plenary is very important, but not to the point where it becomes inflexible and thus limits the opportunities for the learners to identify what they learned, how they learned and where applicable. *(www.twinkl.com)*

What makes an Effective Plenary?

Plenary, whether they happen during the lesson or at the end, should:

- refer back to and consolidates the most important learning points of the lesson;
- refer back to the learning intentions stated at the beginning of the lesson;
- put the learning in context, by linking it both to prior learning and to the coming stages;
- gives opportunities for informal assessment – your quick check that learning has taken place;
- helps you judge the next steps (important in assessment for learning, Afl) and in enabling you to plan the next lesson;
- summarize and take stock of learning so far;
- draw together the learning of the whole group and the individuals;
- Last about ten minutes, but could be shorter. (*www.creativeeducation.co.uk)*

Importance of Plenary Activities

As with starters, plenary can be used for a range of different purposes. They can enable you to:

- review the lesson's objectives - taking stock of what the class has covered in a task;
- stimulate interest, curiosity and anticipation about the next phase of learning;
- reinforce or consolidate learning;
- use to start a the lesson, they can test learners' recall of what they learnt last lesson;
- use at the end of a lesson, they can enable both the teacher and the learners to assess the learning that has just taken place;
  Recognize and value the achievements of individuals and the class at large. (*www.richardjamesrogers.com)*

They can enable your learners to:

- remember what has been learned;

- crystallize their thought about what has been learned;
- deepen and extend their learning;
- articulate and communicate their learning;
- gain the sense of achievement in the successful completion of a task;
- understand the progress made and revise or set new personal target;
  Perceive themselves as learners. *(www.teachertoolkit.co.uk, www.coursera.org)*

Some Starters and Plenary Activities for Lesson (www,pininterest.co.uk)

Intended learning outcome	**Starter activity**	**Purpose of activity**	**Plenary activity**
To be able to describe strategies to improve both short-term memory storage (chunking) long-term memory storage.	Play 'Kim's game': 15 everyday items on a tray; learners study tray for 20sec. Remove tray for learners to recall items.	To start discussion on what strategies learners used to remember items.	Body Pegs' activity. Attach one strategy for improving retention and retrieval to 7 different major body parts attach a word and action to it.
Describe nutrition including nutritional requirements and common terminology associated with nutrition (Edexcel Level 3 BTEC National Sport and Exercise Sciences unit 12).	Supermarket 'top trumps'- hand out a food packet with nutritional information on to each student. They compare nutritional information, scoring a point for each item e.g. daily saturated fats.	To create a climate of interaction and involvement.	Ready, steady, cook. Provide groups with a shopping bag of pocketed food with nutritional information on, they have 5 minutes to decide what they would include and exclude to create a balanced diet.
Develop an understanding of specific exercise or training programmes including advantages and disadvantages (AQA GCSE Physical Education unit 3)	Learners are asked to match up cards carrying the name of a piece of fitness training equipment with the card containing the main muscle group it works.	To develop subject specific vocabulary to be used in the lesson and understanding of existing knowledge of definitions.	With a partner create one circuit training card with details of the exercise, the muscle works and the repetition options to use in a practical context next lesson.

II. METHODOLOGY

The Study Area and Research Design: Fosco Demonstration B Junior High School is situated in Assin Central District. It is a practice school for the student-teachers of the only college of education in the Assin Municipality, Foso College of Education. Assin Foso is relatively a big town located in the Assin Central District of the Central Region. Most of its dwellers are government workers, private workers and also petty traders with few being farmers therefore making the town very busy. The population of the community could be ranged within twelve (12) thousand and fifteen (15) thousand.

The action research design was used for the study. Action research is a specific type of applied research. Its purpose is to solve a specific classroom or school problem, improve practice or make a decision at a single local area or site. The goal is to improve practice immediately within one or few classrooms or schools. Teachers and administrators conduct action research. In other words, the studies are conducted by practitioners, focusing on their problems or using the principles and methodologies of research.

The Strengths of Action Research

The strengths action research include:

- It is a means of introducing new ideas into the teaching process. It is also a means of remedying a specific situation. This is improving practice.
- It helps the teacher to get better understanding of what actually goes on in the teaching process.
- It also help the learners to get better understanding of all aspects of teaching and learning process on their own, that is relating to the subjects content and methods which will be appropriate for the class.

- It is through action research that that teaching can evaluate his or her teaching effectively, because the teacher needs to be equipped with the knowledge and skill in order to understand the various methods that will best suit the class.

The Weaknesses of Action Research
It is only confined to problems which hinder classroom teaching and learning. Procedures are planned only in general terms, that is, it is a problem which is recognized among some learners. These are selected but the whole is involved in the research. The findings of the action research cannot be applied to a number of areas. It is only concerned with finding solutions to specific problems which are identified.

Research Instruments
The Study Population: A population is a group of elements or cases whether individuals, objects, events, that conform to specific criteria and which a researcher intends to generalize the result of research. The population for i comprises all JHS 2 learners of Fosco Demonstration 'B' JHS both boys and girls.

Sampling Procedure: Purposive sampling and census were used for the study. Purposive sampling is a non-probability sampling method and it occurs when elements selected for the sample are chosen by the judgment of the researcher. Purposive sampling saves time, money and effort. It is flexible and meets multiple needs and interests. It enables researchers to select a sample based on the purpose of the study and knowledge of a population. They choose subjects because of certain characteristics. The primary objective of this type of non-probability sample is to produce a sample that is done using researcher's expert knowledge of the population and selecting a sample of elements in a non-random manner. Purposive sampling has a wide range of sampling techniques that the researcher can use across different qualitative research designs. Typically, qualitative research design involve multiple phases and require different types of sampling techniques at every phase. Purposive sampling becomes useful in this situation, because it offers a wide selection of non-probability sampling techniques. Purposive sampling and census were therefore chosen to include all 50 learners of Fosco Demonstration 'B' JHS. They constitute 27 boys representing 54% and 23girls representing 46 %.

Data Collection Instruments: Observation is a systematic data collection approach, whereby the researcher uses all of their senses to examine people in natural settings or naturally occurring situations. The researcher chose observation because it enables the researcher to describe existing situations using the five senses, providing a written autograph of the situation under study.

