Ministry of General Education

National JETS Year Book 2019

NATIONAL SCIENCE CENTRE
SERVING THE NATION

JUNIOR ENGINEERS, TECHNICIANS AND SCIENTISTS (JETS) 2019

Directorate of National Science Centre

Message from Minister of General Education

Honorable Mr. David Mabumba (MP)

Ministry of General Education

It gives me great pleasure to officiate at the 51st Annual Junior Engineers Technicians and Scientists (JETS) Fair 2019. The Ministry of General Education is privileged to host this important educational event. This annual event gives the youth, learners and the educators an opportunity to interact/network with others of different educational backgrounds, share academic knowledge, learn from the others and have fun in their free time.

The theme for this year '**Enhancing Science, Mathematics and Technology Education' among Learners, Youths and Educators through innovations'** is appropriately chosen for the learners, youth and educators of Zambia wherever they are, to engage and participate in creativity and innovation for their own empowerment.

Government has always been ready and keen to deliberate on issues of Science, Technology, Engineering and Mathematics (STEM) among the youth and learners. During this years' Fair, His Excellency, Dr. Edgar Chagwa Lungu, President of the Republic of Zambia will grace the event, commission the STEM Education Training Centre and establish STEM Schools.

It is important for teachers to employ modern teaching methodologies that are creative and innovative as well as to engage in practical research to improve the learning and understanding of these subjects.

Message from Permanent Secretary – Administration

Dr. Jabbin Mulwanda

Ministry of General Education

The Ministry of General Education aims to share a culture of achievement and excellence through the promotion of an efficient and effective education and training system that is inclusive, integrated, comprehensive and holistic. This cannot be achieved without the support and commitment of the teachers who are the main pillars on which rests the foundation of quality education.

On 26th August, 2019, the 51st Annual JETS Fair will be officially opened at a ceremony where the Head of State, His Excellency, Dr. Edgar Chagwa Lungu will, also commission the STEM Training Centre and announce the 52 STEM Schools. The Government hopes to nurture STEM skills and passion in learners and youths through events such as JETS competitions

Teachers in the schools should encourage science, mathematics and technology exhibitions and should try to build creativity among the learners in order to bring out the inherent talent from them. Teachers should interact with their learners while conducting science/math lessons through hands-on activities. This document will give guide to achieve this. This will call for continuous Human Capital development in order to drive the national vision—promoting centres of excellence.

With the majority of stable economics investing in STEM Education and related industries, it has never been more important for young people to get involved and build a passion for STEM. The competition will help the learners and youth build appreciation for STEM as they work to solve the pressing issues the country is going through. Learners will have the chance to meet their peers from around the country and show off their work to expert judges and members of the public.

Message from Director – National Science Centre

Mr. Benson Banda

Ministry of General Education

I wish to welcome you all to the 51st National JETS Fair, Quizzes and Olympiads. We are delighted that you could find time from your busy schedules to attend this national event. The theme for the 2019 JETS fair is "**Enhancing Science, Mathematics and Technology Education' among Learners, Youths and Educators through innovations".** This is a culmination of various JETS fairs that were carried out by all the regions.

The National JETS Fair is the nation's premier STEM competition with the aim of promoting the interest in STEM among learners, youths and educators through innovations. The Fair also provides a fun and informal learning experience for the participants and audience alike.

I encourage you to take time to visit all the exhibits and innovations and interrogate issues on Science, Mathematics and Technology with a view to generate discourse that could lead to improved research practices that aims at improving the teaching of Science, Mathematics and Technology in the Zambian Schools.

I thank the Government of Zambia, through the Permanent Secretary of the Ministry of General Education, for the support rendered in hosting this event. I also wish to thank the sponsors, partners, exhibitors, delegates and the general public for the support and for attending the event.

Finally, my gratitude goes to the JETS National Coordinating Committee for working tirelessly in preparation to make the national event a success.

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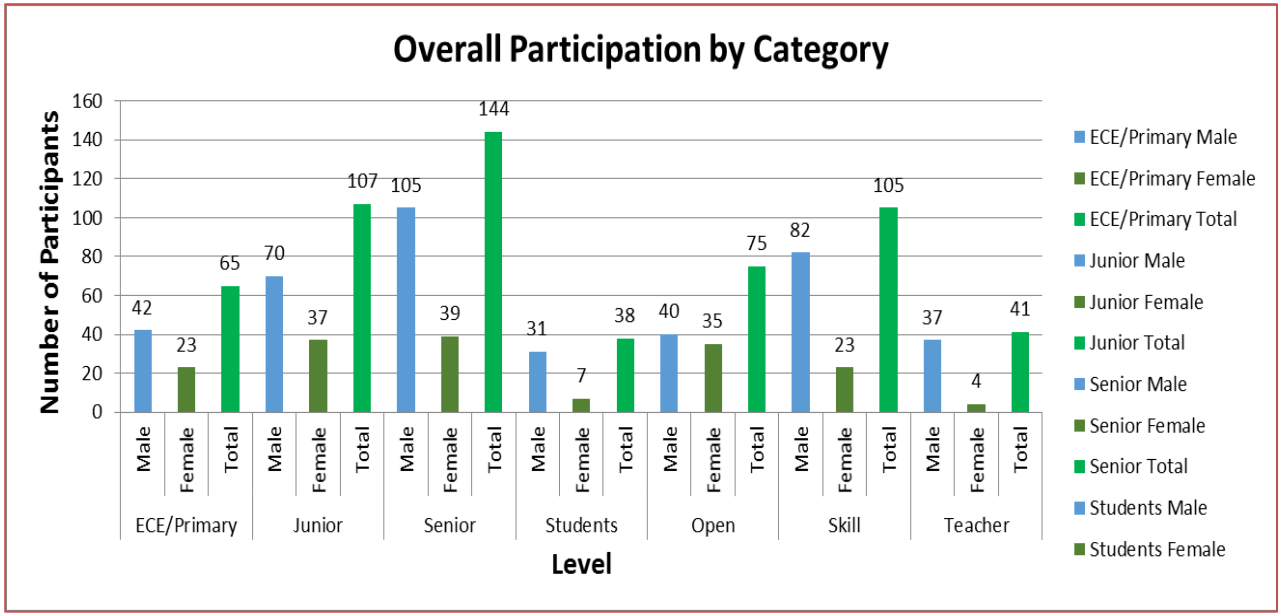
1. Analysis of 2019 JETS Pre-fair

REGIONS	ECE/PRIMARY			JUNIOR			SENIOR			STUDENTS			OPEN			SKILL			TEACHER			TOTAL	%
	M	F	Total	M	F	Tota	M	F	Total	M	F	Total	M	F	Total	M	F	Total	M	F	Total		
Central	4	2	6	5	5	10	8	5	13	3	1	4	3	3	6	5	4	9	3	1	4	52	93%
Copperbelt	2	4	6	4	6	10	9	4	13	3	1	4	3	4	7	6	4	10	5	0	5	55	98%
Eastern	5	1	6	7	3	10	11	2	13	2	0	2	6	1	7	8	2	10	2	0	2	50	89%
Luapula	4	2	6	8	1	9	6	7	13	1	1	2	3	4	7	5	3	8	3	1	4	49	88%
Lusaka	3	3	6	8	2	10	8	5	13	4	1	5	4	3	7	7	3	10	4	1	5	56	100%
Muchinga	4	1	5	5	5	10	11	2	13	2	0	2	1	5	6	8	2	10	3	1	4	50	89%
Northern	4	2	6	7	3	10	12	1	13	3	1	4	5	2	7	9	1	10	4	0	4	54	96%
North Western	4	2	6	5	5	10	9	4	13	4	0	4	4	4	8	7	2	9	3	0	3	53	95%
Southern A	4	2	6	6	3	9	12	1	13	5	0	5	4	2	6	9	0	9	3	0	3	51	91%
Southern B	5	1	6	9	1	10	10	4	14	1	2	3	5	2	7	9	1	10	5	0	5	55	98%
Western	3	3	6	6	3	9	9	4	13	3	0	3	2	5	7	9	1	10	2	0	2	50	89%
Total	**42**	**23**	**65**	**70**	**37**	**107**	**105**	**39**	**144**	**31**	**7**	**38**	**40**	**35**	**75**	**82**	**23**	**105**	**37**	**4**	**41**	**575**	**93%**

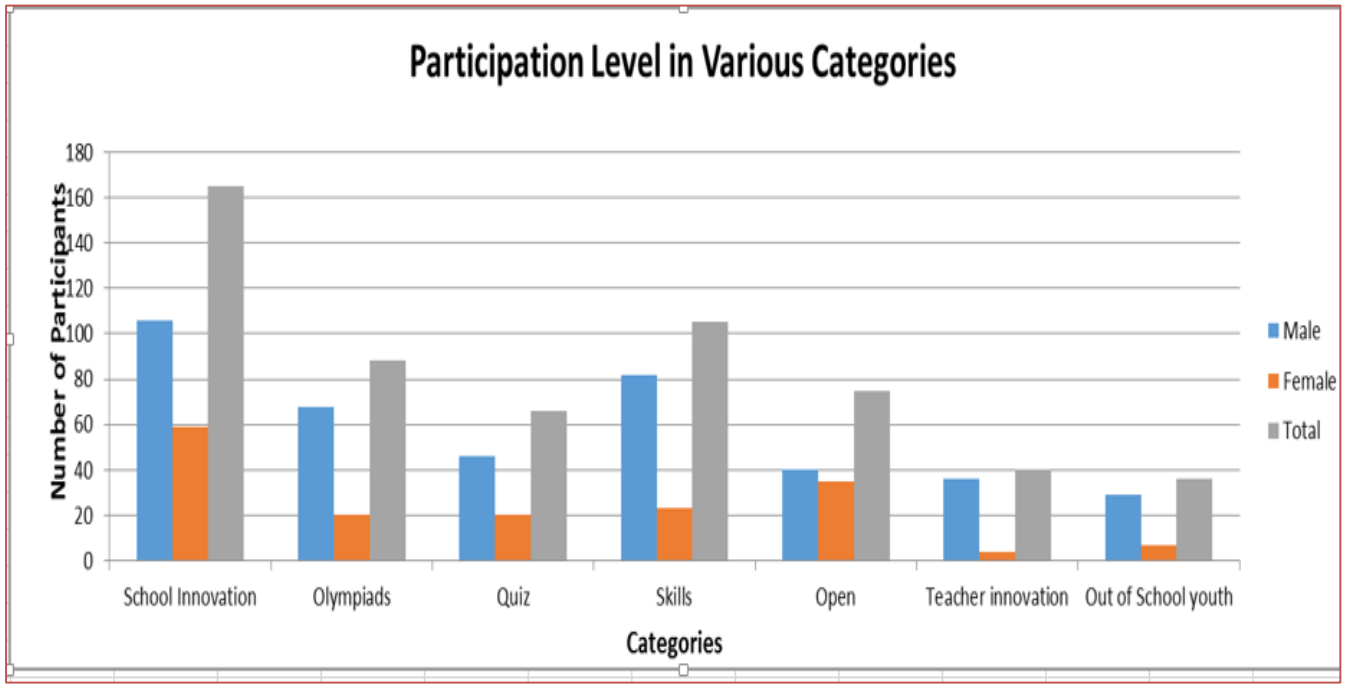
The above statistics show how the eleven regions fielded in participants according to different categories in the 2019 national JETS Fair. Lusaka have 100% participation in all the designated categories while Luapula region have the least number of participants at 88% as indicated from the graph above.

Level	ECE/Primary		Junior		Senior		Students		Open		Skill		Teacher		Regional Totals
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	
	42	23	70	37	105	39	31	7	40	35	82	23	37	4	
Total	65		107		144		38		75		105		41		575

The above statistics shows that female participation is very low. There is need for female teachers and learners to take up STEM subjects and be involved in JETS activities.



The above figure shows levels of participation in different categories ranging from School innovations to the Out of School Youth Innovations across the eleven regions.



The above statistics shows that female participation is very low. There is need for female teachers and learners to take up STEM subjects and be involved in JETS activities.

2. Projects

Category One: Early Childhood Education and Primary

A. *Mathematical Innovations*

1. ***Multiplication on Fingertips,*** *Category: Mathematical Innovations,* ***Name: Lubomba Ngulube, Age: 9 Gender: Female Grade: 5 School: Kabwe Trust,Region: Central***
   Multiplication of numbers from 1 to 5 is very easy and for many people and can be done without mastering the multiplication table. However, it becomes more challenging to multiply larger numbers such as 6, 7, 8, 9 and 10.

2. ***The Easiest Way to Subtract Numbers Using Place Values, Category: Mathematical Innovations, Name: Ntembi Chipepo, Age: 9 Years Grade: 5, Primary Mathematics Innovations, MCM Mufulira Primary School, Region: Copperbelt***
   This innovation is aimed at coming up with the easiest way to subtract numbers using place values. The aim of our project is to help learners to subtract big numbers with less difficulty.

3. ***Counting in Bases Eight, Category; Primary Mathematics, Name : Mwale Alistarico, Age;11, Sex; Female, Grade : 7, School: Chassa Prim, Region: Eastern***
   It has been discovered that a lot of pupils in primary schools face a lot difficulties to write and count numbers in bases. A lot of ideas have been innovated to solve the above problems but they haven't done much and pupils still have difficulties to solve.

4. ***Measuring an irregular object,*** *Category: Mathematical Innovations,* ***Name: Taonga Mkandawire, Age: 4 Years, Sex: Male, Grade: Early Childhood Education, School: Lusakasa ECE Centre:Region: Lusaka***

5. ***Redesigning Culverts and Bridges, Category: Primary Mathematics innovation, Name: Kasonda Gabriel, Grade: 7, Age: 12 Years, Sonshine School, Region: Lusaka***
   Construction of bridges and culverts is done to allow the water to flow under the road. The design of the bridges and culverts is done using the cylinder or cuboids. However, these designs are not the best as more and more bridges are collapsing and causing a lot of financial constraints to the government. Using the frustum in construction will reduce the number of bridges collapsing.

6. ***Chimthunzi Dmas, Math Application Category: Mathematical Innovations, Name: Kaunda Mthunzi Ebenezer Age: 12 Gender: Female Grade: 7, School: Mulenga Mapesa Primary Region: Northern***
   Having noted the difficulties that learners and the business world face in solving mathematical problems, Chimthunzi DMAS Math Application provides a solution. It

serves to solve mathematical problems in an interesting manner yet educative and interactive. Surely learners at different levels would appreciate the application of the innovation. Besides, the application is applicable not only to the learners/students but can be useful to farmers, bankers and entrepreneurs. Moreover, the Math application has provided the easy way of dividing, multiplying, adding and subtracting mathematical or monetary problems as well as a unique way of solving on sets without using a calculator. Consequently, it promotes critical thinking

7. ***Division Using the Box Metro, Category: Primary Mathematics Innovations: Name: Esther Samba, Age: 12 years, Grade 7, Sex: Female, Meheba 'A, North Western.***

   Learning Mathematics is considered difficult by the majority of Students. A mathematical model is a description of a system using mathematical concepts and language. A model may help to explain a system and to study the effects of different components. Models provide an environment for interactive student engagement during the learning process. Evidence shows that significant learning is achieved. When pupils participate in interactive activities during the learning process.

8. ***The Abacus, Category: Primary Mathematics Innovations, Name: Munkombwe Fiona, Grade:…, Sex:… Age:… School:.Region: Southern A.***

   It is important to help people with skills of addition and subtraction. With the project made, it will be easy to teach addition and subtraction in primary grades.

9. ***Angles and fractions wheel, Category:Primary Mathematics Innovations, Name: Tembo Taonga, Age: 11 years, Grade: 7, School: Muma PVT, Region: Southern B***

   This innovation deals with angles and fractions. The model is made up of two card board circles and a cylindrical card board to give support to the base and top circles. A fraction is a part of a whole while an angle is a measure of clockwise or anticlockwise distance between two lines joined together at some point. (Oxford online dictionaries).

B. Scientific Innovations

1. ***Simple Home-Made Room Heater. Category: Primary Scientific Innovations, Name: Chishahisha Musonda Age: 13 Gender: Male Grade: 7, Kabwe Trust, Region :Central***

   Houses can get very cold during winter, and so to ensure comfort in a home during such a season, a room heater can be used. However, considering the fact that not everyone can afford to buy a heater, one can be made from simple materials.

2. ***The Light Board, Category: Primary Scientific Innovations, Name: Nditemwe Mulela, Age: 10 Years, Grade 5, Primary Science Innovations, Mcm Mufulira, Copperbelt***

   The Light board is a piece of ultra- clear glass that is edge light with (LED) strip lights. The presenter writes on the light board with a marker. The light bounces around inside until the light hits the neon marker writing and then exits the glass through the marker. This makes the writing really pop out against the black backdrop.

3. ***Home Made Refridgerator, Category: Primary*** *Scientific* ***Innovations, Name: Mukupa Kangwa, Age: 9 Years, Grade: 4, School: Mphangwe, Region: Eastern***

   The reason for this innovation is to alert people about the importance and benefits of refrigerators or fridges. A small fridge was made using cotton box, electric motor, fun 12vdc. After doing the research, it was found fridges have lot of benefits not only in people who lives in towns but most importantly in these living in rural areas, fridges have many benefits such as keeping vaccines, drugs, food, water and other beverages at a required temperature that tend to preserve them as well as prolonging their life shelves. This improve people to save their food from wastages. Fridges if properly utilised they help to reduce poverty in many house hoods through entrepreneur skills that is selling of ice creams and other cold foods.

4. ***Extraction of Pneumonia Medicine, Category: Primary Scientific Innovations: Name: Moonga Martha, Age: 12 Years, Grade: Seven (7), Musonda Falls Day Secondary, Region: Luapula***

   This project is based on extracting medicinal chemicals from simple local materials such as the pumpkin plant. This project is all about making medicine using simple materials such as pumpkin plant which can bring income to our country Zambia.

5. ***Importance of Sanitation in Public Health: Category: ECE Scientific Innovations: Name: Taonga Mkandawire, Age: 5 Years, Sex: Male, School: Lusakasa, Lusaka***
6. ***Importance of Sanitation in Public Health, Category: ECE Scientific Innovations: Name: Abigail Mwila, Age: 6 Years, Sex: Female, School: Arthur Wina, Lusaka***
7. ***Importance of Sanitation in Public Health, Category: ECE Scientific Innovations: Name: David Mwandila, Age: 6 Years, Sex: Female, School: Arthur Wina, Lusaka***
8. ***Wild life, Category: ECE Scientific Innovations: Name: Paulsent Manjola, Age:6 Years, Sex: Male, School: Lotus ECE Centre, Region: Lusaka***
9. ***Forestry, Category: ECE Scientific Innovations: Name: Manjola, Age:6 Years, Sex: Male, School: Lotus ECE Centre, Region: Lusaka***
10. ***Body Parts, Category: ECE Scientific Innovations: Name: Rabecca Chilekwa, Age:6 Years, Sex: Male, School: Lotus ECE Centre, Region: Lusaka***

11. ***Hydropower Generation, Category: Primary Scientific Innovations: Name: Musa Purity, Age: 12 Years, Grade: 7, Sonshine, Region: Lusaka***

    Generation of hydro power is done by construction of a dam across a river. The water in a dam builds pressure and force which make the turbines to rotate and generate power. The water which passes through the turbines go back straight to the river and during the time of droughts, the dam will have low volumes of water and this will result in load shading which will bring down the economy of the country. The future generation of hydropower generation is all about keeping the environment as original as possible by just tapping water from the river instead of blocking the river for the dam construction disturbs the natural permanently. With the future hydropower generation, the water

tapped goes to the dam. The powerful pumps will then pump the water to the turbines then that water flows back to the dam.

12. ***Home- made Lightning Bulbs: Category: Primary Scientific Innovations, Name: Kasingo Sumani, Age: 11, Grade: 6, K Lombe Primary, Region: Muchinga***

    At this period of the economy when people struggle to make ends meet people have difficulties in accessing cheaper sources of energy to light up their homes and even charge their phones especially in rural areas. However, urban areas also face similar problems with the coming of ZESCO load shedding. This innovation brings in the new way of lighting up the bulbs at night. This innovation solves the problem because the materials used are cheap that most people can afford.

13. ***Vacuum Cleaner, Category: Primary Scientific Innovations, Name: Mwaka Christopher Age: 13 Gender: Male Grade: 7, Nseluka Primary Region: Northern***

    This project is all about finding out means of cleaning articles by means of removing dust. Articles like carpets, cleaning floors, seats etc. This projects has come up with the solution to the hard task of dusting out rooms by using simple means. It has used a plastic bottle, a pipe, a motor a tined bottle for making a fan. It is discovered that dusting out rooms has never been made so easy over before.

14. ***How to make a spectrum, Category: Primary Scientific Innovations: Name: Namushi Mirriam, Age: 12 years, Grade: 7, Sex: female, Meheba 'A' Primary, North Western***

    Primary rainbow is as a result of production of a spectrum from white light by dispersion of white light using a prism. The spectrum contains ROYGBIV which is red, orange, yellow, green, blue, indigo, and violet. These colors are very bright and are clearly seen as they are illustrated in the primary rainbow production.

15. ***Integrated Agriculture System, Category: Primary Scientific Innovations: Name: Mhone Robert, Sex:…. Age:…. Grade:…. School:……Region: Southern A***

    In view of the apparent loss of soil fertility and reduced production blamed on use of inorganic fertilizers, the innovations discusses the importance of integrating all the three main components of agriculture fish, crop and goat farming. Goat manure has the best organic nutrients for plant growth nitrogen, phosphorus and potassium.

16. ***Homemade Pesticide, Category: Primary Scientific Innovations: Name: Hakalyamba Chabota, Age: 11 Years, Grade: 6, School: Nakambala Private, Region: Southern B***

    Home grown vegetables are the best one can always desire to have because you would know what pesticide to use, especially pesticides that are not harmful to one's health. Therefore, the need of home - made pesticides. This project for home – made pesticides will be ideal so that small scale farmers can grow vegetables and spray home – made pesticides that cannot harm human health or have any unknown side effects such as diarrhoea due to chemicals used. Home – made pesticides only uses accessible kitchen vegetables and materials that cannot have harm on the human body.

17. ***Electricity conductivity tester, Category: Primary Scientific Innovations, Name: Mayamba Simasiku, Age: 16, Sex: Male Grade:7, Liumena Primary, Region: Western***
    Electricity conductivity testing is a process of examining whether a certain material or system is conducting electricity or not using devices such as electricity conductivity testers. In Zambia many people, electricians and scientists spend thousands of money to buy expensive and advanced electrical testing devices ranging from analogue to digital. Therefore in. order to help them cut in this cost, I have come up with this project that will help them save their money and also make them do their jobs in an easily and cheaper way.

Category Two: Junior Secondary

A. Agricultural Science Innovations

1. ***Making a Chicken Egg Incubator, Category: Junior Agricultural Innovations, Name: Mazombwe Cecilia Taonga, Age: 14 Gender: Female, Grade: 9, School: Chisamba Boarding Region: Central***

   Egg hatching is very important to increase poultry production. The number of eggs that can be hatched by the poultry are relatively little. Poultry eggs (chicken. Quail. Guinea file, duck and turkey) require almost the same temperature (37.5oC) and humidity (65%). An egg incubator is a tool used to hatch eggs in rather large amount by controlling humidity and temperature at specific values. In this study we designed a system of poultry egg incubator with automatic temperature control mechanism.