Strengths of Observation
- It is a very direct method for collecting data or information best for i of human behavior.
- It improves precision of research results.
- It is very accurate in nature and very reliable in data collection.
- It is less demanding I'm nature, which makes it less bias in working abilities.
- It approaches reality in its natural structure and studies events as they unfold.

Weakness of Observation
- *I*t cannot provide information about past, future and unpredictable event.
- It involves a lot of time as one has to wait for an event to happen to study that particular event.
- It cannot be employed when large groups or extensive events are studied.
- It cannot study opinions or attitudes directly.
- It cannot obtain a complete answer to any problem or any issue.

Test
A test is a procedure of submitting a statement to such conditions or operations which will lead to its proof or disproof or to its acceptance or rejection.

Strengths of Test
- It helps the teacher to organize the things that they teach and when they should teach them. It is a powerful guidance tool for schools and educators to use.
- It also provides the school and teacher with what areas their learners are lacking in and where more focus should be placed in the classroom.
- It helps to exemplify just how far ahead you are from the red. This also place into the funding that is provided for the school from the government.

- It makes them highly subjective, and bias about what the teacher believes and has taught. It does not create a standard and average for testing the learners' knowledge in the way that standardized testing does.

Weaknesses of Tests

- It makes it very difficult for teachers to teach the way they want, or the way that their learners need. They have to follow a very strict curriculum set by the state in order to get the best scores on their tests.
- It provides an inaccurate judgement. Each student is different and understands things in a different way. Standardized tests put these learners into boxes that they feel they must fit into, which is negatively impacting the mindset that comes along with an education.
- It inspires cheating. Most schools funding depends on how well they perform on the State standardized tests. This is a huge amount of pressure to put on teachers and learners. It's because of this pressure, and throwing money into the mess, that there have been numerous cases of cheating. When I say cheating, I don't mean by the learners either. Teachers and schools, Districts all over the country have. Been found guilty of changing answers, submitting false tests and doing just about anything they can in order to boost their class scores.

Data Collection Procedure: The first research instrument used by the study was observation. This was conducted on the learners during other subjects like English language and Pre-technical skills where the teaching involved a lot of resources coupled with lots of activities. As a result, the learners' participation and performance were very high after marking the exercises. But during the mathematics and science lessons, which were delivered without resources and activities, learners performed badly. It was then realized that learners had a peculiar problem on attention deficit which prompted i to use other research instruments. One of such instruments was test.
Here, five (5) questions were written on the whiteboard for learners to provide answers as pre-test questions. After ten (10) minutes, they were collected and marked. It was realized that teachers of Mathematics and Science do not use the appropriate activities to whip up learners' inability to show interest in these subjects.

Intervention
Week One: Day One
Topic: States of Matter
Using a poem as a starter
Lesson process
Surrounded all around us in the classroom are a number of things
Tables, chairs, duster, charts, chalk, whiteboard, bag and phones

All these occupy space and have some weight.
What do we see and feel when we move outside the classroom?
Water, plants, air, animals, buildings, lands, etc.

These are called matter.
In the wider world, what else do we see?
Lakes, seas, mountains, buildings, machines and trees
All these substances have weight and occupy space.
Molecules: who has ever come across that word?
This is what all substances are made up of.
Molecules vary in different substances,
Molecules of a substance are held together by some force.
Want to know what that force is?
Wait, I'll tell you the next time we meet.

Follow up questions:
What are the three (3) states of matter?
Learners: solid, liquid and gas.
Teacher: Name some examples of solids, liquids and gases around us
Solids: Table, chair, whiteboard, duster, trees, buildings, mountains, shoes, books, pen and bag
Liquids: Water, liquid soap, soup, urine, dettol, petrol and kerosene
Gas: Oxygen, hydrogen, carbon dioxide, neon, argon, helium, nitrogen and sulphur dioxide
Teacher: Now let us watch this short video after which we shall discuss the properties of the states of matter.
Link. Htt://www.youtube.com/watch?v=VmkyoQAKUO

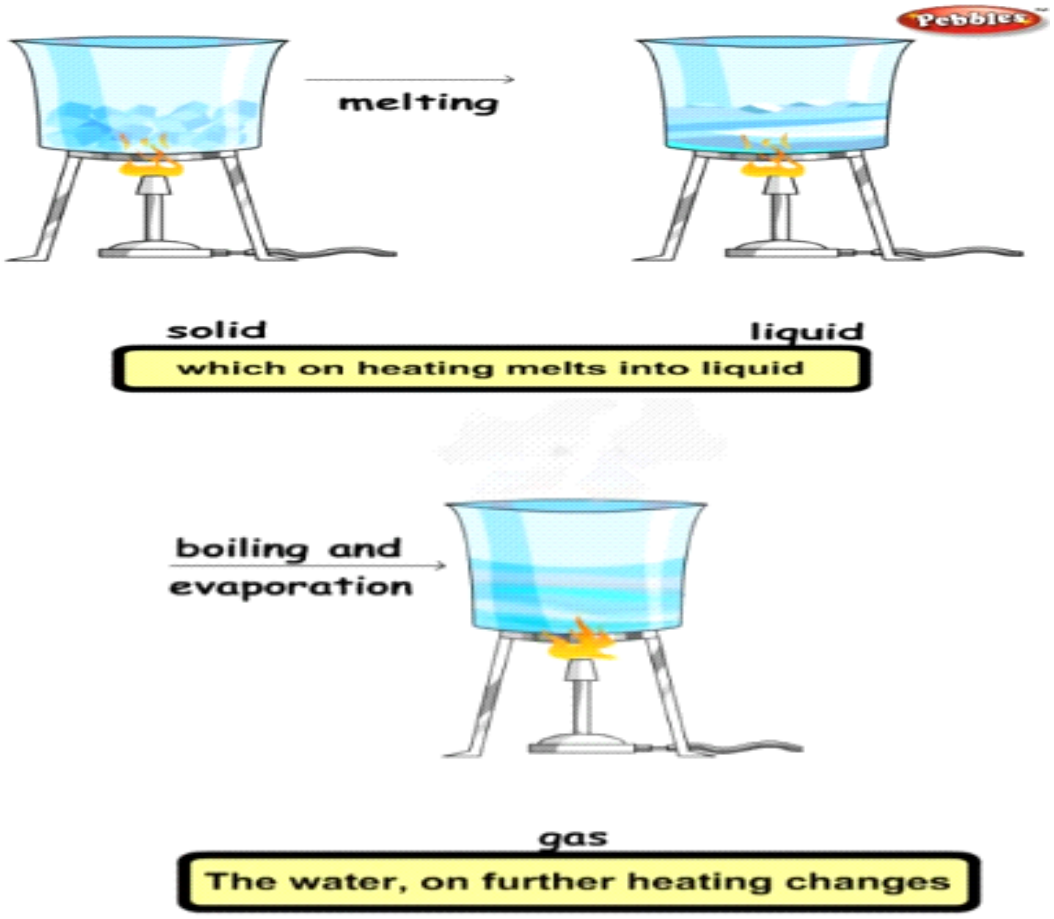
Lesson Plenary: individual impression about the topic.
Which part of the lesson did you enjoy and why?
Which part didn't you enjoy and why?
What new thing did you learn today? Each group will write one.