2. ***Simple Moisture Senso, Category: Junior Agriculture Innovations, Name: Bwalya Chali, Age: 15 years, School, Region: Copperbelt***

   This innovation uses moisture sensor to determine whether the crops requires water or not. This innovation is aimed at controlling the wastage of water in areas where there is not sufficient water supply and also helps plants that do not need a lot of water to grow well.

3. ***Simple Home Made Egg, Category: Junior Agriculture Innovations, Name: Sydney Mate, Age: 12, Grade: 8, School: Kasenengwa Boarding Secondary School, Region: Eastern***

   This egg incubator is a simple way of incubating eggs. It can incubate eggs using very cheap and affordable materials as compared to an actual incubator. For example all you need is a bulb, rheostat and thermostat.

4. ***Aquamatic Syste: Name: Lushomo Sibalwa, Age: 15 Years, Grade: 9, Junior Agriculture, David Kaunda National Technical Secondary school, Region: Lusaka***

   Aquamatics is a system that involves poultry farming, aquaculture (fish farming) and aquaponics. The fish is grown in a pond where it is fed by the waste of the chickens. This is because chickens do not fully digest their food. An alternative is put in place just in case the chickens did not produce enough food for fish, buoyancy stick will be placed in the fish pond to control the amount of food that goes into the pond. The waste is produced by the fish will be used as nutrients for the plant that are going to be grow in the fish pond.

5. ***Drip Irrigation System, Category: Junior Agriculture Innovations, Name: Haguka Mwangala, Age: 12, Grade: 8, School: Kapililonga Secondary: Muchinga Region***

   This project aimed at using drip irrigation as a means of irrigating gardens or watering gardens as well as putting chemicals, the results showed that it is a very good way of watering or putting chemicals because it saves time and money.

6. ***Cow Sprayer, Category: Junior Agriculture Innovations: Name: Yandisha Emily, Age 16 years, Grade 9, Sex: Female, School: Solwezi Day Secondary, Region: North Western.***

   I came up with this the time I went to my grandfather's farm in western province where I had to find out that most cattle in the farm was not as expected .this loss was due to the dipping of cattle in drainages as the drainages were wide and deep .It came to my concern as an educated pupil to help my grandfathers and other famers to reduce the death rate of cattle. Not only that, I also thought of something that will help them grow their crops even when there no rains as they rear livestock by bringing another irrigation methods .Investigating irrigation methods will help in development of the as it increases food production ,raw materials and export in the country. I stared researching in books but most especially on some TV channels such as DICOVERY FAMILY and YOU TUBE as well.

7. ***Poultry, Fish and Aquaculture Farming, Category: Junior Agriculture Innovations, Name: Mwale Renford, Age:… years, Grade:.., Sex: .., School: ……, Region: Southern A***

   This innovation is about how best chicken manure and water can be used in aquaculture and crop production

8. ***Wireless irrigation system and livestock sprayer, Category: Junior Agriculture Innovations, Name: Makando Beckham, Age: 15 years, Grade: 9, School: Maamba Secondary, Region: Southern B***

   This innovation is about a wireless irrigation system and livestock sprayer instead of using the old mechanism and dip tanks. This is to use a wireless remote control to activate the whole system. This can be used or setup in both rural and urban areas. Therefore, the aim of this innovation is to provide a mechanism for a new way of spraying livestock.

9. ***Electronic Soil Moister Sensor, Category:*** *Agricultural Science Innovation,* ***Name: Kambeu Rodrick Age: 15, Gender: Male, Grade: 9, School: Kaoma Secondary, Region: Western***

   I decided to introduce this project in order to avoid the loss of plants in the farms or gardens for excess water.

B. Biology Innovations

1. ***The Working Kidney Model, Category: Junior Biology Innovations, Name: Wengo Kabandama Age: 14 Gender: Male Grade: 11 School: Broadway Secondary Region:Central***

   In Zambia and the world at large there exist a great deal of separation from the world of biology to the world of practice and application and this is simply because of lack of proper understanding of biological concepts. Therefore people tend to care less about their health and this really leads to health problems and complications such as kidney failure. This innovation aims at making a working model of the kidney to demonstrate how the kidney functions and what really results into kidney ailments

2. ***Investing Enzymes found in Munkoyo,*** *Category:* ***Junior Biology Innovations, Chanda Blessings, Age 14 years, Riverain Primary School, Region: Copperbelt***

   This innovation brings to light the role of Enzymes Munkoyo roots and it can be used for the fermentation of cereal-based beverage. The special feature of this is the use of Munkoyo roots as the source of enzyme for the production of the beverage. Enzymes are the chemical composition of Munkoyo roots that are responsible for fermentation which is used in the production of alcohol.

3. ***Simple Stethoscope, Category: Junior Biology Innovations, Name: Phiri Alaidah, Age: 15, Grade:9, School: Chimtengo Primary School, Region: Eastern***

   The purpose of this project is to provide an easy and cheap teaching aid to Zambian schools. A simple stethoscope may be common in hospitals and maybe familiar to those learning medicine but certainly not common to some learners in Zambian schools. This is strange because I strongly believe that the doctors and nurses who use this instrument at one point or another went through primary and secondary school but never had a chance to see this instrument. They only got to see it at a higher learning institution like the University of Zambia (UNZA). However the adoption of this project will enable learners who want to pursue careers in medicine to see and use the instrument while in primary and secondary school.

4. ***Med-Herb Beverage, Category: Junior Biology Innovations, Name: Chiputa Honest Age: 14 Years Grade: 9, St. Clements, Region: Luapula***

   My innovation is all about making a Medi – herbal beverage and the same time making a medicine which will be used for healing diseases like; Diabetes, Bronchitis, Malaria, Diarrhoea. I came up with such an innovative ideal when it came to my concern that a lot of people were facing challenges in healing of different types of diseases and that

there was a cost of buying different types of medicines to treat one disease. So as junior scientist of the JETS Club I have come up with a solution to solve the problem. In my innovation am using simple local and readily available materials in the environment and that they are organically based. in my innovation am using Tamarinds because they contain all the mineral elements that the body requires accept for vitamin B12 and that they contain Thiamine which is commonly known as vitamin B1, which enables the body to use carbohydrates as energy also it contains Iron which is used to prevent anaemia. Am not only using tamarinds but am also using Lemons of which they contain 65% of citric acid which will be burning up the fats in the body for those who are suffering from diabetes and who want to gain proper weight, not only that but also cleaning the bronchioles and that the same citric acid will be used to in the healing of malaria. The last thing that am using is Honey which will be acting as a preservative and at the same time as a sweetener because of the presence of as orbital.

5. ***Using pure Sunflower oil to treat a Cataract, Category: Junior Biology Innovations, Name: Lusako Osiwe Manda, Age: 13 Years, Grade: 8, Matero Boys Secondary School, Region: Lusaka***

   The main purpose of this project is to show us how we can treat a cataract which affects a number of people in the world and is the main cause of blindness. The project will teach us how to get rid of the cataract using one of the cheapest methods of treatment.

6. ***Stain remover, Category: Junior Biology Innovations, Name: Chanda Sally, Age: 12, Grade: 8, School: Lwitikila Girls Secondary, Region: Muchinga***

   This innovation was to form a stain remover that can be used on various different surfaces that needs to be cleaned. However, the materials used are simple and readily available in so many societies. With this the innovation targets the poor families of Zambia that cannot manage to buy washing soap.

7. ***The Internal Structure of the Human Heart, Category: Junior Biology Innovations, Name: Yamba Leah Age: 14 Gender: Female Grade: 9 School: Katopola Primary School Region: Northern***

   Learning of natural sciences in Zambian schools has proven a challenge owing to lack of adequate teaching and learning aids in most schools, especially rural areas of Zambia. This has not only affected the lesson delivery by well qualified teachers but also pupils understanding of the lessons, especially those that involve the study of structures of different parts. The need for various visual-audio teaching aids has not at a better time than this when technology has brought many ways of making teaching and learning a lot easier. In many schools of rural Zambia however, these technology based teaching aids are not accessible. This however, should not disadvantage these rural pupils from having the same learning experiences as those in urban schools. This is what ignited my desire to develop a model of the heart as it is one of the topics that most pupils struggle to understand in most schools, with a study of Katopola primary school in Luwingu district of Northern Province of Zambia.

8. ***The effect of aspirin on plant growth, Category: Junior Biology Innovations, Name: Siasowa Luyando Chabota, Age 12 years, Grade 12, Sex: male, School: Solwezi Technical Secondary, Region: North Western***

   Fertilizer changes the fertility of the soil. I thought of using one of the components of fertilizer to boost up plant growth because the artificial fertilizers we use contain a lot of chemicals hence it destroys the fertility of the soil. The name of the components is aspirin which contains some of the nutrients which plants need in large quantities examples are oxygen and carbon.

9. ***How to make a Liquid that can be used to kill mosquitoes, Category: Junior Biology Innovations: Name: Banda Moses, Age:.., Grade:…, Sex: …, School: …., Region: Southern A***

   The innovation is aimed at helping people in rural areas on how they can prevent malaria

10. ***Making plastic using potato starch, Category: Junior Biology Innovations: Name: Shapwaya Chipo, Age: 15 years, Grade 9, School: St Joseph's secondary, Region: Southern B***

    In today's world we are experiencing a huge rate of land pollution due to plastic that are non-biodegradable. The Zambian government came up with the innovation of making biodegradable plastic carrier bags. This innovation is providing a cheaper and easier way of making plastic related materials like bowls, straws, cups and many more. The plastic is biodegradable within a period of two months reducing the rate of land pollution.

11. ***Lontis Healing Flue Using Basic Medication, Category: Junior Biology Innovations, Name: Kangwa Lontia Age: 13 Gender: Female Grade: 8 School: Kaoma Secndary, Region: Western***

    As a student who cares about the lives of other people I sat down and thought of a way of healing flew before visiting the hospital however the word innovation simply means the act of starting something new for the first time hence the term flew came from the word influencer which simply means the acute fibril highly contagious viral disease.

C. *Chemistry Innovations*

1. ***Making Chipboard, Category: Junior Chemistry Innovations, Name: Lwendo Mudolo, Age: 14, Gender: Male, Grade: 8, School: Serenje Boys, Region: Central***

   In this project I am coming up with an easy way to make chipboard using simple and available materials like PVC foam. PVC is mainly used for industrial manufacturing purposes. This material is primarily used in the manufacturing of signs and displays which are used promotion ads. Closed cell PVC can also be used in the many road sign seen around the country in addition; these material properties have made it extremely popular among the makers of sale models and theatrical props.

2. ***Home-made Vaseline, Category: Junior Chemistry Innovations, Name: Ruth Kalumba, Age: 14 Years, Grade: 9, Chibote Secondary School, Region: Copperbelt***

   This innovation is aimed at making cheap and affordable Vaseline using candle wax, sunflower oil, lemon and from local wine bear called Kachasu. These ingredients can easily be acquired easily and at a cheap cost to make Vaseline less costly and available to all.

3. ***Importance of Charcoal, Category: Junior Chemistry, Name: Sakala Princess, Age: 13 Years, Grade: 9, School: Kasenengwa Boarding Secondary, Region: Eastern***

   This innovation is about the importance of charcoal and hold it can be used in everyday life. People mostly know and use charcoal for only one purpose which is wood fuel. This innovation has been created to inform people about the many things it can be used for.

4. ***Simple Apparatus for Electrolysis of Water, Category: Junior Chemistry Innovations, Name: Mambwe Frank, Age: 16 Years, Grade: 9, Region: Luapula***

   The main aim of undertaking this innovation is to find an easy way of making a simple apparatus that can be used to teach concepts under "electrolysis of water" in the absent of standard equipment. The innovation involved the use of simple materials that can be found locally without incurring significant costs. After assembling and testing the model, it was found that the method that is developed could achieve the same results as those that can be achieved from the use of standard equipment. Therefore, if this innovation is used properly, it can have a positive impact on science teachers and learners.

5. ***The Charcoal Water Purifying Experiment, Category: Junior Chemistry Innovations, Name: Sean Maseka, Age: 12 Years, Grade 8, Matero Boys Sec, Region: Lusaka***

   The project is a water purification method which will be beneficial to the general public. It is generally cheap and can be beneficial.

6. ***Making a simple solution indicator, Category: Junior Chemistry, Name: Musawa Salome, Age: 14, Grade: 9, School: Lwitikila Girls Secondary, Region: Muchinga***

   Researchers who have used anthocyanin as acid-base indicators are listed below. Economic use of pigments of some common flowers as acid/alkali indictors Bose, b (1983), have been shown by using common flowers like Hibiscus rosa-sinensis ,Ipomoea fistulous an clitoral turnetea contain various anthocyanin pigments in the form of purple –red , violet ,and blue color resp . Therefore the innovation looks at how best the chemicals in some flowers could be extracted and used as indicators.

7. ***Making an Indicator, Junior Chemistry Innovations, Name: Kabwe Gracious Age: 15 Gender: Male Grade: 9 School: Lubushi Day Secondary Region: Northern***

   An indicator is any substance that show whether a substance is acidic, alkaline or neutral by showing different colour changes. This innovation will thus look at how you can determine whether a substance is acidic or alkaline using the Chingovwa universal indicator

8. ***Cassava Insecticide and Weed killer, Category: Junior Chemistry Innovations: Name: Simululwa Godfrey, Age: 15 years, Grade 9, Se: male, School: Solwezi Technical Secondary, Region: North Western***

   The cassava insecticide is a simple homemade insecticide that can kill almost all kinds of insects. It can help in both rural and urban areas. Rather than people buying expensive insecticides that they even fail to understand when using but the cassava insecticide is cheap and durable and easy to understand. It can work as an insecticide and as a weed killer.

9. ***Local Electricity Vanadium Battery, Category: Junior Chemistry Innovations: Name: Kagumu Kezia, Age:…, Grade:…, Sex:…, School:….., Region: Southern A***

   This innovation involves the production of electricity energy from a chemical reaction between metals and vanadium. The main goal of the innovation is to show that chemical reactions can be used as a means of producing energy that can power bulbs or phones. To do this, put two pairs of metals (steel and copper) in vanadium, a chemical reaction between vanadium and the metal takes place which produces electricity.

10. ***Water purification, Category: Junior Chemistry Innovations, Name: Ndanji Silungwe, Age: 14 years, Grade: 9, School: Nakambala private, Region: Southern B***

    This innovation is about purifying water by using a homemade coagulant from cheap and readily available materials such as sulphuric acid and iron rust from scrap iron. Pure water is essential and needed for activities such as washing, cleaning, cooking and bathing. This innovation will help reduce challenges people have in some societies in accessing pure water. It also helps pupils understand the concept of coagulation in chemistry.

11. ***Purification of Water Using Moringa Oleifare Seeds, Category: Junior Chemistry Innovations, Name: Kapalu Mwikisa, Age: 13 Gender: Male Grade: 9 School: Kalabo Secondary, Region: Western***

    To help people access clean and safe water whether living in urban or rural because there is a large number of people dying due to lack of clean and safe because together we can.

D. Entomology Innovations

1. ***Atochi Pesticide, Category: Junior Entomology Innovations, Name: Musumali Mary, Age: 14, Gender: Female Grade: 9, School: Kapiri Girls National Technical Secondary School Region: Central***

   I came up with this pesticide after I observed from the news that most of the crops in Zambia are being attacked by pests such as army worms, aphids, stock borers and other small insects. This pesticide will help in curbing the common problem farmers have been experiencing of late and crop yield is expected to increase because the pests would have been gotten rid of using this cheap and readily available pesticide.

2. ***No title of the Project, Category: Junior Entomology, Name: Sungubele Temwani, Luanshya Girls Secondary, Region: Copperbelt***

   Wasps have generally earned themselves a bad reputation. But despite their occasional aggression, these insects play an important role in the ecosystem. The ecosystem actually relies on these underappreciated insects. This project is aimed at discussing the benefits of wasps. There are two main reasons to keep a wasp in your yard. Wasps provide a natural pest control method and also help in pollination. Wasps are hugely beneficial to their native ecosystems because they attack many insects like caterpillars, stink bugs, grubs, weevils, aphids and army worms etc. they use a stinger to paralyze their prey. The venom of the wasps' paralyses the host causing it to stop feeding which is good for the plants.

3. ***Quick Insect Killer, Category: Junior Entomology Innovations, Name: Mvula Warren, Age: 12, Sex: Male, School: Chassa Secondary, Grade: 8, Region: Eastern***

   The natural pesticide is an innovation meant to help both small scale and large scale farmers in terms of controlling pest. Management of crops has become a great challenge to most farmers in Zambia that most farmers fail to control due to the fact that they are expensive and some pesticides have negative effects after application. Therefore this pesticide has been innovated to help control pests without any negative effect and the materials are easy to find.

4. ***Mosquito Trap, Category: Junior Entomology Innovations, Name: Kalaba Jesintar, Age: 14 Years, Grade: 9 (Nine), Musonda Girls Technical, Region: Luapula***

   This innovation is based on making mosquito trap using simple local materials to reduce the usage of mosquito traps made out of chemicals that affects the environment. The other thing is that this project is protecting people from the borne disease of mosquitoes e.g. malaria.

5. ***Organic Pesticides, Category: Junior Entomology Innovations, Name: Akhoza Banda, Age: 13 Years, Grade: 9, David Kaunda National Technical Secondary School, Region: Lusaka***

   The organic pesticide uses botanical materials which are; dry tobacco leaves and fresh papaya leaves where we can abstract the chemical nicotine which can be used as an insecticide and also papain which also be used as an insecticide.

6. ***The Importance of Cockroaches to the environment, Category: Junior Entomology*** *Innovations,* ***Name: Chimwemwe Chibale, Age: 12, Grade: 8, School: Lwitikila Girls Secondary, Region: Muchinga***

   Insects play an important role in the environment though they may seem to be a nuisance at some point. However, they may be useful to the environment like eating waste to clan it.

7. ***Environmental Importance of Insects, Junior Entomology Innovations, Name: Mwamba Justine Age: 13 Gender: Male Grade: 9 School: Nsama Day Secondary School, Region: Northern***

   Insects have proven to be a nuisance to human beings in many ways. Human being have had to deal with the insect irritations for a long time. This has been a result of humans colonization of most of the insects habitats leading to the two groups of organisms sharing the habitats. Humans however, have of late been developing various mechanisms of eliminating the innocent species from their own habitat. This has been, and is been achieved through the various inventions of chemical insecticides that are meant to kill these insects indiscriminately. It is this development that has necessitated me to educate people on the ecological effects of eradicating insects indiscriminately. This is because some insects role in sustaining a healthy ecosystem is so enormous and undisputed. Ecology is the branch of biology that deals with the relations of organisms to one another and to their physical surroundings. It is from this background that I feel the need to sensitize people on the importance of these insects despite the nonsensical irritations they may take us through as humans. There are many insects that are important to humans wellbeing ranging from health, agricultural and ecological. This paper will endeavors to highlight the importance of insects as well the recommendations on the best ways mutually coexist in order to sustain the ecological benefits of these insects.

8. ***Study of Spiders, Category: Junior Entomology Innovations: Name: Khondowe Maana, Age: 13, Grade 9, Sex: male, School: Solwezi Technical, Region: North Western***

   Many people are afraid of spiders not knowing that spiders are friendly to people and it is so importance to people and especially for farmers. Spiders are helpful to human because they eat up pest that want to feed on thing that are important like crops and they feed on common on indoors. And with the venom and webs they produce is helpful like with the venom that it produces it can be used to make medicine and the web it can be used for making clothes and cotton.

9. ***Control of Citrus Swallowtail Butterflies in Citrus Trees, Category: Junior Entomology Innovations: Name: Sitali Gracious, Age:…, Grade:…., Sex:…., School:……., Region: Southern A***

   This innovation aims at taking a breakthrough into studying the citrus swallowtail butterfly, how it affects citrus trees in Simoonga village 25km west of Livingstone. Many small scale farmers go into growing fruit trees so that they can earn a living to support their families but often experience poor harvest due to great damage to the leaves by the larva stage of the butterfly. This damage causes reduced fruiting and low photosynthetic capacity. Further the innovation focuses on ways of controlling the infection of the butterfly with a view to reducing leaf damage so that fruiting and eventually harvest increases. All this is done by environmental friendly pesticide made from tobacco, washing detergent, sugar and water.

10. ***Making a garlic mosquito repellant, Category: Junior Entomology Innovations: Name: Ngoma Chileleko, Age: 14 years, Grde 9, Mazabuka Girls, Southern B***

    Malaria is a very dangerous disease that can kill and harm every one if not taken care of very well. In Zambia it is reported that most of the people are dying due to the high rates of malaria. It affect most people both in rural areas and urban areas, and so my repellent will help people be safe from malaria, because garlic repels mosquitoes very much just like lemon. Lemon respells mosquitoes, for those that are allergic to garlic can also use lemon for their repellent using the same methodology.

11. ***The Controlling of Bees Using the Queen Bee for the Production of Honey, Category: Junior Entomology Innovations, Name: Ngoma Chilekwa, Age: 13 Gender: Female Grade: 8 School: UCZ Sefula Secondary Region: Western***

    This project looks at the methods of culturing and capturing of bees to produce honey on a larger scale. It also looks at the plants best known for having sweet nectar; therefore, having these two together can help farmers and apicultures to produce honey on the large scale

E. Mathematics Innovations

1. ***Pythagoras Theorem Learning Aid, Category: Junior Mathematical Innovations, Name: Peter Malakata, Age: 14 Gender: Male Grade: 9 School: Kabwe Trust Secondary Region: Central***

   The Pythagoras theorem is used to calculate angles in a right triangle. It is therefore very important for learners to understand the practical aspect of the theorem, with the aid of a model. Considering the words of Confucius I hear and I forget/I see and I remember/I do and I understand. It is therefore, important to help learners understand the application of the Pythagoras theorem, by giving them a learning aid.

2. ***Pupils' Built-Up Game Board, Category: Junior Mathematical Innovations, Name: Emmanuel Chimwemwe Banda, Age: 13 Years, Grade 8, Tug – Argan Secondary, Junior Mathematics Innovations, Region: Copperbelt***

   This Innovation is intended to Easy the Teaching and Learning of Mathematics on the part of the topic – Cartesian plane or Coordinate Geometry. Most pupils find difficulties to understand this topic as a result of lack of tools other than grid chalk board to use in its teaching and learning. This Innovation has come up with the "Pupils' Built-up Game Board" to help in the teaching and learning of Cartesian plane or Coordinate Geometry.

3. ***Finding Root of Perfect Square Numbers Using Diagonal Method, Category: Junior Mathematics Innovation, Name: Phiri Enock, Grade: 8, Sex: Male, Age: 14, School: Mbwindi Day Secondary School, Region: Eastern***

   Mathematics has a key component in the day to day life of all human being throughout the world. Its application and need to apply it in economics, business, a typical day life engineering, medicine cannot be over emphasized, however its application in high levels

of education and academics is usually enhanced by how skilled an individual is from the square root at junior education (8-9) level.

4. ***Yield analysis in agriculture, Category: Junior Mathematics, Name: Tembo Choolwe, Age: 14, Years, Grade: 9, Junior Mathematics, David Kaunda National Secondary School: Region: Lusaka***

   Looking at the situation in which most of the plants grow just in certain conditions. For instance, some require too much water while others the opposite. Due to such, some crops tend to wilt when too much or too little water is supplied to them. As such, the project computes the correct amount of water that would be needed by certain species of plants in order to allow them to carry out the minimum amount of photosynthesis so as to provide it the required nutrients.

5. ***The application of mathematics in construction, Category: Junior Mathematics, Name: Watona Samakayi, Age: 16, Grade: 9, School: Isoka Boys Secondary School: Region: Muchinga***

   The application of mathematics in construction and other fields has been wide. One type of mathematics that this innovation looks at is matrices and its application in hierarchical matrix pre-conditioners.

6. ***MC's Law of multiplication, Category: Junior Mathematical Innovations, Name: Chama Mutale Age: 14 Gender: Male Grade: 9 School: Kasama Boys Secondary School Region: Northern***

   Students especially at junior level are finding difficulties in multiplying numbers. This innovation is now a new way of multiplication which involves the use of matrices .It is easy to pick up and understand. It helps multiply digits in a short period of time. Hence, it will help students improve in their academic life especially at Mathematics.

7. ***Dividing Model and Multiplication by vertically and Cross, Category: Junior Mathematics Innovations: Name: Mumba Jessy, Age: 12, Grade: 8, Sex: female, School: Meheba Boarding, Region: North Western***

   Learning Mathematics is considered difficult by the majority of Students. A mathematical model is a description of a system using mathematical concepts and language. A model may help to explain a system and to study the effects of different components. Models provide an environment for interactive student engagement during the learning process. Evidence shows that significant learning is achieved when pupils participate in an interactive activity during the learning process.

8. ***Multiplication of Numbers Between 5 and 9 In Base 10, Category: Junior Mathematics Innovations, Name: Simalyo Mercy, Age:…, Sex:… Grade:…, School, Southern A***
   The innovation is about multiplication of numbers between 5 and 9 in base 10.

9. ***Muyuwas multiplication formula, Category: Junior Mathematics Innovations, Name: Mwendalubi Muyuwa, Age: 14 years, Grade: 9, School: Rusangu Secondary, Region: Southern B***
   Muyuwa's Multiplication Formula works well in multiplication of numbers especially in two or more digits where we have problems in additional of zeros in the known formula. The formula involves multiplication of single digit number and additional of numbers which is easier to everyone. The other method involves a lot of reminders that a learner can forget than my formula which has less or not at all.

10. ***Mamama and Mbo's Theorem, Category: Junior Mathematics Innovations, Name: Mboo Muyoywa, Age: 15 Gender: Male Grade: 9, School: Senanga Secondary Region: Western***
    These two formulas came into my mind after experiencing that learners find it difficult to find squares of numbers and imperfect square roots of numbers.

F. Physics Innovations

1. ***Portable Fan, Category: Junior Physics Innovations, Name: Zulu Suzyo Age: 13 Gender: Female Grade: 9 School: Stephen Luwisha, Region: Central***
   A portable air cooler uses a motor or batteries to light up a bulb. A mini air cooler using a motor and batteries is affordable to everyone because it is easy to make and the materials are easy to find. It is affordable to almost everyone in rural areas e.g. there are some villages were they can't manage to pay the electricity company (ZESCO) to come put electricity.

2. ***Free Energy Water Pump, Category: Junior Innovation, Name: Muyobo Tendai Norah, Grade: 9, Sex: Female, Age: 13, School: Saint Monicas Secondary School, Region: Eastern***
   This innovation is about designing a pump that works without electricity, a free energy water pump. It uses energy from a falling quantity of water to pump some of it to an elevation much higher than the original level of source, so long as there is a continuous flow of falling water; the pump will work continuously and automatically. This innovation is beneficial to the country because if we are to start using things that do not use electricity then it will be better for us as a country because we will be saving both money and electricity.

3. ***Hydraulic Gate System, Category: Junior Physics, Name: Chibwe Pasiya, Age: 15 Years, Grade: Eight (8), Junior Physics, Luwo Primary School, Region: Luapula***

   This innovation is on Hydraulic gate system. Hydraulic system is used in compressible fluids such as water or oil and transmits force from one location to another. Meaning if a gate is connected to the Piston the gate can be moved to open and to close.

4. ***Eco Air Cooler, Category: Junior Physics, Name: Kambole Kambole, Age: 13 Years, Grade: 8, Junior Physics, David Kaunda National Technical Secondary school, Region; Lusaka***

   It has been observed that people end up suffering with the heat in most regions or places due to the fact that they cannot manage to possess an air conditioner, even those that own one have to buy electricity or fuel for a generator to run it.

5. ***Security System, Category: Junior Physics, Name: Sikazwe Emmanuel, Age: 13, Grade: 8, School: Isoka Boys Secondary: Region: Muchinga***

   The innovation looked at the security system in a Zambian set up. The innovation used a simple method of constructing security alert which can either be at a private property or public property. The system is cheaper in that it uses locally sourced materials that are available and cheaper.

6. ***Making A Simple Water Dispenser, Category: Junior Physics Innovations, Name: Chisanga J Mbulo, Age: 12 Gender: Female Grade: 8 School: Therese Girls Sec School Region: Northern***

   I think that air at high pressure can be used to dispense liquids. This project seeks to explain how air pressure can be used to dispense liquids such as water in a very hygienic manner. The project hypothesis is that air at high pressure can force water out of a container. In order to prove this, air at high pressure is forced on to the upper surface of water which is enclosed in a container. When air at high pressure is exerted on the water, the water is forced to come out through a narrow dispensing tube.

7. ***Powerless projector, Category: Junior Physics Innovations, Name: Wongani Manase Zaji, Age: 12, Grade: 9, Sex: male, School: Meheba Boarding, North Western***

   There is need to help rural schools in learning by using a projector but the problems most of them have is lack of accesses to power. This project was meant to make a powerless projector that can be used by teachers and learners anywhere during learning time. Using simple material like a cardboard, magnifying lens and a phone, a powerless projector was made and it was able to reflect what is showing on the screen of the phone to a while surface.

8. ***Domestic Single Line Circuit Using Simple Materials, Category: Junior Physics Innovations, Name: Siachipita Blessings, Age:…, Sex:… Grade:…, Southern A***

   This innovation educates people on the electrical flow of current in a circuit from the substation through cables and breakers into the house to the bulbs and circuits.

9. ***Automated bridge on the railway line, Category: Junior Physics Innovations, Name: Habwankuta Wisdom, Age: 15 years, Grade: 8, Maamba Mine Sec, Southern B***

It has been concluded that level crossings of rail and roads pose potential danger to vehicles crossing the railway line. Due to ever increasing number of vehicles daily, it was concluded that using automated technique at level crossing can be useful for the safety of traffic. Level crossing protection is the consequence of having level crossing on the railway line. The main aim is to develop an automated level crossing system that would prevent accident between trains and vehicles.

Category Three: Senior Secondary

A. *Agricultural Science Innovations*

1. ***The Highbreed, Category: Senior Agriculture Innovations, Name: Nawa Emmanuel Age: 17, Gender: Male Grade: 11 School: St John Paul Ii Secondary, Region: Central***

   The design that was used is specialized specifically for mining and construction purposes, with the use of hydraulic arms, the machine is capable of digging, scooping and lifting heavy loads, with a keyboard, the project is incredibly reliable in that it is equipped with a security system which will help alarm the owner of the machines in case of attempted theft. Therefore I may say that the keyboard is there to prevent theft.

2. ***Irrigation System, Category: Senior Agriculture Innovations, Name: Mwaaba Munyinya, Age: 18, Gender: Female, Grade: 12, School: John Paul II, Central***
   According to my research on the problems that farmers face. I found out that farmers usually face difficulties in irrigating their crops due to insufficient water supply. I therefore thought of a good solution which will help farmers to irrigate their crops.

3. ***Automated Farming Mechanism, Category: Senior Agriculture Innovations, Name: Mwila Joshua, Age:.. Grde: 12, Kitwe Boys Secondary, Copperbelt***

   The world's ever-growing population demand the need to increase the food basket. New technologies such as less labour-intensive methods must be employed to address the call to improve farming. Farms must be automated to pave way for efficiency and reduced labour-intensive jobs that characterise day to day farm activities. The project will endeavour to design the J-5 mechanism, water pump, power supply, and the sprinkler irrigation. The automatic switching water pump switches off and on the water in the chicken pen and Cow pen when there is no water respectively.

4. ***Chickens Automatic Feeder, Category:*** *Senior* ***Agriculture Innovation, Name: Simpemba Kelvin, Age: 18, Grade: 12, Chizongwe Technical Secondary, Eastern***

   In our community and country, people are employed self, small scare business and simple efficient feeders which they can make and use locally without importing from other countries hence, promoting and changing Zambia's grey economy into a stabilized economy. However, youth especially, school leavers scramble for jobs and get to graduate with agriculture design and technology skills which they think that it does not add to up to any value of their social lives.

5. ***Electronic Livestock Counter, Category: Senior Agricultural Science Innovations Name: Sampa Dennis, Age:15 Years, Grade: 10, , Ng'ona Secondary School, Luapula***

   This innovation is all about making medicine to treat cancer, diabetes and cardiovascular diseases using simple local materials such as: honey, lemon grass, cassava meal and papaya leaves.

6. ***The Dual Sprayer, Category: Senior Agricultural Science Innovations, Name: Bridget C Maipambe, Age: 16 Years, Grade: 11, Rufunsa Girls Technical Secondary School, Region: Lusaka***

   In as much as it brings about all these benefits, some farmers find it hard to do some certain things such as spraying pesticides and manure at the same time With the development of liquid fertilizers, I have come up with a new design of a sprayer that will help to boost up the crop yields of farmers not only in the country but all around the world.

7. ***Improved Maize Sheller, Category: Senior Agriculture Science Innovations, Name: Chileshe Joseph Chilufya, Age: 17, Grade: Male, School: Isoka Boys Secondary, Region: Muchinga***

   The problem farmers face in most parts of Zambia is on shelling process of their produce especially maize grans. Therefore this innovations looks at how best the cost and time of shelling could be reduced by improving on the already shellers.

8. ***Simple Hydroulic Weed Remover and Soil Improver Machine, Category: Senior Agriculture Science Innovations, Name: Moshe Joseph, Age: 16, Gender: Male Grade: 10, School: Kasama Boys Secondary School, Region: Northern***

   The hydraulic weed remover and soil improver machine is an innovation which can assist both small scale farmers and commercial farmers in removing weeds and improving on soil fertility. Farmers in rural areas usually experience challenges in removing weeds. Farmers depend much on artificial fertilizers which depletes the natural fertility of the soil. Hence this innovation will help farmers in terms of weeding and improving on the fertility of the soil via simple compost made from the weeds. It will encourage farmers do more farming as the soil fertility is being improved and saves time as it works faster in removing weeds. Hence, improving on the agricultural production which intern improves on the economy of Zambia through exports of the agricultural commodities produced.

9. ***Preparation of clean water safe for animals and plants, Category: Senior Agriculture Innovations- Name: Foloshi Kapalu Age: 16, Grade: 10, Sex: male, School: Solwezi Technical Secondary, Region: North Western***

   A purification system is a system that is used to purify dirty water safe for animals and plants to drink. It also uses sunlight to heat the water and kill organisms without the use of chemicals. The actual process applied to this is simply heating. This could be either the natural heat (sun's light) or the artificial source of heat.

10. ***Waste Crop Ethanol Plant, Category: Senior Agriculture Innovations, Name: Nyeleti Mayabbu Andrew, Age: 17 Years, Grade:11, Sex: Male, School: Choma Secondary, Region: Southern A***

    The innovation will help farmers to overcome climate change challenges. Farmers now are shifting into poultry farming. Poultry farming needs electricity. Electricity tariffs

have escalated and water levels are low due to droughts. This innovation produces ethanol from dry crops which solves the problem of power generation.

11. ***Harvesting rain water for Agriculture, Category: Senior Agriculture Innovations, Name: Zimba Choolwe, Age: 15 years, Grade: 10, School: Nakambala Private, School: Southern B***

    One of the most important factors in production of crops and livestock in agricultural is water. Water is needed for high production in crops and animals. Without water agricultural is not sustainable. This innovation is illustrating on harvesting, storing and purifying of rain water to be used in agriculture. This farming technique can overcome shortages of water available for agriculture especially during the dry season and drought period. Farmers represent a front line to defend against this risk.

12. ***Insector Manure, Category: Senior Agriculture Innovations, Name: Moonga Nasla, Age: 17, Gender: Female, Grade: 12, School: Kambule Tech Sec Secondary, Region: Western***

    Having a good harvest in crop farming especially in unfertile land needs fertilizers which can be either artificial or organic. Nonetheless organic fertilizer in today's modernized world cannot cater for all the commercial farms and so artificial fertilizer is preferred. A cheap and easy way to find fertilizer is needed to cater for both the commercial and subsistence farmers to boost the globe's agriculture development mainly in crop farming. The raw materials such as cockroaches (in this innovation American and German cockroaches have been used) and Moringa tree leaves can be used to make manure.

B. *Biology Innovations*

1. ***Urine Sensor, Category: Senior Biology Innovations, Name: Kakoma Judith Age: 17 Gender: Female Grade: 12, School: Ibolelo Secondary Region: Central***

   The urine sensing device is an innovation based on detecting urine just from the name itself. Urine contains metabolic waste products such as; carbon dioxide, urea, uric acid, creatinine, sodium chloride and ammonia which are normally present and have no particular pathological significance. The urine sensor detects the presence of urine within a certain area e.g a baby's diaper, incubator and patient's bed. The sensor is made up of two small sheets of aluminium that are separated by a thin sheet of paper this part consisting of the aluminium .it manipulates the electrical conductivity of sodium chloride when the chemical is in its aqueous state. When wet with urine, the paper acts as the switch that triggers the small alarm/led which is located on the main body of this whole sensor as shown in the sketch provided.

2. ***Making Home Made Food, Category: Senior Biology Innovations, Name: Emellia Mulinda Lungu, Age: 18, Grade:12, St Monica's Sec, Eastern***

   I came up with innovation in order to help to reduce on the household expense and people who have poorly developed hair. This hair food can be used by any one and anywhere because it can be easily be affordable .The ingredients are cheap and locally available.

3. ***Anti-Carcinogen, Category: Senior Biology Innovations, Name: Mung'andu Tamara, Age: 16 Years, Grade: Twelve (12), Musonda Girls' Technical, Region: Luapula***

   This innovation is all about extracting anti carcinogens from simple local materials which can neutralise the action of carcinogens and slows or prevents the development of cancer which has been considered as the most fearful disease of all that affect humanity.

4. ***Transpiration Simulator, Category: Senior Biology Innovations, Name: Gwebela Cletus, Age: 17 Years, Grade: 11, Chirundu Secondary School, Region: Lusaka***

   This project is a transpiration simulator made to predict the amount of water lost by plants through transpiration. To make this project the following factors were achieved;

   - Devices that create and regulate factors that affect the rate of transpiration (wind, light, temperature and humidity) were attached to the transpiration simulator
   - The potometer that measure the rate of transpiration
   - A stopwatch to measure time.
   - Switches that regulate the factors that affect the rate of transpiration

   The assembling of the above-mentioned devices results in a very strong way of creating and regulating heat, wind, light, temperature and humidity to predict the rate of transpiration. The amount of water is predicted by adjusting the wind, light, temperature and humidity to that of the following day (or the future weather). Based on how this project works we conclude that this project is able to predict and determine the rate of transpiration when a plant is exposed to the factors that affect the rate of transpiration. This project can be used to predict the amount of water lost by a plant, therefore it can help farmers to plant the right crops when there is a drought or when the farming conditions are not normal. Scientists can use this device to experiment on how plants can be modified so that they do not lose a lot of water through transpiration. The transpiration simulator can be used by students to carry out transpiration experiments.

5. ***Migi's Formula, Category: Senior Biology Science Innovations, Name: Chilala Muguel, Age: 18, Grade: 12, School: Nakonde Secondary, Region: Muchinga***

   This project namely migi's formula is mainly concerned with the use of natural remedies to eradicate, treat and act as a prevention to over 85% of the pathogenic, viral and bacterial infections such as respiratory infections, carcinogens and so many more . It also boost the immune system by the activation of the white blood cells to fight infections naturally. This medicine removes the pathogens inform of free radicals example, the orange contains the anti-oxidants quercetin that inhibit the oxidation of molecules and removes the free radicals out of the body effectively this is migi's formula.

6. ***Electronic Arm, Category: Senior Biology Science Innovations, Name: Mulenga Moses Age: 17 Gender: Male, Grade: 10, School: Kasama Boys` Sec, Northern***

   Electronic arm innovation is meant to help people who have physical disabilities, to overcome the difficulties they face in their daily lives. The people who are disabled are faced with a lot of difficulties in performing physical activities, and this has made it difficult for them to find employment. This has led to them failing to get their basic needs,

contributing to the increase of poverty levels in Zambia. Therefore, the electronic arm can be of very much help if put into consideration. Such that an amputated person can just put it on and it will be able to do the functions of a real arm. As the electronic arm is designed in a way that it is able to do the physical actions that a real arm can do.

7. ***Home based pregnant test, Category: Senior Biology Innovations, Name: Kamangu Ruth Age: 16, Grade 10, Sex: Female, School: Mutanda Boarding, North Western***

   This innovation addresses the challenges that some people face in communities where they would require walking long distance to access medical health care and alike. As such testing for pregnancies is one of the causative factors for stress among community members and the society at large. Is in that line that I came up with this innovation that would do away with the stress that mother to be go through. This innovation only requires urine of a suspected female put in a transparent container add a T-spoon of salt stir for until salt dissolves in urine. The reaction of urine and water would produce milky cheese like liquid and the forms will appear on top. The solubility of salt will increase because the presence of human chorionic gonadotropin will increase the temperature.

8. ***Detecting the Sex of an Unborn Baby, Category: Senior Biology Innovations, Name: Chikumba Faith, Age:.., Grade:…., Sex:…, School:…., Region: Southern A***

   This innovation talks about how we can use simple and readily available materials to detect the sex of the unborn baby. It has been medically proven.

9. ***Co-ordination improving device, Category: Senior Biology Innovations, Name: Mwanza Nathan N, Age: 17 years, Grade: 12, School: Canisius Sec, Southern B.***

   This project mainly emphasizes on the basis of a conditioned reflex action. As an individual continues to attempt to pass the circular wire through the twisted wire, he will be improving his strength of nerve impulses and thus reducing the effect of delirium tremens.

10. ***Making Herbal Medicine, Category: Senior Biology Innovations, Name: Banda Christine Age: 15 Gender: Female Grade: 10 School: Mulambwa, Region: Western***

    The drugs which are manufactured from pharmaceutical factories can cure and heal a range of diseases but they also have side effects. Some drugs given for healing stomach pains for example fragile in some individuals cause diarrhoea and vomiting. Conversional medicine cannot be available in some cases were people cannot afford it or it is in short supply. As a result, there is a great need to use some herbal medicines which have little or no harmful effects on human beings. This made me to think and come up with an herbal medicine which can cure stomach pains with no harmful effect. The medicine is cheaper and very available as the tree can be found in most parts of the country. The preparation for the medicine is easy as it require just a few steps.

C. Chemistry Innovations

1. ***Safety Experimental Room, Category: Senior Chemistry Innovations, Name: Kunda Hellen Age: 16 Gender: Female, Grade: 11, School: Kapiri Day Secondary, Central***

   This innovation is a better way of doing chemical experiments in schools and other chemical laboratories. It only require external operations to produce internal effects inside a closed room by using simple physics concepts of hydraulic press and simple circuits

2. ***Prickly Organic Shampoo, Category: Senior Chemistry Innovations, Name: Twatasha Kasembe, Age: 17 Years, Grade: 12, Fatima Girls Secondary School, Copperbelt***

   The innovation is aimed at making an organic Shampoo which is a cleaning agent with an acidic pH ranging between 5 and 7, designed to clean the scalp and act as an anti-dandruff. The Conditioner is able to soften one's hair, provide hair food as it acts as a fertilizer that gives the hair its necessary nutrients, while hair sprays give it a shiny silky look without side effects.

3. ***Making Liquid Ink for Printers, Category: Senior Chemistry Innovations, Name: Hakacha Gilbert, School: Nyanje Day Secondary School, Grade: 12, Region: Eastern***

   The production of ink is a scientific research which is employed in the easy making of ink using local available resources. The, the study included the meaning of ink, the active element in ink and the action mechanism. The vivid analysis of the process is done by carrying out an experiment which included: Lemon, water, jully jus and candles.

4. ***Multipurpose Electrolyser, Category: Category: Senior Agricultural Science Innovations Chiumya Natasha, Age: 17 Years, Grade: 12, Senior Chemistry, David Kaunda National Technical Secondary School, Region: Lusaka***

   The main science of this project is mostly the electrolysis of different common electrolyte and the use of chemical compounds and elements to displace each other and form new compounds ending with a lot of useful products.

5. ***The Catalytic Conventer, Category: Senior Chemistry Innovations, Name: Kaluba Suwilanji, Age: 16, Grade: 11, School: Isoka Boys Secondary, Region: Muchinga***

   The world is changing very fast in terms of climate. The whole world is disseminating information about how best we can conserve our planet. This is a reason why this innovation looks at the construction of a catalytic converter that can reduce the emission of harmful substances like CO_2 that contributes to global warming.

6. ***Auto-Plating Machine, Category: Senior Chemistry Innovations, Name: Jumaa N. Kataya Age: 16 Gender: Male Grade: 11 School: Kasama Boys` Secondary, Northern***

   The Auto-Plating Machine is an innovation that is able to plate metals without using electricity. The sole purpose is to enhance industrial methods of plating metallic and non-metallic products to add decorative or functional purposes and to prevent a metal from corrosion. Generally, electricity is very costing. This innovation do not use electricity, therefore decreases the usage and expenses of electricity in our country`s economic sector

and the world at large. This innovation is able to plate metals all with the help of oxidation and reduction reactions. The design of the innovation is domestic use ready and can further redesign to suit commercial and industrial standard use.

7. ***Deoxygenation of alcohols using visible light Photoredox Catalyst, Category: Senior Chemistry Innovations, Name: Tungati Purpose, Age: 16, Grade: 11, Sex: male School: Solwezi Technical Secondary, Region: North Western***

   Deoxygenation of alcohols is wide process in organic chemistry. However, the focus of this project is the Deoxygenation of ethanol (C2H5OH) which will produce an alkene called ethene (C_2H_4). Ethene is good for combustion and can be used as fuel and is also be used in the production of ethylene which is later used to make plastics.