Week One: Day Two
Topic: States of matter (Solid, Liquid and Gas)
starter: Using matching cards and mind mapping.
(Video downloaded from: https//www.facebook.com/ManochaAcademy)
Learners were put into groups of four and each group given complex samples of liquids, solids and gasses. Matching cards with labels solid, liquid and gasses were also given them. The groups were to identify from their samples those which fall in each of the three categories and match the cards against them.

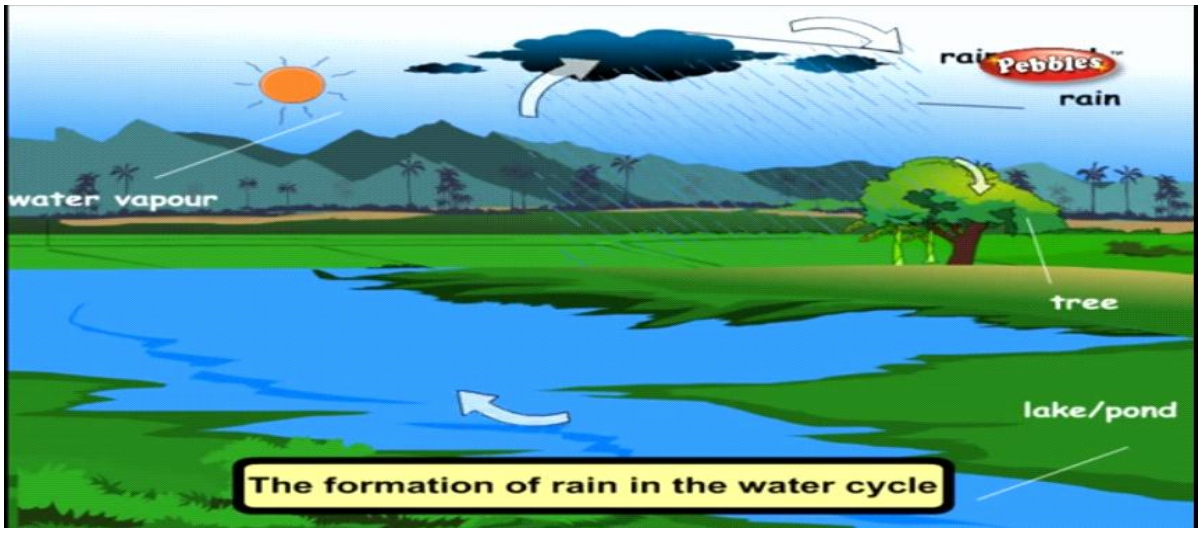
Lesson Plenary
Now from the video, let us answer the following;
- What are your comments on the video?
- What are some of the properties of solids, liquids and gases?
- Model the structure of the three states of matter.

Week One: Day Three
Topic: Change of States of Matter

Starter
Hello there, welcome to yet another section of our lesson. In this episode, we are going to talk about the changes that take place in the three states of matter. Quickly, let us write down three examples each of the three states of matter. Good, all of you are correct!
Now, let us watch these pictures and discuss what is happening in each case.


Pebbles
melting
solid
liquid
which on heating melts into liquid
boiling and
evaporation
gas
The water, on further heating changes


Pebbles
This is called condensation.

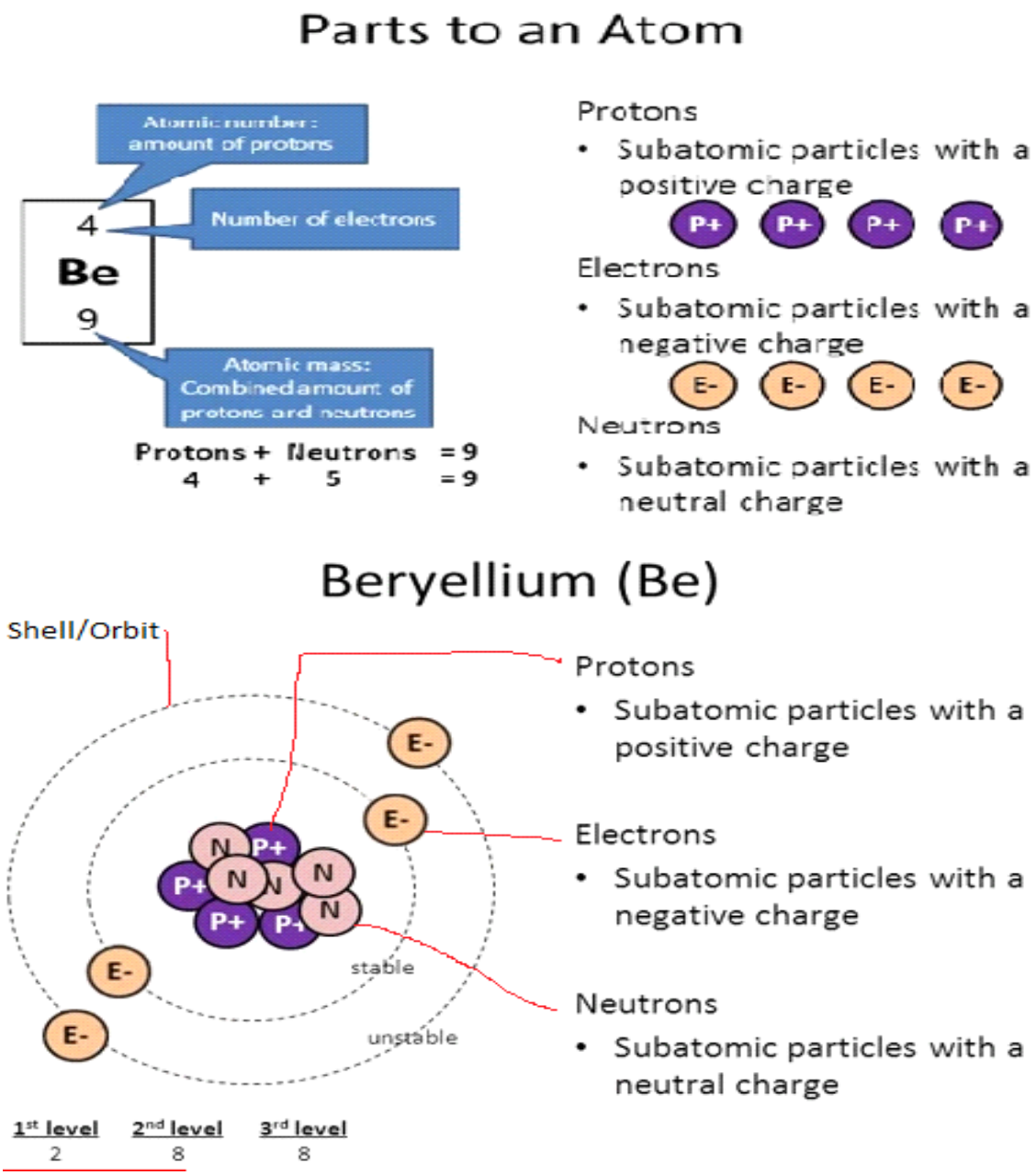


Now, let us watch this video to widen our understanding on the change of states of matter.
(Downloaded from: https://www.youtube.com/wacth?v=VmkyxoQAKU0)

Lesson Plenary
What do you like about rains?
What don't you like about rains?
How do you feel about the process of rain formation?

Week Two: Day One
Topic: The structure and parts of an atom
starter
Hello friends! Welcome to yet another section of the class where we are going to learn about the structure and parts of the atom. But before that, I would like the class to recite the acronyms of the first 20 elements accompanying with action of your choice. Let us now do the following;

- Now, number yourselves from 1 up to 20. Locate your partners and sit in pairs according to your numbers.
- Take pieces of papers and write the names of the elements according to your numbers.
- Again, write any two things you know about the element (atom) that you have written.
- Now exchange papers with your similar groups and check it out if other groups did something close or different from yours.
- Let us now comment on what others have written.
  The teacher now shows the model of few atoms to the class for discussion.

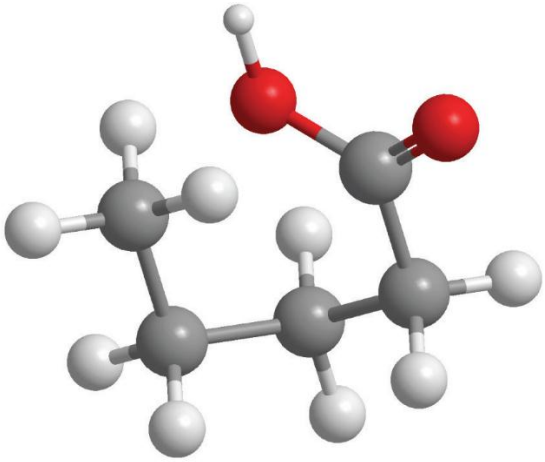


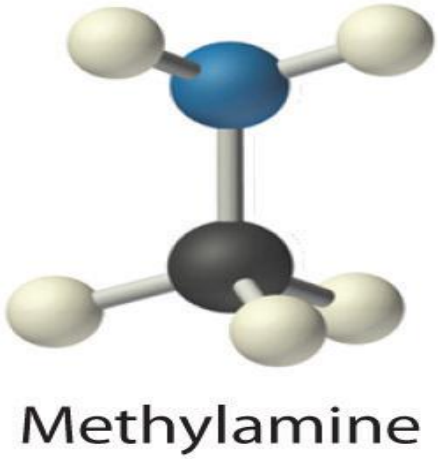
Now, watch this video on further structure and parts of other atoms.

(Video downloaded from:https://www.teacherspayteachers.com/Product/Covalent-vs-Ionic-Bonds-Powerpoint-2340207)

Lesson Plenary
In pairs write on the flip charts given, which part of the lesson interests you most and post it on the walls for a gallery walk.

Week Two: Day Two
Topic: Chemical Compounds
Starter
Present to learners the following: Salt (NaCl), sand (Silicate), chalk (CaCO3), water (H2O), ammonium (NH4). Led with questions, let learners discuss why they are called chemical compounds. Again, distributes the teaching and learning resources to the learners and assist them to model some of the chemical compounds as shown in the picture below.



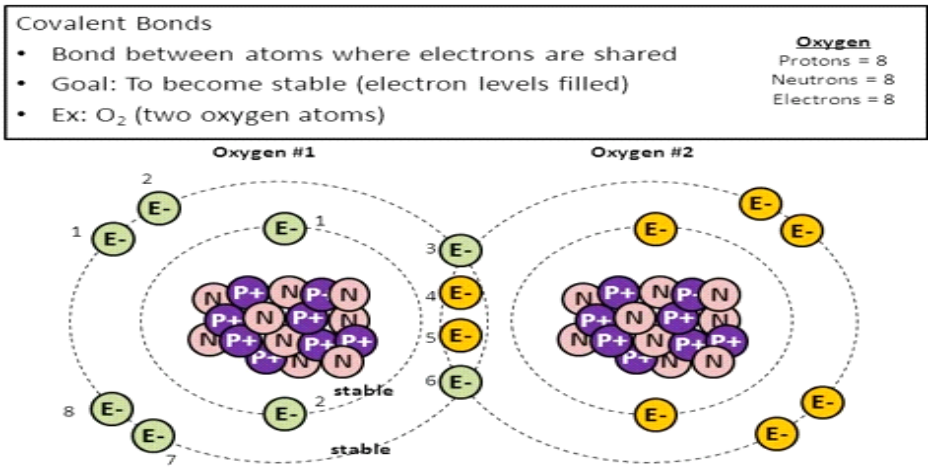


Lesson Plenary
Using the 4Rs and Science as plenary activities.
Which part of the lesson will you group under