8. ***Production of Pyrolytic Fuel from Plastic with Waste Utilization, Category: Senior Chemistry Innovations, Name: Chisenga Wesley, Age:….Sex:…,School: Southern A***

   Plastics have woven their way into our daily lives and now pose a serious threat to the environment. Over 5 billion tons of plastics are produced annually worldwide. Furthermore, these plastics have become a common feature in overflowing bin and landfills. Though work has been done to make futuristic bio-plastics (biodegradable plastic), there has not been many conclusive steps towards cleaning the existing problem. The process of converting waste plastic into value added fuel and later making powder from the carbon monoxide (CO) is a viable solution for recycling waste plastic. This therefore settles the problem of waste plastic and fuel shortage. Pyrolysis runs without oxygen at high temperatures of over 100ºC which is why the chamber as fabricated to provide the required temperature. A brazier can be used. The waste plastics are subjected to depolymerisation, pyrolysis, thermo cracking and distillation. This is done to obtain fuel such as petrol. After using the petrol, the CO which is released is later converted to baking powder by adding sodium hydroxide (NaOH). This means no waste is released since all of it is utilized as well. The process of converting plastic to fuel and later baking powder has now turned the problems we experience into opportunities to make money from waste and minimizes pollution caused by waste plastics.

9. ***Industrial smoke purification system with an alternative energy source, Category: Senior Chemistry Innovations, Name: Tuntepe Lubuto, Age:16 years, Grade 10, School: Nakambala Private, Region: Southern B.***

   We know that in our world we are faced with one big problem that affects us as a global society. This major problem is industrial air pollution. As citizens of planet earth we should aim to find ways by which we could solve major problem. In order to create an ideal earth. I took it upon me to think of a way by which I could solve this issue in the simplest way possible. As a concerned citizen of planet earth I have come up with an innovation that traps industrial smoke produces electricity from it with some by-products and clean air.

10. ***The Recycle of Waste Gases, Category: Senior Chemistry Innovations, Name: Kwaleyela Petty, Age: 17 Gender: Female, Grade: 12, School: Kalabo Secondary, Region: Western***

The recycle of waste gases is an innovation which comprises of the structure of a factory, on the chimney of the factory with pipes connected to it then directed to the liquid chamber where there is a source of water. The reason for this liquid water is to let the waste gas which will be produced from the factory to be recycled by reacting with water. This innovation can be performed at the factory in the aim of reducing pollution. It is called the recycle of waste gases because it recycles waste gases to form useful substances like acids and examples of acids are carbonic and sulphuric acids.

D. Entomology Innovations

1. ***The Use of Insects in Forensic Crime Investigations, Category: Senior Entomology Innovations, Name: Enock Zulu Age: 14, Gender: Male, Grade: 10 School: Broadway Secondary School, Region: Central***

   Forensic entomology is the study of insects/arthropods in criminal investigation. Right from the early stages insects are attracted to the decomposing body and may lay eggs in it. By studying the insect population and the developing larval stages, forensic scientists can estimate the post-mortem index, any change in position of the corpse as well as the cause of death. Forensic odontologists are called upon more frequently to collaborate in criminal investigations and hence should be aware of the possibilities that forensic entomology have to offer and use it as an adjunct to the conventional means of forensic investigation.

2. ***Bee Power Unknown to Man, Mukupa Matipa Tafadzwa, Age: 16 Years Grade: 11, Senior Entomology Innovations, Mpongwe Secondary School, Region: Copperbelt***

   This is an entomology project focusing on the bee scientifically known as Aphis Malefic. Here are ideas of how we can put this insect to good use as well as preserve it. The innovation explains the benefits of a bee (Aphis Malefic) and its products which have multi-purpose themselves but there products too. It brings to light bee venom that is extracted from the stinger which can be used for chemotherapy to relieve back pain as it has anti-inflammatory properties. Honey has anti-bacterial chemical properties that is why it is used for treating burns and tropical treatment i.e. treatment of dandruff and dry hair. It makes the hair strong and healthy due to its multiple vitamins present such as vitamin A, B and C. Another product is beeswax. It is extracted from the stinger if a bee, on bee farm or 'killan', (conservation farm) that is used for making candles for lighting, wood polish and hair foods.

3. ***Double System Mosquito Killer, Category: Senior Entomology Innovations, Name: Zulu Mweemba, Age: 17, Sex: M, School: Chassa Sec, Grade: 12, Region: Eastern***

   When I had gone to the village to pay a visit I discovered that people in the village are mostly affected by mosquito's all because they don't have enough funds to buy insect sides and mosquito nets to protect themselves from mosquito's which is the cause of malaria. As a junior scientist I put in interest to come up with this double system mosquito killer which will be affordable by people in the village and this would reduce the cases of malaria.

4. ***Making A Bedbug Repellent Using Local Materials, Category: Senior Entomology Innovations, Name: Mwila Abigail, Age: 17 Years, Grade: 12, Senior Entomology, Musonda Girls' Technical, Region: Luapula***

   This innovation is based on making a biological bedbug repellent in order to help people unable to afford chemical repellents. In this innovation simple and available local materials are being used such that each and every individual is able to afford them. Above all the materials in this innovation are user environmental and friendly.

5. ***Effects of Pests on Crops, Category: Senior Entomology Innovations, Name: Monde Pumulo, Age: 17 Years, Grade: 12, Entomology, Kabulonga Girls Sec, Lusaka***

A pest can be categorized in three categories which are; biting and chewing pests, piercing and sucking pests and boring pests. Biting and chewing pests are pests that have a mouth piece designed for biting and chewing plant parts such as the leaves and the stem. Examples of biting and chewing pests are locusts, these are pests that disturb the most important functions of a plant in order for it to survive which are the transportation of water and mineral salts in the stem and photosynthesis in the leaves, these functions cannot be carried out because the stems have been eaten off and the leaves have been defoliated. Piercing and sucking pests are pests that have a mouth piece that has been designed to pierce and suck out cell sap (chlorophyll) from cell tissues of a plant, the mouth looks like a needle. These pests also transmit diseases to the plant through the mouth piece. Examples of piercing and sucking pests are aphids. Boring pests are pests that make tunnels and holes in the plant stem or fruit and start to eat the cell tissues from the inside, these pests lower the quality of fruit crops. Examples of these pests are maize borers.

6. ***The Uses of Spiders And Their Webs To The Environment, Category: Senior Entomology Innovations, Name:Kabela Jemimah L, Age: 16, Grade: Female, School: Lwitikila Girls Secondary, Region: Muchinga***

A cobweb is the easiest and non-costly way to help with the healing of cuts and wounds. It is also environmentally safe as it helps in the pest control and plays a very big role in the food chain. The innovation looks at how best spiders and other related insects can be utilised in the environment.

7. ***Water Striders (Aquarius Regimis), Category: Senior Entomology Innovations, Name: Chilambwe. Wanjivwa. Robert Age: 15 Gender: Male Grade: 11 School: St. Francis Secondary School Region: Northern***

Aquarius regimes (water striders) are small insects that are found on the surface of water bodies like dams, rivers and stagnant or slowly moving water. These insects have been in existence for a very long time and many people do not know their importance and use. That is why this innovation has come, to make people aware of the great importance and uses of these living organisms.

8. ***Dung Beetles and their importance in the ecosystem, Category: Senior Entomology, Name: Wamuwi Phlavia, Age: 17, Grade: 11, Sex: female, School: Meheba Boarding, Region: North Western***

People see dung beetles as useless insects though there are not. This project was undertaken to study the role which dung beetles play in the ecosystem. The method of study used was physical observation through sieving and light trap. Results showed that dung beetles move in a straight line, despite any obstacle. They clean the ecosystem by burying and consuming biodegradable substances such as cow dung which was found on the study area in Molepolole, Kweneng district, Botswana. Further results showed that dung beetles can push and bury dung 250 times in one night (that is like an average

human being pulling six double decker buses full of people). Therefore, dung beetles clean the ecosystem by participating in biodegrading of substances such as dung which works to reduce pest activity in the ecosystem, thereby reducing disease breakouts as well as recycling nutrients to the soil.

9. ***Groove's Operation, Category: Senior Entomology, Name: Chiyongwe Lushomo, Age:…, Grade: …, Sex:…, School: …., Region: Southern A***

   The innovation establishes better methods of repelling mosquitoes and avoids the increased rates of mosquito transmitted diseases that according to the World Health Organization claims not less than 2000 lives in a year in the sub Saharan region and Africa as a whole.

10. ***Insects orders and as medical cure, Category: Senior Entomology Innovations, Name: Mweemba Derrick, Age: 17 years, Grade 12, School: Monze Sec, Region: Southern B***

    This project is just based on entomology. Entomology is the study of insects and its relationship to the environment. Insects belong to the kingdom anamalia, to the phylum anthropoda, to the class insect and on the order that's where the focal point of this project is as mentioned earlier on, all insects belong to the same kingdom, phylum and class, despite them being all insects they are put in different order by considering their wing structure. This project highlights how and why insects are put in different orders by the use of clear and visible displayed insects. This project is designed in a way that it will give you a clear understanding on insects. Because one of my findings during the research was that, the difference in the orders also makes them not to mix.

11. ***Production of Hydrogen using Termites, Category: Senior Entomology Innovations, Name: Mukuka M Georgina, Age: 15 Gender: Female Grade: 11 School: Kaoma Secondary, Region: Western***

    Termites are believed to be harmful according to human perception. Therefore, this presentation is to look into the most importance of securing termites for the purpose of hydrogen production.

E. Mathematics Innovations

1. ***Trigonometry, Category: Senior Mathematics Innovations, Name: Gift Milo Age: 16, Gender: Male, Grade: 11, School: Broadway Secondary School Region: Central***

   The word trigonometry is derived from the Greek word tri meaning three gon meaning sides and mentron meaning measure. Therefore Trigonometry is the study of how the sides and angles or a triangle are related to each other. An angle is a figure formed by two rays. A unit circle is defined as a circle with a radius of 1 with its centre 0. Many people find it very difficult to memorize and understand the unit circle of trigonometry.

2. ***Differential Formulae, Category: Senior Mathematics Innovations, Name: Chisha Chikwanda, Age: 16 Years, Ibenga Girls Secondary School, Region: Copperbelt***

   The innovation is on mathematical formulae. These formulae will enable one to differentiate as many times as desired. It caters for the general function $f(x) = ax^n$,

where n is either an integer (positive or negative) or a fraction. The formulae will enable one to find even the fiftieth derivative when applied properly. The formulae will enhance one's accuracy and efficiency. It will enable one to find derivatives in a shorter period of time as compared to the ordinary way (power rule). Permutations are part of the formulae i.e. permutations are used/needed. It makes use and identifies the relationship between differentiation and permutations.

3. ***How To Square Number's Using Four by Two Rectangular G, Category: Senior Mathematics, Name: Zimba Simon, Age18, Grade12, School: Chizongwe Technical Secondary School, Region: Eastern***

   With this skill, many people will benefit. Here we use a four (4) by two (2) rectangular grid to find a square of a number. In this innovation, it will benefit many people especially in the squaring of numbers.

4. ***Measuring Distance Using Similar Triangles, Category: Senior Mathematics Innovations, Name: Chitupa Naomi Verah, Age: 16 Years, Grade: 11, St Clements Secondary School, Region: Luapula***

   This project is all about introducing a modern way measuring regular distances using similar triangles with the help of a telescope. With advanced geometry, people can use this principle to measure distance of fields, ponds and other distances of regular shapes and the uses of similar triangles in real life.

5. ***Nestor's Theorem, Category: Senior Mathematics Innovations, Name: A build Hamangaba, Age: 15 Years, Grade: 10, David Kaunda Secondary School, Region: Lusaka***

   Abstract missing…

6. ***Addition and Subtraction of Integers, Category: Senior Mathematical Innovations, Name: Prisca Mulala, Age: 17, Sex: Female, Grade: 12, School: Lwitikila Girls Secondary School, Region: Muchinga***

   This project is mainly based on a simpler way of solving integers. We are outlined with three parallel lines, where when given a question the answer lies on the middle line.

7. ***Kulelwa's Formular Sir Gid, Category: Senior Mathematical Innovations, Name: Kulelwa Gideon, Age: 16 Gender: Male, Grade: 12 School: Mungwi Technical Secondary School Region: Northern***

   Calculations on calculus are said to be the most difficult in all levels as well as at university level. It is because of this that I had to make this project in order to make these calculations simple. However, for me to come up with these formulas and ideas it took me Four Months. My intention was to find a way of helping my fellow pupils as well as students who have problems of differentiating under calculus and to enable have positive attitude on this topic and to know that nothing is difficult. Not only this it will also help teachers and students to understand this topic more. Therefore, if these formulas are published people will be aware about these formulas as a result it will enhance understanding of an individual. In addition to this it will boost the understanding of the

topic at national level and international level.

8. ***NEWMANS theorem on differentiation, Category: Senior Mathematics Innovations- Name: Kangele Gift, Age: 17, Grade: 12, Sex: Male, School: Solwezi Technical Secondary, Region: North Western***

   It really got to my attention to realize that we claim to live in a dynamic world, a world that is evolving and trying new things and yet when it comes to mathematics we are stuck to the very old ways of doing things. Since the introduction of ***CALCULUS*** as a branch of mathematics to deal with changing quantities by Isaac ***NEWTON*** and ***LEIBNITZ***, no one has attempted his or her own ways on how to go about working out certain expressions. Therefore, it gives me much courage and joy to welcome you to the first of its kind; the ***NEWMANS THEOREM ON DIFFERENTIATION.***

9. ***Lifusium Theorem, Category: Senior Mathematical Innovations, Name: Mapalo Katongo, Age:.., Sex:…, Grade:…. School:…. Region: Southern A***

   A simpler yet accurate way of doing mathematics in what Lifusium Theorem is all about. It's a convenient method of solving day to day problems.

10. ***Volume of A Pyramid Frustum Made Easy, Category: Senior Mathematical Innovations, Name: Muleya Queen, Age: 17 Years, Grade 12, School: Chikankata Secondary, Region: Southern B***

    Finding the volume of a frustum of a pyramid Presented by Queen at the jets fair is a project meant to make mathematics easy. With the ambition of being a mathematician, I thought of bringing this formula so that it is widely known by pupils for better performance in mensuration under the topic mensuration. This is because many pupils tend to hate mathematics due to the processes involved in calculation of questions. Consequently, I found it worth it to make their work easy when dealing with questions involving volume of a pyramid frustum. I would like this project to be part of the teaching aids in mathematics lessons. The volume of the pyramid in this newly study will be made easy and reduce wastage of time during exams.

11. ***Luka's Formula of Quadratic Equations, Category: Senior Mathematical Innovations, Name: Luka Chinyemba, Age: 17 Gender: Male, Grade: 12 School: Matauka Secondary, Region: Western***

    Luka's formula of quadratic equation is a formula used to solve the quadratic equation that have factors only and then divided by the coefficient of x2 and be multiplied by a negative. Most learners find it difficult to use book formulae in solving quadratic equations. This innovation helps the learners solve such problems in a simpler way.

F. Physics Innovations

1. ***Electronic Purification Water Tank, Category: Senior Physics Innovations, Name: Cecilia Mubala, Age: 15, Gender: Female, Grade: 11, School: Serenje Boma Secondary School, Region: Central***

   The old model tanks that manufactures have made before they usually don't purify water though they supply water but my tank is purifying water thus, making it healthier for domestic use.

2. ***Security and Energy Production System, Category: Senior Physics, Name: Malele Kaboleka, Age: Grade: 12, Kitwe Boys Secondary, Region: Copperbelt***

   The project is aimed to provide a solution to the following aspects: Security and the generation of electric energy at our homes. It provides security by alerting the owner of the house whenever an intruder gets into the yard with a phone call instead of installing an alarm. Further, this innovation is able generate electrical energy from the turbines are place strategically to make turns as rain water pours on them. The House is also connected with solar panel to generate electrical energy required for the home use.

3. ***Automatic Security Gate, Category: Senior Physics Innovations, Name: Mvula Dimbani, Age: 20 Years, Grade: 12v, School: St Peter and Paul Sec School, Region: Eastern***

   This project is talking more about an automatic security gate that does not require human effort for it to open and close it only require small amount electricity. And it does not need a security guard and it offers convenience of not opening the gate physically to gain entry into your home it offers convenience especially in rain storms or other bad weather conditions and this thing is made up of simple materials such as DC motor, gears, timber, connecting cables, old cell phone card box and a three volts battery.

4. ***Cheap intelligent security System, Category: Senior Physics Innovations, Name: Mwango Benjamin, Age: 15 Years, Grade: 10, School: Ng'óna Secondary School, Region: Luapula***

   This innovation is a problem solving, especially to those people who require a cheaper but effective enhanced security for their properties. The system can also be used to secure examination strong rooms to lessen leakages.

5. ***Sensitive (Feeder) Alarm,Categiry: Category: Senior Physics Innovations, Name: Kanyanta Thulani Mulyata, Age: 17, Grade: 11, Munali Boys Sec, Region: Lusaka***

   This sensitive feeder is an innovation which detects the level of feed in the chicken run. Once the feed runs low it triggers an alarm to alert the farmer so that they can add some more feed. This makes it convenient for the farmer who doesn't have to spend time checking on the level of feed in the chicken run. The spare time created can be used in running other errands on the farm.

6. ***Automatic Light On, Alarm Reactor and Self Genarator, Category: Senior Physics Innovations, Name: Anthony Nkonde, Age: 17, Grade: 11, School: Isoka Boys Secondary School, Region: Muchinga***

   The innovation is all about security system in most private and public buildings in which the researcher has inverted the self-generator to provide power in areas where there is critical shortage of electricity or highly affected by load shedding.

7. ***The Application of the Phone to improve on the Zambian Security System and the Free Energy Generation, Category: Senior Physics Innovations, Name: Mwila Bwembya, Age: 17 Gender: Male Grade: 10 School: Kasama Boys Sec, Region: Northern***

   This innovation is aimed at combating security issues in our communities and the country at large. The same innovation will provide remedy to crime related issues such as theft and robbery which is mostly the headline of Zambian news. There are so many people employed as security guards and do not even work to the required standard. This innovation will help people save money in the issue of employing security guards. And for the people that live in areas in which electricity cannot reach or those that find difficulties in paying electricity bills, the innovation will provide a solution to these problems because it is designed to do just that.

8. ***Home-made Traffic Gate, Category: Senior Physics Innovations, Name: Siamalyata Gideon, Age: 17, Grade: 10, Sex Male, School: Solwezi Technical Sec, North Western***

   For many years' people have been losing there lives on the railway cross because there was poor Technological protection on the road-railway cross between the cars and the train, the project has a high mechanism of technology of solving such problem. Looking at month Zambia, it doesn't have such a road-railway mechanism and because of that I thought of creating one that will help the nation and the world at large for it will help in the reduction of accidents.

9. ***Simple HD Projector, Category: Senior Physics Innovations, Name: Mweemba Joseph, Age:… Sex:…, Grade:….School:…. Region: Southern A***

   Theoretical teaching and learning process is difficult for pupils to grasp the concepts. This illustrated simple HD projector made from simple and local materials will solve the problem. It comprises a lamp, condenser lenses, a film and one projection lens preferably a recycled bulb makes it possible for image formation to be observed. The simple HD projector can be carried to class for lessons easily and can project images provided there is a screen.

10. ***Ultrasonic spectacles, Category: Senior Physics Innovations, Name: Nchimunya Milimo, Age:17 years, Grade 12, School: Canisius Secondary, Region: Southern B***

    The purpose of this innovation was to provide a guidance system for the visually impaired hence eliminating sudden and spontaneous injuries the visually impaired encounter due to inability to navigate their environment. It consists of an ultrasound transmitter and receiver attached to a recycled pair of glasses and a speaker that that produces varied tones. It probes the theorem of reflection of Ultrasonic sound waves off objects and

produces an output sound through the speaker that solely depends on how far the origin of the reflection is. This means that it produces a particular tone for a particular distance. A visually impaired person can easily interpret the tone a distance from an obstacle hence providing some form of guidance. In a nutshell this innovation restores "sight" to a visually impaired person in one way or another.

11. ***Constructing A DC Toy Car, Category: Senior Physics Innovations, Name: Kawana Matengwana Age: 19 Gender: Male Grade: 12, School: Ilukama PVT, Western***

In recent past, Zambia has been importing a lot of goods ranging from simple things such as toys. In view of this, it is important to come up with local products which can fill the local market. Projects like this one are a great way to use one's creativity to come up with unique designs. The project will be using a DC motor, AA batteries and a switch to create a simple circuit that powers the creation. The creation has been powered with different switches which make it move in different directions.

G. Information Communication and Technology (ICT) (Software and Hardware)

1. ***Medical Database, Category: Senior ICT Innovations, Name: Ndhlovu Chimwemwe, Age: 17 Gender: Male Grade: 12 School: Kapiri Girls National Technical Sec, Central***

The main purpose of this project is to act as a storage media for different in situations depending on their fields. According to research in most institutions, records of varying information are usually misplaced or lost due to the massive paperwork involved. A lot of time is taken to find information (in this case about patients or equipment etc.). This project was designed using Microsoft access (an application in Microsoft office package).It is a database program with included instructions and features to act as an aid in the use of the databases software.

2. ***EDU APP - Mapalo Kanyanta, Category: ICT Innovations, Age: 15 years, Grade: 10, Mukuba Secondary School, ICT Innovations, Copperbelt Province***

Edu App is an android based app which the user will interact with for educational purposes. The app is a system software. Edu App as the name describes is packed with educational materials such as past papers, books, educational games and text to speech or vice-verse (TTS). The past papers are updates from ECZ which means they are recommended. The text to speech or vice-verse (TTS) is going to help the user to know how to pronounce words and also how to spell words and how to read them. Besides that it consists of educational games just for fun after studying.

3. ***The Website for Secondary Students, Category: ICT, Name: Stephen Phiri, Age: 19, Grade: 11, School: Anoya Zulu Boys Secondary School, Region: Eastern***

This website has two servers, for teachers and one for pupils. When a teacher signs up on teacher's server, she/he needs to wait for the confirmation email from any registered teacher at his or her school. A pupil is not allowed to enter into the teacher's page because on teacher's page, everything found on pupil's web page can be monitored on teacher's

server. A teacher can upload books (soft copies) and make it available for pupils to read or download the books. A pupil can send questions to teachers. I created this because I discovered that almost every pupil who have electronic device which supports internet uses social media such as Facebook and WhatsApp as a results they end up gaining nothing. So pupils will be using this website and find all the answers they need. A pupil will need to sign up and wait for confirmation message from the teacher which can be sent using email address or phone number (Text message).