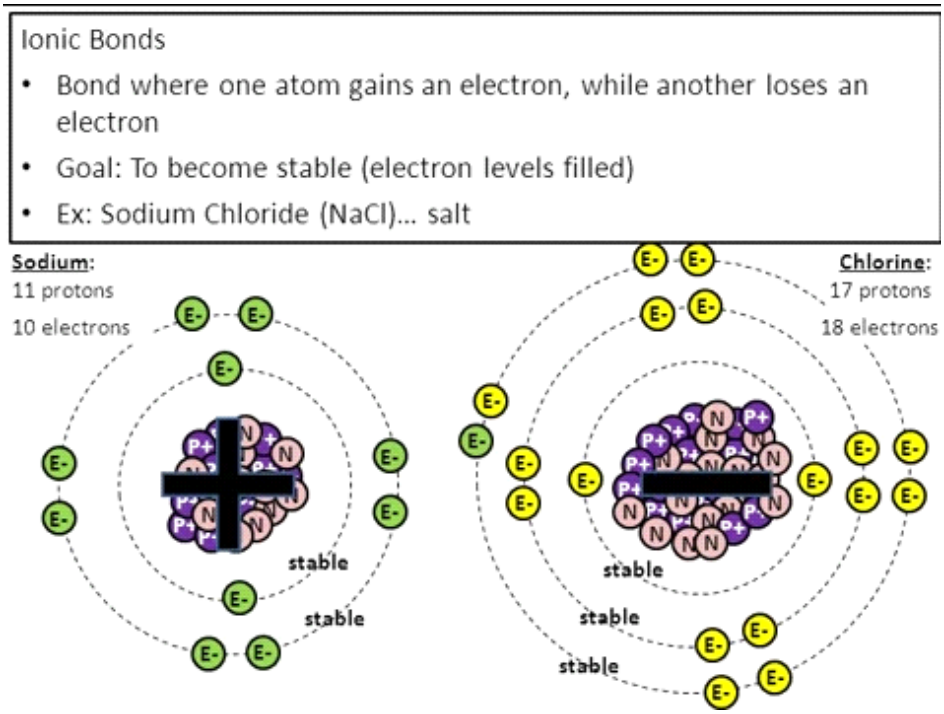
a. Reading
b. Writing
c. Creativity
d. Arithmetic
e. Science

Week Two: Day Three
Topic: Naming of Chemical Compounds (Ionic and Covalent Bonds)
Starter: using concept cartoon and carrousel activity
Hello friends! Welcome to another episode of our lesson on the topic 'Formation of Ionic and Covalent Bonds'. For this lesson, each one of you is going to look for someone to write a simple sentence with any of the following: Atom, Element, Proton, Neutron, Electron, Atomic number, Atomic mass, Covalent, Ionic, O2, Salt and Sodium chloride. After you put yourselves into groups of four, each one draws their heads creatively and attach the sentence you formed to it. This is what is called concept cartoon. Any group which comes out with the nicest drawing, will get a price. You are using ten minutes.

Now at the sound of my clap, you leave your chart on your group table and move to another group table and observe what they have drawn and written. We will go round all the groups. After we discuss what you read from others and decide on the best drawn concept cartoon. This activity is the carrousel activity.
Let us as usual watch this piece of document and have a friendly discussion afterwards.
(Video downloaded from:https://www.teacherspayteachers.com/Product/Covalent-vs-Ionic-Bonds-Powerpoint-2340207).
Covalent Bond

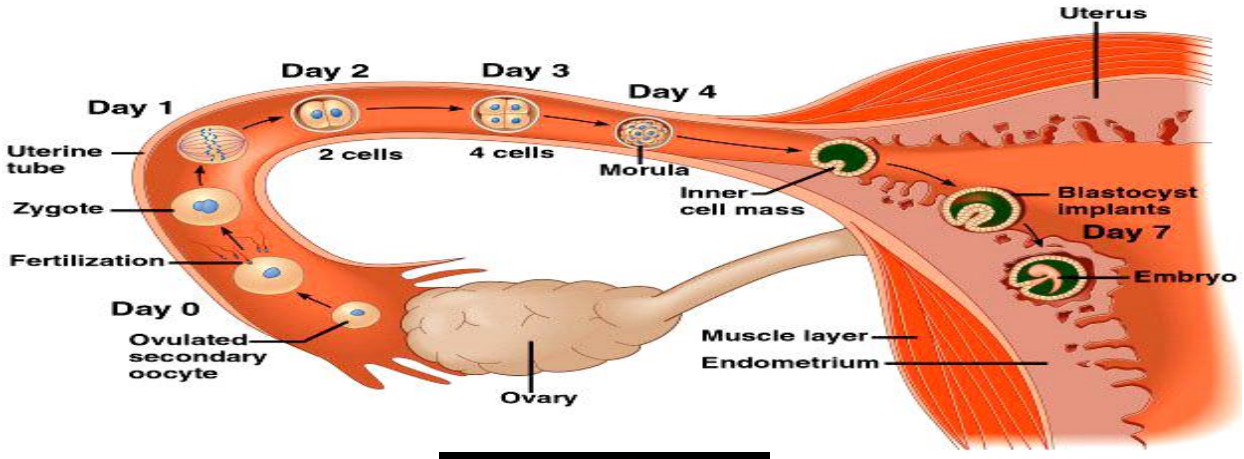


Ionic Bond



Lesson Plenary
-What did we learn today?
-How did we learn it?
What new thing have you learnt?

Week Three: **Day One**
Topic: Reproduction in human (Stages of development of the foetus)
Starter: using story telling.
Once upon a time, Aunty Maggie, a humble woman was gracefully wedded by Uncle Joe and after their honey moon at a five star hotel in Accra, the couple settled in their new premises. Aunty Maggie was very industrious. She woke up early, did her chores and everything expected of her as a wife and after taking breakfast with her husband, off she would leave for her shop. Three month later, Aunty Maggie did not seem very well. She started throwing up early in the morning and was not her usual self. Her husband quickly rode her to the hospital for fear that she might have contracted malaria, a deadly disease. After going through the hospital procedure, the doctor invited Uncle Joe to his consulting room and told him "Mr. Husband, your wife has taken seed. I can deduce from your reactions that both of you are a bit ignorant about the issues of pregnancy so I have decided to give you some education on it. We shall all watch this video together"



Lesson plenary

- Tell a story about your birth or that of your sibling
- Now tell me the stages of foetal development
- Which stage excites you the most? Why?