4. ***Henry's Mathdroid, Category: Senior ICT Innovations, Name: Kanyanta Henry, Age:18 Years, Grade:12, Mansa Secondary School, Region: Luapula***

   Zambia is ranking poorly in technology when looked at on an international scale. However regardless of the efforts put in, to put our country on the map, it proves not to be much as required. As a programmer, I took kin interest in programing and robotics and came up with an innovation that can be of help in sectors such as education and others. Since most youths are interested in social media programs, I decided to make a robot having android features like a smart phone and producing enough sound to satisfy the user and capturing the attention of the listeners. My innovation is beneficial to all stake holders as the requirements are cheap and available on the market, as the screen mechanism uses an FRP locked android phone screen which is rendered useless to most users. The program is able to test the ability of the user to answer questions in math, although math is not loved by many, I programmed Khody to read out questions and give four possible answers to the user, which makes it easy for the user to advance in math. The program coded on Khody has a provision of an on-screen keyboard which makes using it both easy and fun at the same time. Most youths or smartphone users enjoy using touch screen phones and prove to be addicted to such technology hence Khody uses touch screen technology for input and output purposes. The languages used in the program installed are C++ and python which give it the sound

5. ***Vieni's Mechatronic System, Category: Senior ICT Innovations, Name: Mafuto Kalupa Vieni, Age: 17 Years, Grade: 12, David Kaunda National Technical, Lusaka***

   Vieni's Mechatronic Edition is a multipurpose project; it creates a platform for traffic control as well as a key system that deals with distance and temperature measurement. The project is one that makes Students of Physics and Engineering understand certain concepts of science and matter with a wide range of implementation. It comes with involvement of calculations, robotics, computer programming and Science. On the other hand, it has a wide range and relation to Artificial Intelligence specialities. In addition, the basic control of traffic which contributes to the rate of productivity in a country sees the use of Led's been used along with connecting wires and a controller board on the design. Furthermore, a simple temperature sensor and an ultrasonic sensor, Liquid crystal display, Connecting Wires, Bread Boards and a controller board are used for the significance of distance and temperature measurement. It can be used to determine the distance of objects and areas for accuracy in relation to matters of science and technology. This can be related to vehicles moving on the road which will bring about their systematic flow due to efficient prevention of collision as the design gives full support for this. Concurrently, the design even prevents things like drug degradation which is one key

thing in health sectors. Apart from that it is a security apparatus and can be used to safeguard so many things. One of the most important is that it is a major contributing factor to the country's economic productivity as it is something that improves the road network thus leading to increase in Gross National Product.

6. ***A School Management System (SMS), Category: Senior ICT Innovations, Name: Kalonde Emmanuel, Age: 15, Grade: 12, School: Chitulika Sec, Region: Muchinga***

   The introduction of technology in schools can thus result in a decreased use of paper and in bringing most of the school office work in an e-format. Thus, the schools should employ management information systems to improve the efficiency of administrative services. A school management system (SMS) is a system or process that provides the information necessary to manage a school effectively.

7. ***Express Management Hub, Category: ICT Innovations, Name: Jonathan Simwinga Age: 14 Gender: Male Grade: 12 School: St Francis Secondary, Region: Northern***

   Express Management Hub is a very easy, user-friendly website which keeps up with school activities such as class registration, test registration; Sending pupil report forms and enhances parent-teacher conferencing. And also managing schools activities such as schools activities, staffs management teachers database, pupils management etc. It also has videos, Personal Study table, revision papers. And also making a leaving for teachers waiting for employment. It can also be used by teachers for Class and test registrations. Most schools in Zambia carry out their administrative tasks such as classroom and test registrations as well as sending of pupils report forms and newsletters on paper work therefore more time is consumed and there is more paper work. And by the introduction of the Express Management Hub, school administrative tasks will now be managed online from different places in one place, less time is consumed and less paperwork is involved and thereby education and office management can be enhanced which will result to better academic performance and management in Zambia.

8. ***Kelcon School Management System, Category: Senior ICT Innovations, Name: Kipamba Shadrick, Age: 18, Grade: 11, Sex: Male, Solwezi Tech Sec, North Western***

   Kelcom software has a combination of all school activities that will enable users of the system to run the institution in an easy, effective and efficient manner.

9. ***Online Voting System, Category: Senior ICT Innovations, Name: Yooma Benson, Age:…, Sex:…, Grade:… School:… Region: Southern A***

   In the new era of advanced technology where online system boosts work speed, reduces mistakes and promote the generation of accurate results, having manual election system is a misfortune. A public election system constitutes the back bone of a democracy where the people their preferred candidate. Zambia currently uses a manual election system which causes several problems. Due to this paper ballot based election system, a number of challenges are faced before or during elections in the administration of voting. An online system involves procedures like registration of voters, vote casting, vote counting and publication of results. Voting system innovation is developed using PHP, JavaScript, Bootstrap and CSS. The innovation has a lot of essential features such as voter's log in

side where a voter can sign in to vote and administration panel where total votes can be viewed and added, positions assigned and many others. The voter needs an ID in order to log into the system which can be retrieved from the administration panel.

10. ***Teaching aid (computer architecture), Category: Senior ICT Innovations, Name: Nzoombe Steward, Age: 16 years, Grade: 12, School: Monze Sec, Southern B***

    Computer architecture is a set of rules and methods that describes the functionality, Organization of computer systems. Architecture defines it as describing the capabilities and programming model of a computer. In other definitions computer architecture involves instruction set architecture design. An instruction set architecture (ISA) is an abstract model of a computer. It is also referred to as architecture. A realization of ISA is called an implementation.

11. ***Teach Me Application, Senior ICT Innovations, Name: Lubinda Mando Age: 17 Gender: Male Grade: 12 School: Kalabo Secondary Region: Western***

    There is a rise in the demand for computing and communication devices although their operating systems are alien. This results in most computer application system to remain foreign and unused. Due to non-production of locally made operating systems users have therefore been subjected to rely on foreign imported operating systems. Therefore, this innovation attempts to describe the ways to be followed in order to create a computer program that is able to ask questions mainly brain teaser and also be able to tell the user the correct answer if the user answered wrong formula for the area of a conical frustum.

Category Four: Open Categories

A. *Energy Innovations*

1. ***Multi-Turbine Power Generation, Category: Energy Innovations, Name: Kayamba Saya Age: 18 Gender: Male Grade: 12 School: Kapiri Day Sec, Region: Central***

   This innovation is based on introduction of new design of producing electric energy using multiple turbine energy generation.

2. ***A Simple Aircon, Category: Energy Innovation, Name: Chikopa Gideon, Grade: 12, Age: 18, Sex: Male, Region: Eastern***

   Air cons are essential machines used for cooling mostly in hot seasons, the development of air cons has led to luxury, refreshments and enjoyable at the same time. In this project, despite existing air cons, this simple air con does not require an alternating current but has reduced to cost of electricity by using direct current unlike these existing air cons.The condition for its operation is a provision of least seven volts battery (there cells of 1.5v-2v) and frozen ice, but you can also use cold water (but not effective ice), for some villagers who find it difficult to obtain frozen ice, they can provide for any liquid that has been exposed from 20^0c-30^0c.

3. ***Multiplication System, Category: Energy Innovations, Name: Dennis Lumamba Age: 14 Years, Grade: 9, Mumana Primary School, Region: Lusaka***

   This invention can help our society or societies when there is no electricity. It works using cells (1.5x4=6v). If we have this multiplication system in our homes, immediately the power goes, you can just switch on the multiplication system and the bulbs will be on and you can charge your phones.

4. ***Electricity Conservation Photo electricity: Energy Innovations, Name: Mutale Mulenga, Age: 16, Sex: Female: School: Lwitikila Girls Secondary School, Muchinga***

   Photoelectricity is that type of electricity generated as a result of the flow of electrons. Therefore my projects targets the use of light in enhancing the flow of electrons so that electricity is generated. The motivation was a result of the abundance light that we have in Zambia. The protect looks at the deficiency of electricity and this can cushion the deficiency by tapping what is already in abundance. The materials used in this innovations are simple ones that can easily be found locally without any struggle and can cheaply be obtained by every average family. Therefore this innovation about energy and how best to conserve it.

5. ***Simple Solar Panel, Energy Innovations, Name: Zulu Geoffrey, Age: 17 Gender: Male, Grade: 12 School: Mungwi Technical Secondary School Region: Northern***

   I came up with this project to help people in both rural and urban areas in terms of power. This project is also going to help who cannot afford to buy solar panels instead they are going to be making on their own since materials are user friendly.

6. ***Free energy auto Generator, Category: Energy Innovations, Name: Phiri Khama, Age: 16, Grade: 11, Sex: female, School: Solwezi Technical Sec, North Western***

   My project is all about free energy auto generator that generates electricity using motors and a battery (cells) were a battery powers up the motors to produce electricity. As the battery powers up the motors to produce electricity and powers up a house, an office, a bank etc. the battery is also automatically charged by the same electricity that the motors produce where converts kinetic motion energy or mechanical energy motors into electricity.

7. ***Making a Solar Oven, Category: Energy Innovations, Name: Lusambo Bubotu, Age:…, Sex:.., Grade:…School:… Region: Southern A***

   Upon noticing the suffering among most Zambians in places that do not have electricity, I decided to come up with an innovation which does not use hydro-power. This innovation needs sunlight but it doesn't require a solar panel instead it uses aluminium foil. It's easy to assemble using card boards and aluminium foil only.

8. ***Solar tracking panel, Category: Energy Innovations, Name: Ngulula Jojo, Age: 17 years, Grade: 12, School: Canisius Secondary, Region: Southern B***

   This report mainly involves information on how the use of solar energy can be maximized by the use of a solar panel that follows the sunlight. It can also help diversify the source of energy which will broaden the economic base of the country and people in rural areas who don't have access to electricity .it uses a very simple design which uses the well-known fact that the sun rises from the east and sets in the west to its advantage.

9. ***Cooking Using Solar Energy, Category: Energy Innovations, Name: Akabondo Sherrine Age: 14 Gender: Female Grade: 9 School: UCZ Sefula Sec, Western***

   This project looks at how we can use solar to cook which will reduce on air pollution and the number trees cut down for the use of firewood.

B: Oral Paper Presentations

1. ***Cancer- A Mitochondrial Disease, Category: Oral Paper Presentation, Name: Taonga Tendai Nyirongo, Age: 17, Gender: Female, Grade: 11, School: Kapiri Technical Central Region: Central***

   Cancer has been defined as a genetic disease involving nuclear mutations in oncogenes and tumour suppressor genes. Yet recent studies have proved that cancer is actually a mitochondrial disease. The struggle for cancer has been made a global problem because of the number of victims it has claimed in the recent years. The agony of this is that people don't know that the foods we take in containing a lot of sugars give mitochondria

a lot of nutrients to break down produce a vast amount of energy thus causing the multiplication of cells to increase more than normal which leads to cancer. It's a pity that the cure known by most people for this is too expensive and as if that's not bad enough, they are usually fatal in which patients still end up dying because the same mitochondria have been made in a way to resist yet also accept chemotherapy. My research was meant to illuminate people on the cheapest yet most effective method of curing cancer via normal sessions done in the comfort of our homes. With this enlightenment cancer in Zambia can be reduced by 90% or even 99% if this word is allowed to spread.

2. ***Diabers, Category: Paper Presentation, Name: Isaac Kanyinji, Age: 17, Grade: 12, School: Kasenengwa Boarding Sec School, Region: Eastern***

   This innovation is about diabetes, its causes, and how best it can be treated or even prevented. Diabetes has become a common disease amo0ng the young, middle aged of this day. This is resulting from high energy intake from the foods that we take in on a daily basis. Most of the people are unaware of the factors that are responsible for causing such a condition. However, this oral paper presentation serves to educate the people on how to prevent the occurrence of this disease or better still maintain blood sugar levels that are moderate in cases of the already affected population. This presentation will also inform you on the important role that is played by the kidneys and the liver in the maintenance of an environment that is optimum for enzyme operation as they catalyze all body metabolic processes.

3. ***Kabwe Making a natural PH Indicator, Category: Oral Paper Presentation, Name: Deborah, Age: 16 Years, Grade:12, Nchelenge Secondary School, Region: Luapula***

   Abstract missing…

4. ***Genome Editing with CRISPR - Kapufi Levy, Age: 17 Years, Grade: 11, Oral Paper Presentation, Kabulonga Boys Secondary School, Region: Lusaka***

   CRISPR-Cas9 is a versatile tool for genome engineering that has revolutionized biotechnology and is poised to impact medicine. Recent advances in the identification of unique CRISPR systems, as well as the re-engineering of the Cas9 protein for expanded function, have enabled the diversification of the CRISPR genome engineering toolbox. In this review, we highlight these innovations and discuss how advances in CRISPR technology can lead to breakthroughs in the field of gene therapy.

5. ***The Use of Carica Papaya in the Cure of Dengue Fever, Category: Oral paper presentation, Name: Kalonde Moria, Age: 17, Grade: 12, Chitulika Sec, Muchinga***

   The dengue fever is one of the life threatening diseases caused by dengue virus (*Flavivirus*) that is borne and transmitted by mosquitoes. So far there is no effective medicine and vaccine approved for the dengue virus. The effect of papaya (*Carica papaya* L.*)* leaf juice in curing the dengue fever was studied. The leaf juice of papaya improved the health of patients by increasing the number of platelets.

6. ***Immunity-Boosting Immunity, Category: Oral Paper Presentation, Name: Joshua Musonda, Age: 15 Gender: Male, Grade: 10 School: Mungwi Technical Sec, Northern***

   The innate system in mammalians, for example are programmed to recognize foreign substances and react. The adaptive system composed of more lymphatic cells that are programmed to recognize self-substances and don't react or set on fire. The non-reaction to self-substances is described as immunity. Meaning to exempt or inmmuno tolerence. The reaction to foreign substances is etymologically described as inflammation, meaning to set on fire. The two components of the immune system create a dynamic biological environment where the health can be seen as a physical state where immunologically spared and what is foreign is inflammatorily and immunologically eliminated. Disease can arise when what is foreign cannot be eliminated or what is self is not spared.

7. ***Balancing Chemical Equations using linear algebra, Category: Oral Paper Presentation, Name: Lufunda Kayombo, Age: 16, Grade: 11, Sex: Male, School: Meheba Boarding, Region: North Western***

   Balancing chemical equations using linear algebra is all about using letters to indicate the elements or compounds present. By so doing, it is easy to identify the elements present and subscript. With the indication of the elements and their subscript, we can easily give the unknown (letters) values to place in their various compounds. Once the values are placed, we then multiply all the elements or compounds present by 2 or any even number. This is to avoid a fractional equation.

8. ***The C.A.P. Refinery, Category: Oral Paper Presentation, Name: Mwiinga Choolwe Arthur, Age:…, Sex:…., Grade:…. School:…. Region: Southern A***

   This study is about a way to combat global warming and finding a way to cheapen the market of one of the most expensive products in the world today (diamond). It will also reduce the massive air pollution which has proved a big challenge to control and it will help meet the increased current demand for electricity. The main focus of the innovation is to combat pollution by producing ozone from the oxide pollutants.

9. ***"Ozone layer depletion", Category: Oral Paper Presentation, Name: Phiri George, Age: 18 years, Grade: 12, School: St Edmunds Secondary, Region: Southern B***

   The earth is surrounded by a layer of ozone that is at approximately 25km in altitude. This ozone layer protects the Earth's surface from ultra-violet radiation from the sun. The ozone layer is constantly being destroyed by chlorine atoms from CFCs, aerosols, refrigerants and cleaning solvents when they are destroyed by sunlight. The depletion of ozone layer results in the formation of a hole that enables high energy ultra-violet rays to reach the surface of the earth, where it causes severe damage to vegetation and also results in higher risk of people getting skin cancer. As a result of this depletion, use of CFCs must be banned in our country. When ozone is depleted in the stratosphere due to reaction with chlorine, it comes down near the earth's surface and at Sea level it becomes a pollutant. Ozone can also be produced when sunlight acts on unburnt hydrocarbons and nitrogen oxide. Depletion of ozone is a serious case that needs adequate attention and through this project a lot of useful information is given how we can eradicate this serious issue and save our planet.

10. ***Biology Teaching Aid, Category: Oral Paper Presentation, Name: Mulyokela Mulyokela Age: 18 Gender: Male Grade: 12, School: Senanga Secondary, Western***
The overall purpose of my innovation is to educate learners in schools on how to get a clear concept on the structure of the brain without difficulties using a simple model. I discovered this teaching aid, simply because learners find it difficult to know the regions and other parts of brain. Some advantages of the innovation can be summarised as follows; Helps learners to understand the concept of the brain more easily. And identify confusing parts of the brain. Not only that but it makes it easier for the learners to learn through the model to avoid drawing on the board which makes it difficult to identify the parts.

C. Entrepreneurship Innovations

1. ***Wrist Bands, Category: Entrepreneurship Innovations, Name: Lubasi Kunda Age: 12, Gender: Female, Grade: 7, School: Boma Primary School Region: Central***
A wrist band is an innovation based on reducing the cost or expenses of buying expensive bracelets that can be made on our own.

2. ***Decorating Various Places Using Bottles - Memory Siyanga, Age: 17 Years, Grade: 12, Entrepreneurship Innovations, Chibote Secondary School, Copperbelt***
This innovation brings to light the concept of decorating disposable bottles both plastic and glass. This concept enables one to make fine decorations which can be used at various occasions. The decorations are so simple, but have a wonderful touch. This could be a means of income and create employment use cheap and available.

3. ***Bicycle Hand Pump, Category: Enterpreneurship Innovations, Name: Charles Tembo, Grade: Eleven (11), School: Chinunda Day Secondary, Region: Eastern***
Local production of bicycle pump as a means to utilize waste materials and reducing costs on buying bicycle pumps in Kasenengwa District in Eastern Province of Zambia.

4. ***Waste Management, Category: Entrepreneurship Innovations, Name: Natalie Kasanda, Age: 12 Years, Grade: Nine (9), Sonshine, Region: Lusaka***
With an increase in population, there is a direct increase in the generation of waste products. Consequently, this brings pressure on how the disposal of the ever-increasing production of waste is to be managed. To manage waste, there is need to recycle the waste that is generated daily.

5. ***Crayon made from chalk, Category: Entrepreneurship Innovations, Name: Mubanga Mwape, Age: 13, Gender: Male, Grade: 8, School: Gibeon Adventist Secondary School, Region: Northern***
Crayons are used in schools parents buy crayons weeks by weeks and some in days some parents gave up since imported crayons are expensive with my products parent will spend little because it is cheap.

6. ***Making a Lamp Stand using Newspaper, Category: Entrepreneurship Innovations, Name: Chileshe Kabuswe, Age: 17, Grade: 12, School: Lwitikila Girls Secondary School, Region: Muchinga***

   Pollution can be stopped or reduced by recycling paper and plastic hence preventing certain health problems. Entrepreneurship can be another way of preventing pollution as one recycles plastic and paper. It's another way of making a living and avoiding theft cases by teenagers because they will have something to keep them busy.

7. ***Improving Zambia's Economy, Category: Entrepreneurship Innovations, Name: Mbuzi Richard, Age:…, Grade:…, School: ……., Region: Southern A***

   Dairy and meat farming can improve Zambia's economy.

8. ***Tea Flavourant (Natural Coffee), Category: Entrepreneurship Innovations, Name: Phiri Chipo Janet, Age: 15 Years, Grade: 9, School: St Joseph's Sec, Southern B***

   In modern day society people enjoy taking coffee and energy drinks which contain caffeine. This innovation will help reduce diseases caused by beverages containing caffeine. Caffeine is a drug which kills people slowly. This innovation help reduce risks of contracting disease like ulcers and addiction from caffeine.

9. ***Sindambi Jam Production, Category: Entrepreneurship Innovations, Name: Ilishebo Golden Age: 19, Gender: Male, Grade: 12, School: Senanga Sec, Region: Western***

   This innovation is vintage but only olden. But it is a Golden innovation that can reduce unemployment levels in the country and also highlight Zambia on the map.

D. Rural Development Innovations

1. ***Simple Flame Geyser, Category: Rural Development, Name: Kangwa Francis, Age: 18, Gender: Male, Grade: 12, School: Serenje Boys, Region: Central***

   This project is based on heating water through heat transfer with any fire flame example cow dang pieces of pine wood and any substance that can produce a flame like petrol spirit diesel etc.

2. ***Innovation of recycling of paper (Paper Jewellery, Category: Rural Development Innovations, Name: Mukangwa Christine, Age: 17 years, Grade: 12, Copperbelt***

   This project is aimed come up because of land pollution that is being done in the most places in Zambia. As means of reducing land pollution the project was made to help reduce paper that were polluting the communities more especially in schools. Paper jewellery was made of paper which was recycled, because paper is available and affordable to everyone. The materials that I use were; coloured magazine, glue, stick, strings, pencil, scissors, ruler, vanish, paintbrush, paint and paper beads.

3. ***Soya Beans Sheller, Category: Rural Development, Name: Emmanuel Banda, Age: 16, Gender: Male, Grade: 11, School: Lundazi Boarding Secondary School, Eastern***

   Due to the escalating problems faced by soya beans farmers in rural areas, the simple soya beans shelling machine was made and designed in such a way that it should help these farmers. It uses a simple motor which can use either solar panel, car battery, electricity and many other cheap sources of energy. It is made using cheap materials such that even local farmers should afford to buy. It is also very safe to protect the user form external injury.

4. ***Ecomonic Benefit of Tarmarind Fruit, Category: Rural Development Innovations, Name: Gloria Zulu, Age: 17 Years, Twelve (12), Musonda Girls' Tech, Luapula***

   Upon seeing how our country is having reduction in the sustainable development and increase in poverty, due to indiscriminate use of trees as fuel, charcoal in homes and building section in making of burnt bricks. Trees protect the ultraviolet rays from reaching the earth's surface and the protective screen of the ozone layer will be maintained. It helps the ministry of environmental issues to protect the natural resources like trees and prevent deforestation. As a result, I came with project to promote business in rural areas by using fruits extract and seeds to promote business.

5. ***A Solar Siphoned Animal Powered Bamboo irrigation system, Category: Rural Development Innovations, Name: Mwelwa Jemimah Chikesenge, Age: 18 Years, Grade: (Twelve) 12, Kasisi Girls Secondary School, Region: Lusaka***

   Food production is one important factor appreciated worldwide. In Zambia the weather patterns have taken sudden change affecting when the food is expected to be produced. Due to this natural measure that can't fully be controlled farmers are disadvantaged especially rural farmers. This is because they don't have affordable effective irrigation systems to assist them, as they cannot afford the diesel-powered irrigation systems that are available.

6. ***Home Made Water Purifier, Category: Rural Development Innovations, Name: Nalwaba Lolanji, Age: 15, Grade: 10, School: Kapililonga Sec, Region: Muchinga***

   The greatest challenge most villages face is how to find safe clean drinking water, and because of this problem most them visit the clinics regularly because of diarrhoea cause by contaminated water. This project aimed at coming up with a water purifier based on simple filtration that used only sand and stones in small bottles. The results have shown that water can be purified at a very cheap price.

7. ***Feeding Fish Using A Mobile Phone, Category: Rural Development, Name: Christabel Musonda, Age: 13, Gender: Female, Grade: 7, Lubushi Primary, Region: Northern***

   Feeding of fish needs a lot of time and intervals to manage hence most time fish is mainly left without feed or overfed there by reducing on the growth rate. Hence this device will automatically feed fish by using a phone even if a person is not there.

8. ***Solar water Geyser, Category: Rural Development Innovations, Name: Kakoma M. Kuwunda, Age: 16, Grade: 12, Sex male, Solwezi Technical Secondary,North Western***

   My project is entitled Solar Water Geyser. It is a machine which will be used to warm water using the sun through reflective object such as mirrors, discs and many more.

9. ***Cray Water Filter, Category: Rural Development Innovations, Name: Manyepa Emmanuel, Age:…, Grade:…., Sex:…, School:…….Region: Southern A***

   Unsafe water has been the major contributor of poverty and diseases. Unsafe water does put a lot of people's lives at risk due to the impurities it contains which are unsafe for the health of people. In rural areas it has been a hazard that has affected many people for several years. This innovation will address these challenges.

10. ***Power Generation And Automatic Time Switch, Category: Rural Development Innovations, Name: Ngulube Michael, Age:16 Years, Grade: 11, School: Siavonga Secondary, Region: Southern B***

    During my research on rural areas on the challenges they face, I came across different problems but the most prominent challenge they face is lack of energy access and sources to generate their own power and as well as lack of human labor to support their local business. Therefore, I came up with an innovation to help tackle.

11. ***Firewood Storage Heater, Category: Rural Development, Name: Kashina K. Samuel, Age: 17, Gender: Female, Grade: 11, School: Kaoma Secndary, Region: Western***

    Home storage water heaters or a hot water system (HWS), is a domestic water heating appliance that uses a hot water storage tank to maximize heating capacity and provide instantaneous delivery of hot water into the house. When the kinetic energy of water molecules in the water tank is increased, the water starts to boil. In this project I have built a simple fire wood storage water heater from the concept of heat transfer and kinetic energy.

E. Environmental Sustainable Development Innovations

1. ***Plastic bottle recycling, Category: Environmental Sustainable Development Innovations, Name: Silomba Kedrick, Age: 17, Gender: Male, Grade: 11, School: Ibolelo Secondary Central, Region: Central***

   Waste management is the problem faced by many countries. This has led to the pilling up of garbage providing a fertile breeding ground for many harmful bacteria the cause deadly diseases such as cholera. Additionally, garbage from plastics make the county side dirty for so many years because it is non bio degradable. In my innovation, my focus is in finding not only a lasting solution but also a workable, easy and a beneficial way of recycling this non bio degradable garbage especially plastic bottles. The innovation therefore turns the disposed of plastic bottles into a number of useful products such as brooms, plastic fences, baskets, ropes and many more. The method used to produce all these products only involves cutting the bottle in thin strip which are of equal thickness. To achieve this, I made a special cutting tool from wood and surgical blades. The entire process of producing these products does not involve burning of plastics, hence the process is environmental friendly. Brooms made from plastic bottles can be in turn be used to clean the environment. In this sense therefore instead of having plastic bottles to be source of worry, they can easily be turned into a source of income.

2. ***Solar Kit Refrigerator - Ethel Phiri, Age 16 years, Grade: … Environmental Development Innovation, Luanshya Girls Secondary School, Copperbelt***

   The solar kit refrigerator is made to improve the lives of people as well as help improve the environment. This project is here to help encourage people on how to use solar energy and how to recycle materials by making something beneficial to mankind like making a refrigerator especially for those in rural areas who are not able to afford a refrigerator. This project is also good because it is environmental friendly in the sense that it uses a renewable source from the sun, recyclable material (box) which mostly causes damage to the ozone layer when burnt but will now be used as a refrigerator, and the gas used is not a pollutant so it's safe.

3. ***Waste Reduction, Category: Environmental Sustainability, Name: Hillary Gray Chikwanda, Grade: 12, School: Nyimba Boarding Secondary, Region: Eastern***

   Most activities done in the society lead to pollution of the environment in our community, country and world at large. This can cause certain diseases to human being, .however, these some littles papers, plastics which are thrown in the environment can be used to make money and make one to earn a living.

4. ***Jets Project Air Purification System, Category: Environmental Sustainability, Name: Mike Chibale, Age: 19 Years, Grade: 12, Nelson Mandela Secondary, Region: Lusaka***

   The problem that the world at large is facing is air pollution which is caused by emission of different substances into the atmosphere and at the agents of air pollution are the industries. But industries are used to produce different day to day materials that we need in our lives, therefore we cannot completely stop operating these industries. Which means

that our environment will suffer the most if we don't stop using the industries? Recent study has shown that the rate and amount of emissions has increased as a result environmental problem such as global warming and climate change have increased. Therefore, I have come up with a project that can reduce our carbon print meaning the emissions of different gases into the atmosphere. Someone inverted dust precipitators which have not been very efficient. Therefore, I'm going to make an air purification system.

5. ***Green Environment, Category: Environmental Sustainability Development Innovations Name: Nsama Tracy, Age: 15, Grade: 10, School: Chinsali Girls Secondary: Muchinga Region***

   Waste plastic disposal has been a very big challenge in Zambia. Which has an environmental concern as plastics are non-biodegradable. A lot of innovations have been used to properly get rid of the plastics including recycling. However, the percentage of both land and air pollution has been increasing due improper disposal and to burning of plastic respectively. This innovation can solve the problem of pollution because the plastic made in this innovation is biodegradable.

6. ***Making an Organic Pesticide Using, Garlic, Onion, Red Pepper, Category: Environmental Sustainable Development Innovations, Name: Esther Sampa Age: 17, Gender: Female, Grade: 12, School: Mpulungu Boarding Sec,Region: Northern***

   This innovation simply looks at how the community and as well the nation at large spend money on the buying of pesticide that are used to spread on the crops mainly the farmers either the commercial or the subsistence farmers when their crops are being eaten up by insets like aphids . IT also help in the reduction of over spending of money when we learn how to our own pesticide simply as this one knows we can be able to reduces the over spending of money for pesticide , we can be able use the money for other things and our economic status can be stable once more and clear.

7. ***The effect of temperature of the rate of respiration of tilapia fish, Category: Environmental Sustainability Development Innovations, Name: Vizigiro Harriet, Age: 16, Grade: 11, Sex: Female, School: Meheba Boarding, Region: North Western.***

   The effect of temperature changes on aquatic life is not known in most circles. This was aimed at accessing the effect of temperature on the rate of respiration of tilapia fish. This project was carried out by counting the number of times the operculum of two tilapia opened at different intervals of time and temperature including 15˚C, 20˚C, 25˚C and 30˚c. Results showed that as temperature was increasing the number of times the operculum opened also increased showing that temperature as an effect on the rate of respiration of tilapia fish. **Therefore**, thermal pollution is very much possible on aquatic life.

8. ***Water Overflow Level Detector, Category: Environmental Sustainability Development Innovations, Name: Siyangwe Benjamin, Age: Sex:… Grade:…School:… Southern A***

   Apart from experiencing drought due to lack of rain, many people still waste a lot of water in Zambia. According to scientific research, it is estimated that in the year 2044, Zambia will experience massive droughts. When the tanks are full in people's houses, water is allowed overflow all over the yard. Water decreases from water resources causing a decrease in the production of hydroelectricity. In the year 2015 Zambia experienced massive load shedding. And currently, it is the problem we are facing. As a youth, I carried out research and I came up with an innovation that would prevent these threats. I reasoned and thought of resources wasted that they are never gained. This water detector will is aimed at regulating the water level, reducing water loss and reserves it for future use.

9. ***Making paving bricks by recycling plastics to reduce land pollution, Category: Environmental Sustainable Development Innovations, Name: Bwalya Ilah, Age:15 years, Grade: 10, School: St Joseph's Secondary, Region: Southern B***

   Current plastic bag use and disposal both by consumers and through waste management activities not only create a visual pollution problem, but also reinforce the perception of a wasteful society. With this innovation, disposal of plastics can be reduced in the environment by simply melting it and adding sand to make useful paving bricks.

10. ***Paving Blocks Out Of Plastic Waste, Category: Environmental Sustainable Development Innovations, Name: Inambao Chiuyu, Age: 16 Gender: Female, Grade: 10, School: Senanga Secndary, Region: Western***

    Disposal of large quantity of plastic wastes emerged as an important environment challenge, and its recycling is facing a big problem due to non-degradable nature. Due to plastics does not decompose biologically. The amount of plastics waste in our surrounding is steadily increasing. The proposed sand bricks which is made up by adding plastic bottles waste in crush form in sand bricks may help to reuse the plastics waste as one of the addictive materials of bricks and to help the disposal problem of plastic-waste.

F. Value Addition Innovations

1. ***Yoghurt Made From Sweet Potatoes, Category: Value Addition Innovations: Name: Kokowe Elizabeth, Age: 17, Gender: Female, Grade: 12, School: Kabwe Secondary, Region: Central***

   The sweet potato yoghurt is very healthy and nutritious when prepared in a safe and conducive environment. The following are some of the guidelines on how to prepare sweet potato yoghurt

2. ***A Simple Hand Dryer, Category: Value Addition Innovations, Name: Kondwani Sinkala, Age: 18 Years, Grade:.. Mikomfwa Secondary, Region: Copperbelt***

   The goal of this project is to make a simple hand dryer by using locally sourced materials which includes damaged hair blowers' elements and copper wires from scraped cars. This project will not only help pupils but it will also help people in terms of hygiene and this product will be easy to make and easy to acquire.

3. ***Making Slippers Using Recycled Material, Category: Value Addition, Name: Chitalu Deborah, Grade: Eleven (11), Entry: Senior, Sex: Female, Age: 17, School: Lutembwe Day Secondary, Region: Eastern***

   The purpose of my project is to help those who cannot afford to be buying slippers every time they get NP and spoiled. I will not help them by transforming old slippers to new ones.

4. ***Extracting Acids and Bases from Locally Available Natural Resources, Category: Value Addition Innovations, Name: Mungela Grace, Age: 17, Years, Grade 11, New Mtendere Secondary School, Region: Lusaka***

   This project helps in many ways e.g. if an institution or a school has no enough funds to buy acids and bases to conduct demonstrations. An acid is a substance which when reacted with water produces Hydrogen ions (H+) as the only positively charged ion. A base is a substance which when reacted with water produces Hydroxide ions as the only negative ions. The reaction between a base and an acid produces salts and water (H2O) only is a neutralization reaction. One of the Properties of these acids and bases include turning a blue litmus paper to red that is a base and turning red litmus to blue.

5. ***Making cheap and long lasting soap, Category: Value Addition, Name: Kaluba Chishala, Age: 17, Grade: 12, School: Chinsali Day Secondary, Region: Muchinga***

   The purpose of my project was to make a home-made hand soap from honey, avocado oil, lemon, sweet orange and pineapple. Most of soap that are harmful to the body in this project I decided to use locally available fruits (materials that have no effect on the skin and body are cheap that they are even grown.

6. ***Pipeline Technology, Category: Value Addition Innovations, Name: Twali Chisela, Age: 15, Gender: Male, Grade: 11, School: St. Francis Sec, Region: Northern***

   Water is a very essential for our day to day lives; we use water for a lot of things such as drinking, washing and farming. But if we look at our water supply system and the sanitation standards of the water we use it is not very reliable, not because there is no water from the sources but because of water leakages in the pipes. Most of the times we may find that water from taps are not very safe as compared to other sources.

7. ***Microbial fuel cell, Category: Value addition, Name: Kayitare Robert, Age: 16, Grade: 12, Sex: male, School: Solwezi Technical Secondary, Region: North Western***

   Waste water effluent (sewage) is one of the minor pollutant in Zambia but according to officials at Civic Center (in solwezi) and the Water and sewerage company wastewater treatment and management is becoming an issue. Conventional aerobic and anaerobic treatment of wastewater needs more energy to operate it. In this context, treatment of wastewater using Microbial Fuel Cell seems to be promising technology because it reduces operational energy requirement and shows efficient treatment too. This research focused on simultaneous power generation and also included wastewater treatment by using Micro-bial Fuel Cell. The objectives of the study were to study the performance of MFC using wastewater as a fuel to power up our MFC's and Polyacrylonitrile carbon (PAC) or other available cheaper materials as electrodes. Waste water was used to harvest energy and reduce COD from complex waste water. The data collection mode was through observing and recording the voltage, current and power produced by the MFC. The findings were analyzed to obtain optimum power density, columbic efficiency and Chemical Oxygen Demand (COD) removal efficiency. Power density, current density and columbic efficiency of MFC with Waste water were calculated. Comparing the results obtained and calculated, MFC with PAC surface area (34.79cm2) showed the highest value for maximum power density of about 76.2133 mW/m2, columbic efficiency of 0.9561% and COD removal efficiency of 45.6%.

8. ***Cosmotology, Category: Value Addition Innovations, Name: Mwenda Martha, Age:… Sex:… Grade:…. School:….Region: Southern A***

   The innovation is about how to use make up at the right time. There are a lot of skin colors and so for someone to come up with a perfect look, one needs to try out different types of makeup.

9. ***An electric duster, Category: Value Addition Innovations, Name: Munyumbwe Buumba, Age: 18 years, Grade: 12, School: Chipepo Secondary, Region; Southern B***
   Automatic blackboard dusters are made so as to ease the tedious job of erasing the blackboard by teachers or pupils. The chalk dust from chalk after erasing the board can cause health problems to both teachers and pupils. Thus there is need to find lasting solution in order to avoid disease that maybe brought by chalk dust. Apart from diseases, manual duster need a lot of energy when being used thus there is need for an automatic dust to be used when cleaning a chalk board.

10. ***Pumpkin Cake, Category: Value Addition Innovations, Name: Akakulubelwa Mukubesa, Age: 16, Gender: Female, Grade: 11, School: Limulunga Day Secondary,Region:Western***
    Consumers buy more ready - to - eat or ready to cook foods. Farmers generally produce and market raw materials to the market some of which are not ready for consumption. Value addition improves a product by changing its physical state or form. Pumpkins are usually produced by farmers and sold by the farmers in their raw state. From pumpkins, a cake can be made and also home - made mayonnaise. This value addition processing offers people to capture large share of the money when it is processed unlike in a state when it has not been processed. This value addition also makes people eat food in different ways.

G. Robotics Innovations

1. ***Pedagogical Robot (Phiri 600), Category: Robotics Innovations, Name: Mpatso Phiri, Age: 16 Years, Grade: 12, Masaiti Secondary school, Region: Copperbelt***

   The drone is a multipurpose robot with a current task of providing efficient education to all Zambian children. The drone gives oral lessons in some subjects and provides education to children who are willing to let it, it can be functional in any area and is able to teach in areas where teachers are insufficient. The drone was made to sustain a teaching environment in any condition or area, it is further supported by solar and can be used in remote areas and teach for more hours adequately. The drone will increase the standard of education throughout the country and aim at achieving 100% pass rate.

2. ***Musa Robot Dog, Category: Robotics Innovations, Name: Muyangwa Musa, Sex: Male, Age: 18, Grade: 12, School: Petauke Boarding Secondary School, Eastern***

   This project presents an effective way to improve on the Zambian security system. It mainly focuses on replacing real dogs that are used for security purposes thereby reducing on our daily expenses such as buying food for the real dogs and many others.

3. ***Hyraulic Robot - Tumelo Tasheni Age: 16 Years Grade: 11, Robotics Innovations Musonda Girls' Technical School, Region: Luapula***

   The enclosed fluids such as liquids and gases can be used as prime movers to provide controlled motion and force to the objects. The specially designed enclosed fluids can provide both linear as well as rotary motion to provide high magnitude-controlled motion. This kind of enclosed fluid system using pressurized incompressible liquids as transmission media are called hydraulic systems.

4. ***Blind Guide & Air Provider: Name: Gabriel Mwale Age: 16 Years, Grade: 11, Robotics Innovations, David Kaunda National Technical Secondary School, Lusaka***

   Having observed that blind people cannot coordinate or move on their own I know that the use of the m bots technology will help blind people extremely. It will help them move in their homes freely. It will help them travel the country effortlessly. Wireless Sensor Networks, in particular Wireless Body Area Networks, is a technology suggested by the research community as allowing elderly people, or people with some kind of disability, to live in a safer, responsive and comfortable environment while at their homes. One of the most active threats to the autonomous life of blind people is the quantity and variety of obstacles they face while moving, whether they are obstacles in the footpath or obstacles coming out from the walls of buildings. Hence, it is necessary to develop a solution that helps or assists blind people while moving either in indoor or outdoor scenarios, simultaneously allowing the use of the use of white cane or the Seeing Eye dog. In this article, the authors propose the use of an ultra-sound-based body area network for obstacle detection and warning as a complementary and effective solution for aiding blind people when moving from place to place. According to the cost estimates of the solution and to the negligible setup time, this could be a real effective complementary solution for blind people.

5. ***Cricket Robot: Category: Robotics Innovations, Name: Simwanza Micheal, Age: 19, Grade: 12, School: Kapililonga Secondary, Region : Muchinga***

   Robotics is a branch of engineering that deals with intelligent machines, machines that are able to read, interpret and execute instructions. This project aimed at making a very simple robot that can mimic a cricket, and the results showed that it's very much possible to make a simple robot using a phone buzzer.

6. ***Hydraulic Robotic Arm, Category: Robotics Innovations, Name: Ng'andu Justin, Age: 14 years, Sex: Male, Grade:9, School: Lucheche Secondary School, Northern***

   This project was made in order to help reduce the cost of using electricity or buying petroleum as a source of energy to run the mechanic machine. This project will also help humanity in terms of man power; instead of people using their energy to do work they can channel that energy to control the robotic arm to do their work.

7. ***Automated wheelbarrow, Category: Robotics Innovations, Name: Phiri Nerbet, Age:16, Grade: 11, Sex: male, School: Kayombo Day Secondary, North Western***

   In my area, most people find it had to transport different goods from one place to another. It is a very big challenge as these goods cannot reach the intended destination on time. I therefore thought of coming up with an automated wheelbarrow that can be of use in easy transportation of goods in areas where vehicles are not available.

8. ***Solar Powered Taraffic Lights, Category: Robotics Innovations, Name: Fungameli Thabo Mirriam, Age:…., Sex:…. Grade:…School:….Region: Southern A***

   The innovation is about a cost saving traffic light system by using a quadrant suspended on the middle of a cross section by one pole which reduces the cost of lights and other materials used per junction. This however improves road safety and control.

9. ***Modern railroad cross alerter, Category: Robotics Innovations, Name: Miti Emmanuel, Age:17 years, Grade: 12, School: Canisius Secondary, Southern B***

   This innovation has light dependent resistors which use light to make resistance thus the more the light the more the resistance. This principle can used to make an innovation that helps control traffic on a railroad crossing point. The will be a light bulb focusing light on an L.D.R and when a train passes through it blocks the light going to the L.D.R thus the resistance will be reduced current will be allowed to flow thereby triggering the L.E.Ds and the motor. The L.E.Ds will flash informing the road users that a train in coming and the motors will make the gates close in case of the careless drivers.

Category Five: Out of School & College Students

A. Scientific Innovations

1. ***3R Principles, Category: Scientific Innovations, Name: Zulu Maxwell, Age: 20 Years, Region: Copperbelt***

   Environmental concern today is the indiscriminate disposal of litter posing a major challenge to environmental pollution. Many resorts to burning of litter causing air pollution. Collection and recycling of used paper, plastic bottles, bottle tops and wires can help reduced environmental pollution and also help create jobs to the people. The project will endeavor to address the problem of environmental pollution using used paper, plastic bottles, bottle tops and wires to create artifacts which can be used in day to day life. Reducing reusing and recycling of papers, plastics, glass bottles, bottle tops and wires can lead to a clean health and modernized country as the motto states let's keep our country clean and green.

2. ***The Improvement of Conservation Farming. (The Proper Usage of Organic Manure), Category: Scientific Innovation, Name: Shumba Debbyson, Sex: Male, College: Chipata College of Education, District: Chipata, Region: Eastern***

   This innovation aims at improving different types of conservation farming as it is the most advisable practice in agriculture this time. This aims at making sure that effective practices are being derived to farmers wisely so that farmers they may know what they are supposed to do and why are they supposed to do.

3. ***Medicinal Extracts from Simple Local Materials, Category: Scientific Innovations, Name: Bwalya Natasha, Age 18 Years, Region: Luapula.***

   This innovation is all about making medicine to treat cancer, diabetes and cardiovascular diseases using simple local materials such as: honey, lemon grass, cassava meal and papaya leaves.

4. ***A.P.A.T Formula, Category: Scientific Innovations, Name: Mwamba Mwanuko Bupe, Age: 19 Years, Region: Lusaka***

   A.P.A.T formula stands for ashes, papaya, aloe vera, and thistle, these are naturally pesticides and can be used to kill army worms. It is more powerful in liquid form for easy absorption on the soil and reacts fast on affected fields.

5. ***Monohybrid Inheritance Model, Category: Scientific Innovations, Name: Munthali Masidah, Age: 22, Gender: Female, Grade: Out of School youth, School: St. Mary's College of Education, Region: Northern***

   Monohybrid inheritance model is an instructional aid to teach monohybrid inheritance in Biology on genetics. Research conducted shows that there hasn't been such type of model on genetics and monohybrid inheritance to be precise. It is called the instructional aid to

teach monohybrid inheritance for lessons under genetics because of its unit features that combines the male and female alleles and thereby producing an offspring. The off springs produced will have characteristics of both a male and female which will have special colours (phenotype). The model is designed from local materials such as a transparent bucket perforated on top where the male and female alleles compartment are fixed where solutions are placed before release into the beaker. It is also fixed with lights to improve the visibility during the dark and the front part is fixed with a transparent glass sheet. I came up with this model based on the fact that teachers and lecturers face challenges in explaining monohybrid inheritance practically. The effective use of this model showed enhanced understanding of monohybrid inheritance in a practical way besides using capital letters for dominant and co-dominant alleles and small letters for the recessive.

6. ***Using remote sensing to show development at Meheba Boarding Secondary school and how unplanned development has caused land degradation in Kitwe, Category: Out of School Scientific Innovations, Name: Lupasha Francis Zimba, Category: Out of School Scientific Innovation, Sex: male, District: Kalumbila, Region: North Western***

   Meheba Boarding Secondary School and other parts of Zambia have been changing as population increases. Land is been developed to meet accommodation demand and as development progresses, a number of problems have been reported in various fast growing cities such as Kitwe. Problems include over cutting of trees, frequent air, water and land pollution and lack of proper solid waste management especially in urban and peri-urban areas. This project was meant to show how remote sensing can be used to show development which took place between 2003 and 2014 at Meheba Boarding Secondary School and how that kind of development has caused land degradation in Kitwe between 1990 and 2015. Results showed that in the time studied, four (4) important buildings were built at Meheba Boarding while in Kitwe vegetation and water decreased by 12%, 0.6%. Bare soil and built up land increased by 28% and 42%. These changes at Meheba are a sign of development while in Kitwe unplanned development has caused land degradation. Results mean that development needs to be planned and natural resources need to be protected.

7. ***Multipurpose Water Regulator, Category: Out Of School Scientific Innovations, Name: Chisha Kafuli, Age:…, Sex:…Grade:….School:…. Region:.. Southern A***

   The multipurpose water regulator is an innovation whose principle is to control the flow of water automatically. It can be used in the field of agriculture to provide automated irrigation and also automated chicken drinker. In addition it can be used as a water level controller by people who have overhead water tanks.