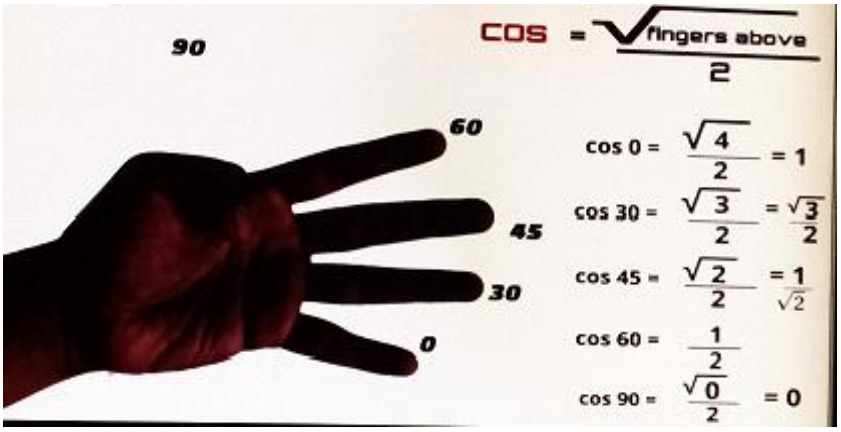
Week Three: Day Two
Topic: Finding the value of special angles using the SoCaToa [Sine (sin), Cosine (cos) and Tangent (tan)]
Starter

- Draw your left palm on a sheet of paper
- Indicate the following on it; little finger, ring finger, middle finger, index finger and tomb
- Again, write the following against the fingers; little finger = 0, ring finger = 30, middle finger = 45, index finger = 60 and tomb = 90
  SINE
- The rule for the calculation is; Sin = $\sqrt{\text{fingers below}}$ / 2
- Now, let's begin to play
-

From the picture on the board, let's compare our answers and see our strength as well as weaknesses
COSINE

- The rule for the calculation is; Cos = $\sqrt{\text{fingers above}}$

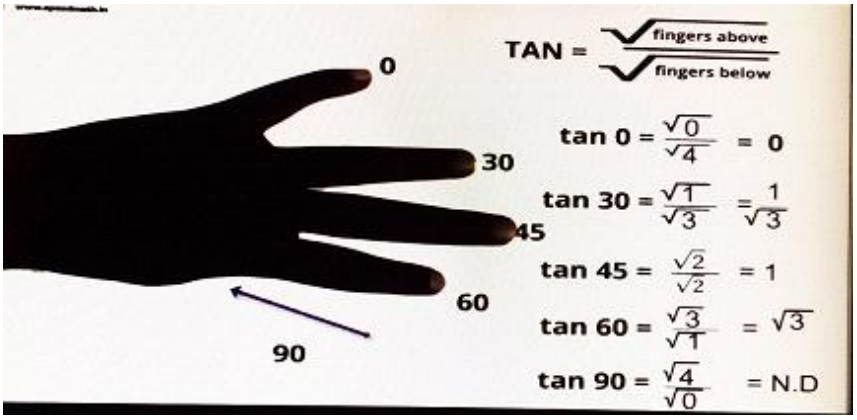
Now, let's begin to play



From the picture on the board, let's compare our answers and see our strength as well as weaknesses

TANGENT

- The rule for the calculation is; tan = √fingers above / fingers below
- Now, let's begin to play



From the picture on the board, let's compare our answers and see our strength as well as weaknesses

Lesson plenary

Did the strategy help you understand the concept?

What about the picture that made you confused"

What about the picture gave you a clue to your answers?

Week Three Day Three

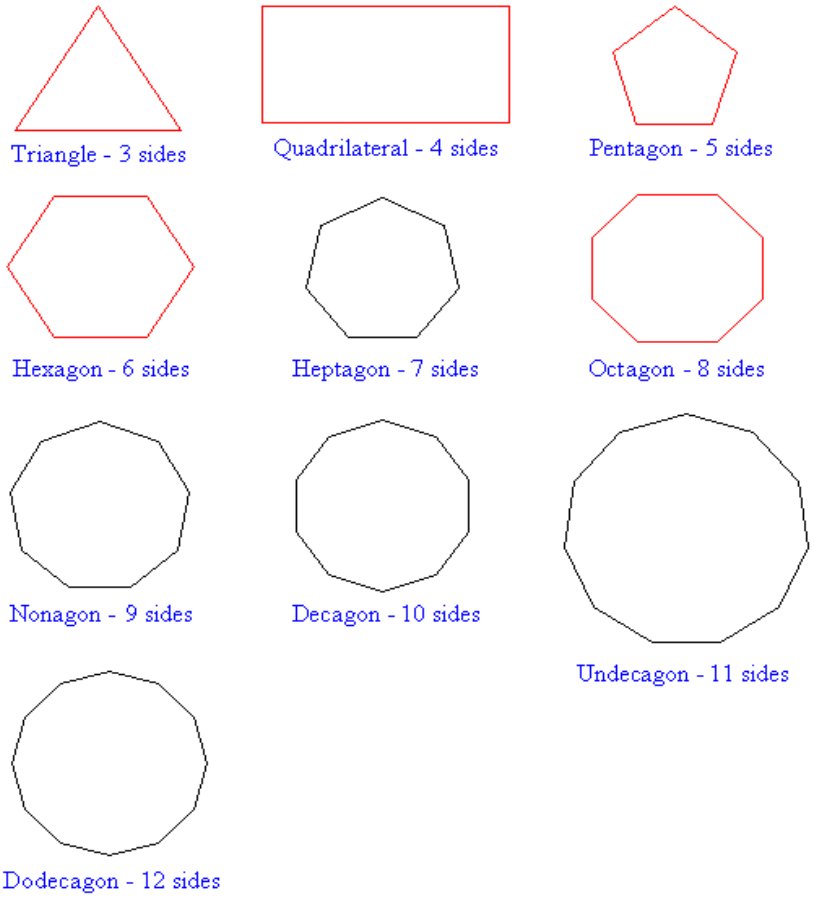
Topic: Finding out about the applications of polygons in real life

Starter: based on a lesson taught in the classroom

Using independent study, learners were asked to state whether each of the following is true or false and explain their answer.