8. ***Air pollution control, Category: Out Of School Scientific Innovations, Name: Phiri Josiah, Age: 17 years, School: St Patrick's Secondary, Region: Southern B***

   In Zambia today, the vague of industrialization is on rapid increase inclusive of the use of motor vehicles for transportation and burning of coal as a fuel, henceforth causing air pollution that has contributed to high levels of environmental degradation. Seeing that the effects are harsh on living things, this innovation is about a method of reducing pollution through cleaning the air from fossil fuels.

B. Mathematical Innovations

1. ***"Calculus Four (4) Differential General Formula", Category: Innovations, Name: Nyoni Elvis, Age: 24, Gender: Male, Out of School youth, Region: Central***

   Coming up with a general formula dy/dx=vdu/dx+u(dv/dz*dz/dx) ,where dv/dz*dz/dx=dv/dx Which will be used to solve problems which may require chain rule, product rule or quotient rule to be used. Where chain rule is the dy/dx=dy/du*du/dx Product rule is the dy/dx=v.du/dx+u.dv/dx Quotient rule is the dy/dx= (v.du/dx-u.dv/dx)v squared Note that dy/dx implies that the change in y-axis with respect to the change in the X-axis which is also called the derivative of y with respect to x.

2. ***Practical proof of circle properties, Category: Mathematical Innovations, Name: Kila Jeffer, Region: Copperbelt***

   Concrete Examples and Illustrations enhance the conceptualization of knowledge or ideas.Therefore, this innovation tries to provide for such in the learning of Circle Theorem. This is a topic that deals with some angle properties on a circle.

3. ***The adjugate Theorem, Category: Mathematical Innovations, Name: Mumba Banda, Age: 22, Sex: Male, School: Chipata College of Education, Region: Eastern***

   The adjugate theorem of finding the inverse and determinant of a 3*3 matrices, emerged out of the analytical examination of the adjugate of the matrices. The theorem focuses on four important laws. The first law (1st) state that, the second and third column of any given 3*3 matrix generate the first row of its adjugate. The second law (2nd) state that, first and third column generate the second row of its adjugate. Third law (3rd) state that the first and second column generate the third row of its adjugate. Combining the three laws give rise to the adjugate of the matrix. The fourth law is called d-law, this law state that the determinant of a 3*3 matrix is generated from any column of the original matrix multiplied by its corresponding rows of its adjugate. The theorem further contains arrows that display the multiplication flow of the elements starting from the bottom going up. Despite the adjugate theorem contains novelty ways of multiplying elements in a matrix, the theory works effectively and simpler towards any question corcen with inverse of a 3*3 matrix and the determinant.

4. ***Nason's Method of Integrating Algebraic Fraction without Decomposing into Partial Fractions, Category: Mathematical Innovations, Name: Nason Njobvu, Age: 24 Years, Rockview University, Region: Lusaka***

   The purpose of this report was to establish the effectiveness of using Nason's method of integrating algebraic fraction without decomposing into partial fraction. There has only been one world known method used when integrating algebraic fraction and that is by using partial fraction. However, Nason Njobvu has developed a simplest, shortest, direct, and accurate method of integrating algebraic fraction and named it after his name

called Nason's method of integrating algebraic fractions. Nason's method is mainly used in the integration of algebraic fraction as a direct method which involves only two steps to arrive at the final answer without decomposing into partial fraction. From the findings, Nason's method showed to be a more effective method to integrate algebraic fractions problems. This is because Nason's method does not involve a lot of steps as compared to integrating by partial fraction method which involves two concepts namely; the concept of partial decomposition and the concept of indefinite integral which has a lot of steps to follow in one problem.

5. ***Formula for Factorizing Quadratic Equation, Category: Mathematical Innovations, Name: Mubanga Chanda Age: 23 Gender: Male Grade: Out of School youth School: Out of School Region: Northern***

   The overall purpose of this innovation is to expose learners to be able to factorize those quadratic expressions that are unable to be factorized by the product and sum method. The major finding in this innovation is the formula for factorizing the quadratic equations and expressions. This formula, gives two factors for the quadratic expressions. It should be noted that by factor theorem, gives the roots of a quadratic equation.

6. ***Expressing quadratic functions using similarity method in the form of $a(x + p)^2 + q$, - Arakaza, Category: Mathematics Innovations, Name: Bon – Berger, Sex: male, District: Kalumbila, Region: North Western.***

   Questions such as expressing quadratic functions in the form 〖a(x+p)〗^2+q are usually asked during exams in additional mathematics paper two where the pupil has to use some approaches in order for him to solve the problem. In the current syllabus, methods taught such as completing square seem to be complicated as some common mistakes such as interchanging signs and so on…In this presentation, new methods such as similarity and turning point methods are introduced to simplify the task. The main aim of this presentation is to find out an easiest way of expressing quadratic functions in the form 〖a(x+p)〗^2+q other than using completing square method.

7. ***Calculating Quartic Equations Using Linear Transformation Y-(B/4a)=X [Ferrari Method] And Their Applications, Category: Mathematics Innovations, Name: Samende Brian, Age:… Sex:…,Grade:….School:… Region: Southern A***

   Polynomials of high degree often appear in many problems such as optimization problems. Equations of the fourth degree or quartic are one of these polynomials. In this innovation a new classic method for solving a fourth degree polynomial equation is provided.

8. ***Solving non perfect squares and bigger perfect squares without a calculator, Category: Mathematics Innovations, Name: Phiri Floriano, Age: 21 years, School: Canisius Secondary, Region: Southern B***

   In mathematics a square number or perfect square is a number that can be expressed as the product of two equal integers. For example 9 is a perfect square since it can be written as 3× **3**. A non –perfect is an integer whose square root is not a whole number, for example 10 is a non- perfect square because it's square root is a repeating decimal.

C. Technology Innovations

1. ***J C L Drug Alerter and Mobile Self Service Dispensing Unit Category: Technology Innovations, Name: Joseph Chikondi Lungu Age: 18 Gender: Female Grade: Out of School Youth School: Out Of School, Region: Central***

   JCL drug alerter and mobile self-service unity. It is a machine that alerts and dispense drugs to patient. It will help all patient all over Zambia and the whole world at large , it organize and reminds when medication should be taken to avoid errors. People will access HIV/AIDS medication anywhere and anytime its 24/7.

2. ***Electrical Potter's Wheel, Category: Technology Innovations, Name: Mwelwa Chris, Category: Technological Innovations College /Out of School, Region: Copperbelt***

   The project is aimed at making an electrical potters' wheel is the machine or the equipment which the potter uses in the shaping known as throwing of the round ceramics and clay. This wheel may also be used during the process trimming of access body from dried ware for applying incised decoration or ring of colour. This simple electrical porter's wheel is the machine enables the porter to use less energy and have minimal body exhaustion.

3. ***Simple Phone CCTV, Category: Technology Innovations, Name: Zulu Arthur, Age: 24 Years, Sex: Male, Chipata College of Education, Region: Eastern***

   People are of different thought in the world that they even fail to reason for themselves for others with their negativity minds. This is why greater thinking and analysation has to take part in this situation through the use of the things we have around us. Like in this project which is all about ensuring powerful security for the home using simple materials and components to minimize the negativity of people toward others through the use of a simple phone to come up with a simple CCTV. This will surely going to cater different people either in urban and in rural areas because it will be cheap, easy to operate and that it does not require network and electricity to operate efficiently, you can imagine just a simple phone and someone will be able to keep records and have enough evidence for whatever happening around the same house.

4. ***Saravec Machine, Category: Technology Innovations, Name: Noah Mwanza, Age: 22 Years, Out of School Technology Innovations, Region: Lusaka***

   Abstract missing…

5. ***Automated Irrigation System, Category:*** *Technology****, Name: Clement Siwakwi, Age: 17, Grade: 11, School: Isoka Boys Secondary School, Region: Muchinga***

   The innovation is all about find an easier method of irrigating plant in spite of drought the country is experiencing so as to increase the yields of plants .The project will be beneficial to the people in different countries as it is going to improve food availability in the country.

5. ***More Energy Efficient Brazzier, Category: Technology Innovations, Name: Nyelezi Blessings, Age: 23, Gender: Male, Grade: Out of School Youth, School: Kasama College of Education, Region: Northern***

   The main reasons of bringing other innovations which are more affordable in using non-renewable energy than tradition fire wood are to enable learners to impact knowledge and skills. The third abstract is deforestation increase because people use only charcoals while our innovation will allow people to use other materials other than charcoal. E.g. saw dust, rice shells and maize cob of which is less money to buy compared to charcoal.

6. ***Astable and Distable Multivibrator square sine wave pulse electric generator, Category: Technology Innovations, Name: Mayeba Rehoboth, Sex: Male, District: Solwezi, Region: North Western***

   Off-grid areas have suffered due to no electricity in the areas whereas agriculture which is one of the driving force of economy has been deeply affected in a way that even yields have been decreased due to insufficient or no electricity supply. On the other hand is the load-shedding issue in densely/ highly populated areas especially urban areas where almost every household needs to use electricity at the same time. This results in dim or low power supply amongst households within the neighbourhood. Sometimes this is attributed by industries consuming high voltage power i.e. mines and mills. All these outlined observations are a result of low frequency electric supply, which ranges between 50-60Hz. Therefore need to create a square-sine wave generator which divides power in respect of frequency consumption and supplies to respective areas.

7. ***Steven Refining Industry, Category: Technology Innovations, Name: Mweene Steve, Age:…. Sex:… Grade:….. School:…. Region:….Southern A***

   Polyethylene furanoate (PEF) represents a promising renewable resource-based bio-plastic as replacement for fossil-based polyethylene terephalate (PET) with improved material properties.

8. ***Sebastian`s hyper hydrostronotology company, Category: Technology Innovations, Name: Zulu Sebastian, Age: 21 years, Institution: St Patricks, Southern B***

   This innovation is all about formulating the Sebastian`s hyper Hydrostronomy company. Hydrostronomy is derived from two scientific branch words Gastronomy which is the branch of science which deals with the study of foods and hydrology which is the scientific study of water. This research used a cactus fruit which contains mucilage will both be used as a medicine and a very cheaper and environmental highly based chlorine. The result will benefit the domestic consumers, companies and the entire nation at large. On the other hand, the use of sodium chloride and water was used to make an effective,

safer and cheaper sodium chloride power plant that will enhance an effective operation of the company and benefit the nation at large.

D. Information Communication and Technology (ICT) (Software and Hardware)

1. ***BRIISP Power Systerm2, Category: ICT Innovations, Name: Billy Peter Munyenyembe Age: 34 Gender: Male Grade: Out of School youth School: Out of School, Region: Central***

   The world has never been the same again with the development of power generating systems but despite the break through, the cry for clean energy and power distribution to all communities has been a dream of everyone. A Lot of developments happening in urban areas are incited by the presence of enough electricity but for rural areas in most cases it is a different story. For people who have access to power they face high electricity rates and load shading. With the BPS2 majority of people will have access to electricity for charging and home usage at a very cheap and affordable price.

2. ***The light board, Category: ICT Innovations, Name: Kaleya Andrew, Age: 21 years, college/out of school, Region: Copperbelt***

   Epigie is a platform were learners, teachers, schools and business corporates will be able to communicate, educate, entertain and inspire themselves with absolute security. Epigie has six main features namely **EpiChat** (private & secure chatting), **EpiThoughts** (Cast thoughts to kalourmates & institutions), **Edoxie** (Upload and download Educational files), **EpiStream** (Stream educational, inspiration and fun videos), **EpiStore** (Connect Business magnets to skilled learners), and **EpiSearch** (Search all of Epigie).

3. ***Online Crime Reporting System, Category: ICT Innovations, Name: Blessings Ngalande, Age: 18 Years, Out of School, Region: Lusaka***

   The world is developing in terms of technology. In our country Zambia most people spend a lot of time on smart phones. In this software most people in our country can report crime online while using their smart phones.

4. ***Rodon Universe, Category: ICT Innovations, Name: Chilongo Rodrick, Age: 16 Years, Gender: Male, Grade: Out of School Youth, School: C/o St Francis secondary school Region: Northern***

   The project I made is website by the name of Rodon Universe. The website is an integrated website which provides useful study materials for all students ranging from grade one to up to university level. It contains video tutorials as well as pdf books and past papers. The website is a useful resource for both teachers and students. in addition, it also automates day-to-day school activities which includes classroom registration, test registrations, showing pupils' report form, applying for a school place online, showing the school bulletin as well as to enhance parent-teacher conference to improve efficient communication to achieve better school and individual pupil performance for a better education and academic performance in Zambia. This integrated package also has

features which will assist school leavers find suitable scholarships as well as student loans to help them study for them to develop our nation. The website also has a career guide to help people realize their capabilities and choose career that is suitable for them to be more productive.

5. ***To Improve Electrol System in Zambia, Category: ICT Innovations, Name: Mumba Mwaanga Moses, Age: 17 Years, School: Canisius Secondary, Region: Southern B***

   This innovation basically improves the electoral process by taking it online which makes the process faster more efficient and more transparent. It takes advantage of the capabilities of the computer age and speeds up the process.

E. Robotics Innovations

1. ***A Model of Logic Gates, Category: Robotics Innovations, Name: Mayani Andrew, Age: 25, Gender: Male, Grade: Out of School youth, School: Out of School,Central***

   This innovation elaborates the importance of using models of logic gates when teaching the topic introduction to electronics in physics by using locally available materials. For that reason, it further highlights the importance of teaching such topics practically in class by teachers.

2. ***Robotic Model for Reflex Response, Category: Robotics Innovations,*** *Name:* ***Lwamba Jonas Pandwe, Age: 19 Years, Out of School Robotics Innovations, Region: Luapula***

   This innovation was carried out to simplify the way the nervous system works. This is done by making the explanation of the nervous system in a physical and tangible way thereby making understanding easy. The materials that have been used in coming up with this innovation include connecting leads, wires, three (3) motors, two switches and curtain boxes. These materials were used to make the human body and brain models. Through this innovation, it was very easy for pupils to understand reflex responses. Further, the innovation was found to be of use by medical personnel to explain to patients who may have defunct reflex action.

3. ***Robotic Model for Reflex Response, Category: Robotics Innovations,*** *Name:* ***Ballack Kalale, Networked Robotic Fuel less Vehicle, Age: 24, Years, Out of School Robotics Innovations, Rock View University, Lusaka***

   The purpose of this report was to reduce the chances of accidents, fuel cost, global warming, and increase the property safety. For the current vehicles, the science applied has only solved the travel challenges but it has inflicted many problems to the environment because it does not really solve the real challenges which are accidents and warrant of the use of the property. Therefore, Ballack Kalale's innovation has solutions to some of the above mentioned challenges. The car is designed in such a way that it will be detecting dangers to cause accidents if continued accelerating. The prevention of accidents is achieved by detecting data from the environment around it, data passed to a computer (microprocessor) inside the device which analyses it and command the output

to slow down the car automatically. By the trends of innovation, the betterment of living will be gradually seen by the reduction of accidents.

4. ***Advanced survey Robot, Category: Robotics, Name: Given Syacitwe, Age: 24, Sex: Male, District Solwezi, Region: North Western***

   A robot has a mechanical body and an electronic nerve system to drive it. For the robots do something useful. You need to be able to program it with some kind of intelligence. This can vary from hardwired logical circuits implementing some early robots to low-level reflex code on microcontrollers used in many small robotics projects. In complicated robotics systems, the control system can go up to advanced neural network control systems running on powerful microcomputers networked together. Included in the mech to anical aspects of robot building would be metal working, mechanical engineering, and electrical motors. Electronic systems fall into three categories: power drivers, discrete electronics and a microcontroller. Humans have a biological form; robots do not. Humans have living tissue that makes up skin, muscles, tendons, ligaments, bones, joints, blood, and all organs including the brain; robots do not making them suitable to do dangerous tasks such as going into a an uncertain tunnel. Today, factories of all kinds use robots to perform tasks such as welding, assembly, sealing and operating dangerous tools. The other advantage to robots is the fact that, as mechanical apparatuses, they never tire; so they can perform their jobs nonstop.

5. ***Tablebot, Category: Robotics, Name: Chibombe Principle, Age:…Sex:…Grade:….School:…Region: Southern A***

   Tablebot is a design and built up device with robotic optimization, automation and remote control features and functionalities that enable it to act as a table, office desk, pulpit or TV stand. It meets the technological needs such as electrical energy generation, transmission, in-house distribution and effortless utilization using an arduino controlled robot arm, water cell, charge controller, leather base phone, stand and a wireless power transfer device.

6. ***Arduino Robotic Arm, Category: Robotics, Name: Zimba Isaac, Age: 17 years, Institution: St Edmunds Secondary, Region: Southern B***

   Today, technology is developing in the same direction in line with rapidly increasing human needs. The work done to meet these needs makes life easier every day, and these studies are concentrated in robotic arm studies. Robotic arms work on outside user or by performing predetermined commands. Nowadays the most developed field of robotics arms is every field in the industry and machine sector. Designed and released in the project, the robot arm has ability move in four axis direction with four servo motors. Thanks to the holder you can take desired materials from one place to another, and also mix the material efficiency. While doing this robot control you can record movement made and started.

Category Six: Teachers

A. Scientific Innovations

1. ***Interactive Table of Elements, Category: Scientific Innovations, Name: Nkandu Abel Age: 33 Gender: Female Grade: Teacher School: Broadway Secondary, Central***
   With the growing challenge of teaching some Chemistry topics such as the periodic table of elements in schools and institutions. The current crop of teaching aid on periodic table is not sufficient to make the learner grasp the concept easily without incorporating the table with information from the instructor. This innovation aims at lessening the burdens teachers carry in order to make learners grasp the periodic table of element concept by making the interactive periodic table of element as a teaching aid one can use at anytime and anywhere. This teaching aid only needs an Android phone and the projecting screen.

2. ***The Application of Investigative Teaching-Learning Approach to Pressure, Category: Scientific Innovations, Name: Lamyar Maxwell, Fatima Girls Secondary School, Copperbelt***
   Classical or traditional teaching approaches to science education have not been effective for secondary school pupils to know science Zambia. Scientific concepts learned through what is referred to as *rote learning*, a conceptual vacuum, have *mystified* science, particularly physics and chemistry. However, investigative teaching-learning approach in which a teacher guides the pupils in the experience of the scientific concept through controlled experiments, provides a more meaningful learning and enhances concept formation, concept transfer and concept attainment. It *demystifies* science. The investigative teaching-learning was used to teach pressure and its related concepts and was compared to the classical teaching method that was earlier used to teach graduates and grade 11 participants.

3. ***Low Cost Hydralic Lift, Category: Scientific Innovations, Name: Lubemba Bernard, Age: 32 Years, Teacher Scientific Innovations, Lukwesa Secondary, Region: Luapula***
   This paper is proposing a fluid machinery application that would provide storing of a pressurized fluid and arrangement of transmitting pressure at certain distances with low cost. This application of pressure is very useful hydraulic car jacks, hydraulic scissor lift and for lifting heavy objects in earth moving vehicles. Incompressible fluids are used by the hydraulic systems such as water, or oil to transmit pressure, power and forces from one location to another within a fluid.

4. ***Plant Stem Cells: Cheaper, Potential for The Treatment of Diabetes,*** *Category: Scientific Innovations, Name:* ***Florence Chisenga, Age: 27 Years, Teacher's Scientific Innovations, David Kaunda National Technical Secondary, Region: Lusaka***

   Stem cells are totipotent cells. Totipotent the cells are undifferentiated and possess the ability to form any cell type given that the chemical conditions around them favour expression of specific genes while other genes are switched off or unexpressed. The expressing of genes should involve differentiation (cell determination) first followed by formation of specific proteins known as specialization (according to the genetic sequence available so that cells have a specific shape a therefore a specific function. Diabetes is a condition that is a result of the malfunctioning of the process that leads to the formation of the protein insulin in the beta cells of the islets of the Langerhans. The difficulties in the production of sufficient insulin in an organism may be due to a fault in the process of gene expression or having too much glucose such that the protein insulin (hormone) is not sufficient enough to convert glucose to glycogen for storage by the muscles and liver. The lack of sufficient insulin means that more glucose runs about the blood transport system even though some of it is used by the cells of organs. This brings about undesirable effects on the organism, for example, in humans, signs and symptoms of diabetes include excessive sweating at night, rapid weight loss, poor and prolonged healing of sores.

5. ***Kamwenya Ray Model, Category: Scientific Innovations, Name: Kaenya Mwenya, Age: 38, Gender: Male, Grade: Teacher, School: Lubushi Day Secondary, Northern***

   When light passes through a lens it bends (refracts) towards the normal. We can draw a ray diagram to show how the light bends as it passes through the lens. Ray diagrams are used to find out how far the image will form from the lens, how big the image will be and whether it will be upside down or right way up. The ray passing through the optical centre is not refracted called the principle axis. The ray of light from the object to the lens is refracted towards the focal point and where the two rays meet is where the image is formed. This innovation is used to determine the characteristics and how the images are formed on a convex lens instead of using other methods which learners cannot see how images are formed but rather memorise the drawings.

6. ***Logic Gates, Category: Scientific Innovations, Name: Nketele Burton, Age:…Sex:…Grade:…..School:……Region: Southern A***

   Abstract Missing????

7. ***The multi-mobile laboratory detector, Category: Scientific Innovations, Name: Mutinta Francis, Age: 31 years, Institution: St Patrick's Sec, Region: Southern B***

   This report describes the design of the multi mobile laboratory detector and how it works. The multi mobile laboratory detector is a composition of the four minor laboratories and these are Chemistry, Physics, Biology, and Agriculture Science laboratory which is made up of a production unit which has crops such as egg plants, tomatoes, onion and lattice flesh vegetables. The multi mobile laboratory detector can carry out any experimental practical examination based on the Zambian curriculum and the globe at large or worldwide experimental examinations at all levels of education.

B. Mathematical Innovations

1. ***Finding the Image under Rotation without Using the Protractor and Campus, with the Use of A Properly Designed Teaching Ai, Category: Mathematical Innovations, Name: Mangwatu Darius, the Kamwala Secondary School, Region: Lusaka***

   The project sets out to investigate an alternative way of finding the image under rotation given the centre of rotation, Angle of rotation as well as the direction. The traditional method employs the use of instruments such as ruler, compass and protractor which is quite involving and cumbersome. Whereas, the alternative way does not require the use of the protractor and a compass for standard angles of rotation (90, 270, and 180). Furthermore, the project demonstrates practical and physical way of finding the image under rotation through usage of a properly designed teaching aids, which compliments clear understanding of the alternative method. It is hoped that if this project implemented, it can play a critical role in alleviating most of the difficulties associated with teaching and learning rotation, as it provides a simpler and alternative method in the absence of instruments. It can, therefore be recommended that stakeholders, such as National Science centre, Ministry of General Education and Curriculum Development Centre takes this project into consideration so as to help the learners grasp the concept of rotation with lesser challenges or difficulties.