- No kite is a parallelogram
- Some trapezoids are kites
- All parallelograms are rectangles
- All squares are rectangles
- Some quadrilaterals are squares
- Some kites are trapezoids
- All rhombuses are parallelograms
- All rectangles are parallelograms

The chart on polygons was studyed for learners to observe.



Source: https://www.tes.com/teaching-resource/ks3-mathematics-angles-in-polygons-worksheet-6165951

Plenary

- Find out about the applications of polygons in real life
- What is the shape of the building in the picture?
- Describe how you will use the picture to measure the total floor area of the whole building (including open spaces and walls). You can make any assumptions (e.g. give the sides some values and use these values consistently in your calculations)

Source: https://upload.wikimedia.org/wikipedia/...

Post-Intervention Stage

The same questions used for the pre-intervention stage were repeated here. It was professionally rewarding to see how the learners performed excellently.

III. RESULTS AND FINDINGS

Introduction

This Chapter Discusses The Results And Analyses The Data Collected Concerning The Pre And Post Intervention Tests Administered.

Gender Distribution of Respondents

Table 1 presents the number of learners in the class with respect to their gender. From the data, it can be seen that 27 of the learners are boys and 23 were girls.

Table 1: Gender Distribution of the Respondents by Gender

Sex	frequency	percentage
Male	27	54
Female	23	46

Source: field work 2020

Table 2: Causes of Learners' Disinterest in Science and Mathematics Lessons

Table 2 discusses the causes of learners' lack of interest in science and Mathematics lessons. The learners were put into groups to discuss why they do not enjoy mathematics and science lessons and present their findings. Their feedback was collated and categorized into four. Out of four causes listed, No practical activities are involved attracted 14 learners representing 28%. This major cause of their problem was attributed to the fact that their teachers did not take them through any activities to help them bring various views to give them a clue as to what the demands of the topics are. 12 learners representing 24% identified themselves with inability to organize their thoughts. They claimed that they did not know what a topic entailed as teachers will do all the explanations and illustrations on the board without making them interact with the environment to make conclusions. They were always confined to the classroom, no attempt is made by teachers to give them cues to forming a concept, nothing audio or visual is brought to class to practicalize the abstract concepts taught in science especially and mathematics is always follow the formulae and work. The third group of learners who chose lessons are fun buttressed the point raised by those who said they could not organize their thoughts. This group asserted that lessons in these subjects are always presented in the same way. No games, no dynamisms, no manipulations. Learners are subjected to spectators who just listen and give chorus answers or observe what other mates try to do on the board. The 13 learners forming 26% said that if learners are made to relax and have fun in lessons and sometimes taken away from the boring 4 walls of the classroom block, their interest would be aroused to study the subjects. The last group of 11 learners forming 22% also said learners were not involved in lessons. No hand-on activities and learner-learner collaboration are enhanced in class. Teachers make no attempt to attend to individual learners to see their level of participation and understanding and so "those of us who don't understand but do not want to show it, resort to copying the exercises given us from friends.

Table 2: **Causes of Learners' Disinterest in Science and Mathematics Lessons**

causes	frequency	percentage
No practical activity	14	28
Inability to organize thoughts	12	24
Lessons are not fun	13	26
Learners are not involved	11	22

Source: field work 2020

Effects of Learners' Disinterest in science and Maths

To know whether the learners actually understood what was being discussed, learners were made to discuss how the problem can affect them. The six core competencies were explained to learners and each was made to identify with just one of them and discuss how it might affect them if they continue to be disinterested in science and mathematics lessons. 5 learners representing 10% identified with no creativity and collaboration. They said that if the study of science has gone into all the inventions of man that we see around, then their lack of interest can cause them their innovative and creative skills which will also affect how they collaborate with people who are scientifically inclined. 8 other learners forming 16% were attracted to no cultural identity/global citizenship skills. They discussed that currently all cultures, no matter how primitive or otherwise are inclined to science and mathematics as chiefs and other traditional leaders are all using mobile phones and other scientific gadgets and as different cultures come together to form the globe, that is why through the application of science in the different cultures, the world is becoming a global village. Their lack of interest in science and mathematics therefore will make them miss out, not to be a good team player in the global citizenship skills. No independent study and personal development swept away 7 learners representing 14%. This group used the access to information on the internet as an example. If they do not have interest in science, it may go a long way to affect their studies because everything they use for the studies, ranging from the books to the computers are from science inventions and acquiring information itself has to also do with science. If they develop interest in science, they can try with other scientific ways of doing things independently and develop. They can move with the demands of the times and not be left out. It was surprising that 12 learners who form the majority 24% identified with no critical thinking and problem solving skills. They came out that what all the other groups have discussed have to do with critical thinking and problem solving skills. It is through critical thinking that inventions are made in the health, education, business, security and other such sectors. When problem solving skills are also enhanced, the problems of the world: natural disasters, accidents, pandemics, mortalities will all be reduced if not done away completely. No leadership and entrepreneurial skills was also chosen by 7 learners constituting 14%. They were very brief with of course without adequate knowledge in science and mathematics which are embodied in our daily dealings, how can one be a leader to direct and manage affairs and less more an entrepreneurial to monitor the progress or otherwise of an establishment. No ICT skills also attracted 11learners forming 22%. They were quick to admit that the world is technologically advancing with complex ICT skills so lack of science and technological knowledge backed by mathematical competence will actually alienate them from the digitally advancing world.

Table 3: Effects of Learners' Disinterest in Science and Mathematics Lessons

Effects	frequency	percentage
No creativity and collaboration	5	10
No cultural identity/global citizenship skills	8	16
No independent study and personal development	7	14
No critical thinking and problem solving skills	12	24
No leadership and entrepreneurial skills	7	14
No ICT skills	11	22

Source: field work 2020

Strategies to Remedy Learners' Disinterest in Science and Mathematics Lessons

Five strategies were listed for the learners to select the one they think would help them overcome their inability to write essays. Out of the 30 learners, 3 constituting % chose reporting back from fields trips. They argued that

what they observe captures all the five senses and since individuals observing the same thing at the same time end up drawing different conclusions, field trips will enhance creativity and diversity.

4 learners constituting % were of the view that being drilled in reading dictation will increase their speed for good essay writing. They continued that the passage if read out very well and at a constant speed will make learners write well and follow the speed of the reading which in no doubt will reflect positively in their spelling, imagination and speed for essays. Another group of 13 learners constituting % emphasized the need for mind maps. To them, if the teacher's intervention is reduced and learners are made to do individual thinking on a subject and writing what comes to mind down simultaneously, learners would feel relaxed, edit their work. Clear off clutters and understand issues better. They said that all the other strategies, though good will not train them on organization, logical presentation of facts and what goes into content. If what the teacher said about mind maps are that practical and workable, then that would mean being taken through planning, shower thoughts, organization and even some spelling. All 13 of them were optimistic that using mind maps was the best of the strategies to help them. Sequential arrangement of events attracted two learners. These were the learners who could easily raise points and analyze them but presenting them logically was a problem. They needed mastery to arrange facts sequentially and meaningfully. Since mind mapping consisted of all the other strategies, it was chosen for the intervention. Modeling pulled 5 learners forming %. They think that if they are given a good model essay to read for some time and understand it, subconsciously, they register the good use of organization, how content is elaborated, unity and coherence in their minds. This will give lasting impressions for them to imitate in writing good essays. The last group of 5 learners chose dramatization. They posited that dramatizing events required in an essay will help them organize facts and write well. The intervention was strategically implemented to embrace all five items.

Table 4: **Strategies to Learners' Disinterest in Science and Mathematics Lessons.**

Strategies	frequency	percentage
Innovative starters and plenaries	28	56
Reporting back from findings	7	14
Experimentations	5	10
Scientific Inquiries	8	16
Modeling	2	4

Pre- Intervention Test Result: Table 5 shows that the lowest range from 1-10 was scored by 50% of the learners. The next range was 11-20 which was also scored by 42% of the respondents and finally 8% managed to score between 21-30.The results show that 92% of the learners scored below the average mark with the modal range of 1-20 and an average score of 8%. It can be deduced out rightly that the learners' performance during the pre-intervention test was low. The indication was that, learners did not understand the mathematical and science problems and because they were not involved from the very beginning to find solutions to the mathematical and science problems, they transferred such ignorance in answering the pre-intervention test.

Table 5 Pre-Intervention Test Score

Marks	frequency	percentage
1-10	25	50
11-20	21	42
21-30	4	8

31-40	0	0
41-50	0	0

Source: field work 2020

Post- Intervention Test Results: The percentage analysis on the table indicates an incredible upward performance. Range 1-10 attracted 1 learner representing 2% while range 11-20 saw 8 learners forming 16% scoring it. Surprisingly 11 learners forming 22% scored range 21-30 and 20 learners representing 40% were in the range of 31-40. One other achievement worth noting is 10 learners forming 20% scored 41-50. The below average percentage which stood at 92% at the pre-intervention stage fell to 18% at the post-intervention stage. A 74% upward improvement testifies to the effectiveness of the intervention strategies. Average score also saw an adjustment from 8% to 22% and above-average performance invited an improvement of 40%. Excellent results of 41-50 which stood at 0% during the pre-intervention phase now had 10 learners representing 20% scoring it for the post intervention results. A rise of 60% from the pre-intervention results has all the proof to conclude that the implementation of the 3 weeks intervention was commendable.

Marks	frequency	percentage
1-10	1	2
11-20	8	16
21-30	11	22
31-40	20	40
41-50	10	20

IV. CONCLUSION.

Analysis of the pre and post-intervention tests confirmed that the score for the post-intervention test was higher than that of the pre-intervention test. The researcher attributed the improvement in the learners' performance to change in the teaching strategy adopted during the intervention. With the introduction of the problem solving skills, the learners' were exposed to numerous activities during the intervention processes. The various activities used in the intervention led to the impressive improvement. This means that when innovative starters and plenaries are used in lesson delivery, the learners understand well and performance improves.

Summary: The main objective of the study was to access the causes of lack of interest in science and mathematics lessons among basic eight learners of Fosco Demonstration 'B' Basic School. Purposive and Census sampling were used to select all the 50 learners for the study that is 27 boys representing 54 percent and 23 girls representing 46 percent. Three instruments, observation and test were used. The data were presented using descriptive statistics making use of tables and percentages. The study identified the following as major findings. a. Causes of learners'

disinterest in science and mathematics lessons: No practical activities are involved (28%) Inability to organize thoughts (24%), Lessons are not fun (26%) and Learners are not involved (22%) b. Strategies to Learners' Disinterest in Science and Mathematics Lessons**:** Innovative starters and plenaries (56%), Reporting back from findings, (14%), Experimentations (10%), Scientific Inquiries (16%), and Modeling (4%) Compared to reporting back from findings, experimentations, scientific inquiries, modeling, innovative starters and plenaries can be considered to be the most important strategy to reduce learner's lack of interest in science and mathematics lessons.

V. CONCLUSIONS

The findings of the study in relation to lack of interest in science and mathematics lessons, No practical activities are involved, Inability to organize thoughts, Lessons are not fun and Learners are not involved were the major causes. The views of the learners led to the conclusion that experimentations, scientific inquiries, modeling, and especially innovative starters and plenaries could be used as the strategies to overcome learners lack of interest in science and mathematics lessons at Fosco Demonstration 'B' Basic School in the Assin-Central Municipality.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are made:

- Strategies to reduce learners lack of interest in science and mathematics lessons at Fosco Demonstration 'B' Basic School should concentrate on experimentations, scientific inquiries, modeling, and especially innovative starters and plenaries
- For optimum benefits, efforts should be made by stakeholders and teachers to tackle, No practical activities are involved, Inability to organize thoughts, Lessons are not fun and Learners are not involved, as these factors could undermine the realization of achieving learners' interest in science and mathematics lessons at Fosco Demonstration 'B' Basic School
- Innovative starters and plenaries in teaching other topics in subjects like English, RME, Social Studies and others should be enhanced for the effectiveness of the teaching and learning process.
- Enough resources must be developed for use in the teaching of science and mathematics concepts and teachers must use variety of materials to encourage children develop the concept rather than rote learning.
- In-service training should be organized for teachers at regular intervals to upgrade their methods of teaching of the subjects.
- Further studies ought to be conducted to look at how games can be designed to teach science and mathematics concepts.

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