2. ***Trigonometry, Category: Mathematical Innovations, Name: Nsende Kelvin, Age: 29, Sex: Male, School: Ntindi Secondary School, Region: Muchinga***

   Trigonometry is derived from GREEK words trigonon [three angles] and metron [measure]. It is a branch of mathematics which deals with triangles of different types namely equiangular, acute, obtuse and right angled triangles. The reason why mathematicians created a branch of mathematics devoted to the study of triangles is because any polygon can be dissected into pieces of triangles. Trigonometry specifically deals with relationship between the sides and the angles of a triangle or any other shapes.

3. ***Formula for Factorising Quadratic Equation, Category: Mathematical Innovations, Name: Chilufya Mulenga, Age: 33, Gender: Male, Grade: Out of School Youth, School: Kasama Secondary School, Region: Northern***

   The overall purpose of this innovation is to expose learners to be able to factorize those quadratic expressions that are unable to be factorized by the product and sum method. The major finding in this innovation is the formula for factorizing the quadratic equations and expressions. This formula, gives two factors for the quadratic expressions. It should be noted that by factor theorem, gives the roots of a quadratic equation.

4. ***Enhancing the teaching of mathematics through the use of reach and projects, Category: Mathematical Innovations, Ndailofa John Demus K, Age: 35, Sex: Male, District: Kalumbila, Region: North Western.***

   Learning Mathematics is considered difficult by the majority of students. A question in every mathematics class is whether the pupils will ever use the principles being taught in

the real life? On the other hand there has been not concrete solution which has been put in place to change the picture and the perception of mathematics in how education system. Project/research based approach tries to makes use of real life problems in solving mathematical problems and see how children can apply can they are learning in the classroom in real life situations.

5. ***The Chain Special Number, Category: Mathematical Innovations, Name: Nketani Brian, Age:…, Sex:….., Region: Southern A***

   This invention is premised on a mysterious four digit number the inventor has named the chain special number. This invention is anchored on basic mathematics concepts i.e. arrangement of digits in decreasing order and vice versa, and subtraction (which the inventor has called the chain operation). It unearths one of the most amazing digits in mathematics 6174.

6. ***Gigantic, invisible triangle: measuring height with an inclinometer, Category: Mathematical Innovations, Name: Mujyambere Philibert, Age: 27 years, Institution: Maamba Secondary, Region: Southern B***

   If you've ever wondered how tall that bridge is, or how high your kite was, then this could be a good project for you. Or sometimes if one has ever gone for a visit in a place without internet and wants to find out the height of a certain object or tall tree for example, then this project will be very useful. With this project we will learn how we can use the mathematics of right triangles to measure the height of an object with two measurements that you can make on the ground. These measurements will help us to find the height of any given object and in our case we will use the Findeco house the well-known tallest building in our country. Let us take not of the Pythagorean Theorem.

C. Technology Innovations

1. ***DC AC Mobile Inverter Console, Category: Teachers Technological Innovation, Name: Kapasa Titus, Age: 34 Gender: Male, Grade: Teacher School: Kabwe Secondary School, Region: Central***

   This innovation is one of the examples of applied Physics. Teachers can use such an innovation to motivate and encourage pupils to apply knowledge acquired from science to come up with projects that can benefit them and the country at large. This innovation uses some of the physics concepts and theories. The creation of a circuit diagram and the correct wirings in respect of terminal polarities is one of such concepts. This innovation will ease the connectivity of the inverter system and the ease of mobility without having to dismantle the whole system and reconnecting.

2. ***Simple (Diy) Spot Welding Machine, Category: Teachers Technological Innovation, Name: Ernest Mugala, Region: Copperbelt***

   The introduction of Design and Technology in schools has its own challenges. Lack of materials, tools and machinery makes it difficult for teachers to delivery practical lessons. Machines such as welding machines are rarely found in our workshops worse still Spot

welding machines. It is against this background that there is need for teachers of Design and Technology to come up with innovations of designing simple machines and tools that can do the needed work when pupils are conducting practical work in workrooms. A simple Do-it-Yourself (DIY) Spot Welding machine can be made from simple materials such as old microwave transformers. A simple Spot Welding machine is able to attach two or more sheet of metal of relatively small thickness. The machine is easy to make, user friendly, safe to handle and easy to repair.

3. ***Design and Implementation of Visual Aid for Logic Gates, Category: Teachers Technological Innovation, Name: Mwape Elias, Age: 32 Years, Teacher Technology Innovations, David Kaunda National Technical Secondary School, Region: Lusaka***

   Logic gates are an important component in the teaching of basic electronics in senior Physics. However, binary language is often not easy to communicate to learners especially if not accompanied by visual aids. Many teachers resort to the derivation of truth tables as demonstration for logic gate operations. The innovation sort to design and implement a visual aid for a universal logic gate to demonstrate logic functions of NOT, AND, OR, NAND and NOR gates. The designed circuit was used to implement logical functions and truth tables were derived in each case. The innovation will help communicate binary language in a visual manner. It is therefore hoped that teachers, learners and the research community the visual aid developed.

4. ***Crank and Slider Mechanism Category: Teachers Technological Innovation, Name: Kambole Mwambazi, Age: 45, Gender: Male, Grade: Teacher, School: Mpulungu Boarding Secondary, Region: Northern***

   The slider-crank mechanism is a particular one, two, three or four-bar linkage configuration that exhibits both linear and rotational motion simultaneously. This mechanism is frequently utilized in secondary schools, colleges and undergraduate engineering courses to investigate machine kinematics and resulting dynamic forces. The position, velocity, acceleration and shaking forces generated by a slider-crank mechanism during operation can be determined analytically. The following artefact details the successful design, fabrication and testing of a motor powered slider-crank mechanism for the purpose of classroom demonstration and experimentation as a teaching aid.

5. ***Authentic tripolicy formulae structure, Category: Teachers Technological Innovation, Name: Kalituta Costa, Age 47 years, Sex: male, District: Solwezi, Region: North Western***

   Abstract missing….

6. ***No Title Project: Category: Teachers Technological Innovations, Name: Mhone Misheck, Age:..Sex:…Institution:…. Region: Southern A***

   Zambia currently has electric power deficiency; this has been so because of over dependence of rain fed production of over 90% of power needed. The other reason is less

investment in to other forms of power generation sources. This paper discusses some new methods in which power can generated. It might not be on industrial level now but small quantities for pupils in the disadvantage communities to use to charge phones and most importantly study when dark. It's cheap everyone can afford. Primarily it is designed for rural school going pupils to access. This power will be generated by themselves and have control though the concept of Bioelectricity which defined as electric potentials and currents produced by or occurring within living organisms.

7. ***Cathode ray oscilloscope, Category: Teachers Technological Innovations, Name: Mweemba Apex, Age: 27 years, Institution: Anchor Private, Region: Southern B***

   Physics (5124 or 5054) has a component of the learning topics Basic electrons, a topic with much importance in the field of science. In this topic, we find a sub-topic electron where we find an instrument called Cathode Ray Oscilloscope (CRO) an instrument of great importance in the world of science. Despite this great importance, many learners have challenges in fully understanding the concept behind the operations of this instrument called the cathode ray oscilloscope. This presentation is basically prepared to help teacher on how to help learners understand how a CRO instrument operate using a CRO model. A cathode Ray Oscilloscope model was basically made using plunks, metal plates, plastics and cables put.

D. Information Communication and Technology (ICT) (Software and Hardware)

1. ***No Title of Project, Category Six: Teacher ICT Innovations, Name: Mulenga Christian, Fatima Girls Secondary, Copperbelt Province***

   Automated Grading System intends to replace manual grading system to cut on inaccuracy and slowness in Managing Student Grades and add more time in Teaching and learning. It will help in serving time for teaching and learning of Computer, Mathematics and all the subjects and also giving Quality, accurate and appropriate feedback to the learners for them to focus in their academic Journey.

2. ***Web-Based/Online Notice Board System, Category and Entry: Information Communication Technology, Name: Mwaba Mordecai, Sex: Male, School: Mzigawa School, Grade: Teacher, Region: Eastern***

   Online notice board is a web-based application that creates a virtual conventional notice board analogous to the traditional notice board implementation of information sharing. It will allow members to subscribe by submitting their few credentials which they will use to participate in posting and reading notices on this online notice board and also logging in to the system. The system was developed using PHP, MySQL, Bootstrap, Html, JQuery, JavaScript and AJAX. During the development stage, UC browser was used. This idea came about after realizing that in Vubwi district, authenticated information flow remains a big challenge which needed serious attention, as there are still areas where there are communication challenges ranging from being outside coverage area to the use of foreign networks from our neighbouring country Malawi. Communication is very

important in every organization and information that is communicated at the right time allows people to make informed decision, delay in sharing important information has costed many people and individual organizations. I can cite an example from what transpired during the G9 Examination for 2018 where the papers were cancelled at short notice and thereby making some examination centers receiving this information late and this brought about chaos costing some workers as far as suspensions which were so unfortunate because this was due to urgent information flow gaps here and there. I therefore thought of bringing a solution on the table to curb and fill up the gap of authenticated information flow by presenting my offer of an online notice board system where in case of emergency or information sake, a post can be made available on such a platform and users can visit the site and read about that from a reliable and authenticated legit source. It is in this vain that i have thought through to bring about this solution to our district in the education sector to see to it that information is made available to all stake holders and actors for effective informed decision making and improved service delivery.

3. ***Automated School Management System - Siyanda Wilfred, Age: 29 Years, Teacher ICT Innovations, Mwense Secondary School, Region: Luapula***

   An Automated School Management System (ASMS) is a web base application system which maintains the information about the pupils enrolled in the school, Teachers, Classes, Hostels, Departments, school details and many more. This is very difficult to organize manually. Maintenance of all this information manually is a very complex task. The Automated School Management System has been designed to computerize and automate the operations regarding generation of report forms, analysis of results, generation of period registers, generation of consolidated mark schedules and all other operations pertaining to the effective and efficient running of schools. This computerization of school helps in many instances of its maintenances. It reduces the workload of management as most of the manual work done is reduced.

4. ***Online Examination System - Marvin Zimba, Information Communication Technology (ICT) Teacher, Sonshine, Region: Lusaka***

   With an increase in examination leakages and malpractices, the credibility of the examination system is being threatened. The government has a burden of spending a lot of money in reprinting exams in case of leakages, paying huge sums of money to markers.

5. ***Two clicks learner performance tracker, Category: Teachers/ ICT Innovations, Name: Chibiya Justine, Age: 47 years, Sex male, District: Kalumbila, Region: North Western***

   Today, teachers are confronted with two big challenges: with the need to learn about new technologies and how to integrate them into the teaching and learning process. This is not an easy process as teachers are faced with technologies with which the most of them are not familiar. Research shows that most schools have a challenge on how to sort out information issues in schools and many other institutions. For that reason many education system have been facing problems in analyzing pupil's results in terms of grades and passing rates at schools. This has been due to lack of knowledge on how to use a

computer. This project was meant to show how computers can help teachers in schools to analyze and track learner's performance within two clicks.

6. ***Twalusi Easy Learn, Category: Teachers/ ICT Innovations, Name: Simpande Derrick, Age:…. Sex:…..School:…….Region: Southern A***

   The Twalusi Easy Learn is Computer Based Learning (CBL) software which helps and guides learners without the presence of the teacher. It comes with a variety of optional subjects with user friendly navigation tools. It also comes with another variety of online educational links where learners can access information according to their preference.

7. ***AFJ JETS Web Portal, Category: Teachers/ ICT Innovations, Name: Jinga Frank Andrew, Age: 35 Years, Institution: Pemba Primary, Region: Southern B***

   A Web based dynamic Application software. This innovation was carried out to automate JETS innovations compilation and publication. The AFJ JETS Web portal is a system that will enable easier publication of JETS innovations done and skills displayed by different participants at JETS Regional and National fair. It enables Regional organisers to capture and submit innovation details onto a central database. It is from this database where the web portal will retrieve information (innovations) for public consumption. This system being web based makes it easier for different stakeholders to view available innovations and new innovations. This in turn will make it easier for investors to adopt or support these innovations. The essence is to have a system that will enable reduction on paper work.

E. Robotics Innovations

1. ***Data Transfer through use of Light, Category: Robotics Innovations, Name: Sikalinda Berry, Sonshine, Region: Lusaka***

   Whether you're using wireless internet in a coffee shop, stealing it from the guy next door, or competing for bandwidth at a conference, you've probably gotten frustrated at the slow speeds you face when more than one device is tapped into the network. As more and more people and their many devices access wireless internet, clogged airwaves are going to make it increasingly difficult to latch onto a reliable signal. Haas says his invention, which he calls D-Light, can produce data rates faster than 10 megabits per second, which is speedier than your average broadband connection. He envisions a future where data for laptops, smartphones, and tablets is transmitted through the light in a room. And security would be a snap—if you can't see the light, you can't access the data.

2. ***Making A Simple Moving Robot Using Local Materials, Category: Robotics Innovations, Name: Chilufya Mulenga, Age: 33 Gender: Male Grade: Teacher School: Kasama Secondary School Region: Northern***

   This project is about a moving robot that can be used to move groceries, papers, bread, etc in shops from one pint to another. It makes work easy especially those who work in big shops and malls. Instead of them using trolleys, a robot can help. The project uses very simple materials that are readily available even and can be accessed at home.

3. Olympiads

Category One: Early Childhood Education & Primary

A. Science Olympiad

1. Mwape Gracious, Age:11,Sex: Male, Grade:7, School: Kalilwe, Central
2. Einstein Kasala, Age:13, Sex: Male, Grade:7, School: Jack Moffat, Copperbelt
3. Shemaiah Chigali, Age:12, Sex: Male, Grde:7, Sch: Hebron Academy, Eastern
4. Miyambo Friday, Age: 14, Sex: Male, Grade: 7, School: Chile, Luapula
5. Gareth Lloyd,, Age:12, Sex: Male, Grade:7, School: Sonshine, Lusaka
6. Siwale Humphrey, Age: 12, Sex:Male, Grade: 9, Sch: Isoka Primary, Muchinga
7. Chilando Rabecca,, Age:13, Sex: Male, Grade:7, School: Stella Maris, Northern
8. Tembo Azaria, Age:12, Sex: Male, Grde:6,, Sch: Emmanuel I.Trust, N/Western
9. Kamera Princess, Age:11, Sex: Male, Grade:7, Sch: Ebenezer PVT, Southern B

B. Mathematics Olympiad

1. Rajamani Javinth, Age:11, Sex:Male, Grde:7, Sch:Maple Hurst, Central
2. Nehemiah Chishimba, Age: 13, Sex: Male, Grade: 7, Jack Moffat, Copperbelt
3. Mwanza Ivy, Age: 13, Sex: Female, Grade: 7, School: Kazulabowa, Eastern
4. Ngandwe Brian, Age: 13, Sex: Female, Grade: 7, School: Lwela, Luapula
5. Sakala Thabo Madalitso, Age: 12, Sex: Male, Grade: 7, Sonshine, Lusaka
6. Kanini Luyando, Age: 13, Sex: Male, Grade: 7, School: Muchinga
7. Simfukwe Wigan, Age: 13, Sex: Male, Grade:7,Mubanga Chipoya, Northern
8. Salazaku Jude, Age:12, Sex:Male, Grade:7, School: Meheba D. North Western
9. Kayiga Sempice, Age:12, Sex: Female, Grade:7, School:, Southern B

C. Quiz

1. Thabo Manyando, Age: 13, Sex: Female, Grade: 7, School: Jack Moffat, Copperbelt
2. Bertha Phiri, Age: 14, Sex: Female, Grade: 7, School: Jack Moffat, Copperbelt
3. Tembo Elisha, Age: 11, Sex: Male, Grade: 7, School: Mombe, Eastern
4. Msimuko Jedidiah, Age: 11, Sex: Male, Grade: 7, School: Mombe, Eastern
5. Chikondi Banda, Age: 12, Sex: Female, Grade: 7, School: Woodford, Lusaka

6. Phiri Tehillah, Age: 12, Sex: Female, Grade: 7, School: Woodford, Lusaka
7. Chitambo Emmanuel, Age: 13, Sex: Male, Grade: 7, School: Nseluka, Northern
8. Chibesa Gift, Age: 14, Sex: Male, Grade: 7, School: Nseluka, Northern
9. Mwansa Abraham, Age13, Sex:Male, Grade:7, Sch: Chimilute Trust, Southern A
10. Mayembe Mapala, Age: 13, Sex: Male, Grade: 7, Chimilute Trust, Southern A
11. Masaka Frank, Age: 12, Sex: Male, Grade: 7, Sch: Nakambala PVT, Southern B
12. Kaumba Desmond, Age:12, Sex: Male, Grade:7, Nakambala PVT, Southern B
13. Mary Mandandi, Age: 13, Sex: Female, Grade: 7, School: Sesheke, Western
14. Chileleko Shamoya, Age: 13, Sex: Male, Grade: 7, School: Sesheke, Western

Category Two: Junior Secondary

A. Science Olympiad

1. Ruzibiza Pervie, Age:13, Sex: Male, Grade:9, Serenje Boys Tech, Central
2. Phiri Jacob, Age:13, Sex: Male, Grade:9, School: Chassa Sec, Eastern
3. Kalumba Shadrick, Age:16, Sex: Male, Grade:9, Myengele Sec, Luapula
4. Mwansa Kingsley, Age: 14, Sex: Male, Grade: 8, School: Mpika, Muchinga
5. Chishimba Chilimba, Age:15, Sex: Male, Grade:9, Kasama Boys, Northern
6. Kapalu Jane, Age: 12 Sex: Female Grade: Solwezi Day Sec North Western
7. Phiri Tendai, Age:13, Sex: Female, Grade:9, Chimilute Trust, Southern A
8. Mutale Macdonald, Age: 14, Sex:Male, Grde:9, Sch: Canisius, Southern B

B. Mathematics Olympiad

1. Lukomba Temwani Age:13, Sex:Male, Grde:9, St John Paul Ii, Central
2. Chileshe Kafwilo, Age: 14, Sex:Female,Grade:9, Sch: Fatima Copperbelt,
3. Phiri Jacob, Age: 13, Sex: Male, Grade: 9, School: Chassa Sec, Eastern
4. Zulu Dalisto Age: 15, Sex: Male, Grade: 9, School: St. Clements, Luapula
5. Chitambala Joshua,Age:14, Sex: Male, Grde: 9, Sch: Chelstone, Lusaka
6. Sinkala George Age:14, Sex:Male, Grde:9, School: Isoka Boys, Muchinga
7. Kafwimbi Alex, Age: 14, Sex: Male, Grade: 9, School: Nsumbu Day Sec,
8. Muna Mark Age: 15 , Sex:Male, Grade:9, Solwezi Day, North_Western
9. Simunkazye Taizyai, Age:14, Sex: Male, Grde:9, Sch: Mukasa, Southern A
10. Kafumukache Blessedlita,Age:14,Sex:Female,Grde:9,StJoseph,Southern B

C. Quiz

1. Atotwe Jinaina, Age: 13, Sex: Female, Grade: 9, School: Kapiri Girls, Central
2. Musonda Patience, Age:13, Sex: Female, Grde: 9, Sch: Kapiri Girls, Central
3. Emmanuel Mubila, Age: 14, Sex: Male, Grde: 9, Sch: Masala Sec, Copperbelt
4. Martha Mwamba, Age: 15, Sex: Female, Grde: 9, Sch: Masala Sec,Copperbelt
5. Daliso Phiri, Age: 15, Sex: Male, Grade: 9, School: Anoya Zulu Sec, Eastern

6. Arnold Mwale, Age: 19, Sex: Male, Grade: 9, School: Anoya Zulu Sec, Eastern
7. Chiti Chanda Age: 13, Sex: Male, Grade: 9, School: Don Bosco Sec, Luapula
8. Mwanza Harrison Age: 14, Sex: Male, Grde: 9, Sch: Don Bosco Sec, Luapula
9. Sibalwa Lushomo, Age: 15, Sex: Male, Grde: 9, Sch: David Kaunda, Lusaka
10. Lungu Rodgers, Age: 13, Sex: Female, Grade: 9, Sch:David Kaunda, Lusaka
11. Thabo Nawa Age: 15 Gender: Male Grade: 9 School: Nakonde, Muchinga
12. Swila Sophia Age: 15 Gender: Female Grade: 9 School: Nakonde, Muchinga
13. Mwale Andrew, Age:16, Sex: Male, Grade:12, Mungwi Technical, Northern
14. Muma Hillary, Age:17, Sex: Male, Grade:12, Mungwi Technical, Northern
15. Selekanya Womba, Age: 15, Sex: Female,Grde:9,Sch: TumvwaniAnai, N/Western
16. Lubanda Clarise, Age: 14, Sex: Female, Grde: 9, Sch:TumvwaniAnai,N/Western
17. Chingwenembe Fitman, Age: 14, Sex:Male, Grade:9,School: Kings, Southern A
18. Chimwemwe Hope, Age: 14, Sex:Female, Grade:9, School: Kings, Southern A
19. Mulenga Oshea, Age: 14, Sex: Male, Grade: 9, School: Canisius, Southern B
20. Kalepa Davies, Age: 14, Sex: Male, Grade: 9, School: Canisius, Southern B
21. Imasiku Kaluwe, Age: 13, Sex: Male, Grade:8, School: Ilute Yeta Sec, Western
22. Sitali Blessing, Age: 14, Sex: Male, Grade: 9, School: Ilute Yeta Sec, Western

Category Three: Senior Secondary

A. Biology Olympiad

1. Mponde Richard, Age: 18, Sex: Male, Grade: 12, Mumbwa Boarding, Central
2. Samantha Malama, Age: 18, Sex: Female, Grade12, School: Ndola Nat., Copperbelt
3. Docas Chilembo, Age:17, Sex: Female, Grade:12, School: St.Monica's, Eastern
4. Chilombo Mercy Age: 17 Sex: Female Grade: 12 School: Musonda Girls, Luapula
5. Chongo Benjamin, Age:17, Sex: Male, Grade:12, School: David Kaunda, Lusaka
6. Ngulube Julius, Age: 19, Sex: Female, Grade: 12 School: Chinsali, Muchinga
7. Ndalama Sally, Age:17, Sex: Female, Grade:12, School: Lunte Technical, Northern
8. Musulo Boaz Age: 17, Sex: Male,Grde:12,School:Meheba Boarding, North Western
9. Moono Owen, Age:18, Sex: Male, Grade:12, School: Namwala Centre, Southern A
10. Sikalima Mapesho, Age:16, Sex: Female, Grade:12, School, Southern B
11. Kansabwa Royd, Age:17, Sex: Male, Grade:12, School: Kambule, Western

B. Chemistry Olympiad

1. Mwansa Chalwe Age: 17, Sex: Male, Grade: 12, School: Kabwe Sec, Central
2. Shadreck Nyirongo, Age: 17, Sex: Male, Grade:12, Chililabombwe Sec, Copperbelt
3. Mzyeche Liwa, Age: 17, Sex: Male, Grade:12, School: Chizongwe Tech, Eastern
4. Kasama Kunda, Age: 18, Sex: Male, Grade: 12, School: Lubwe Secondary, Luapula
5. Mulenga Ben Age: 17, Sex: Male, Grade:12, School: David Kaunda, Lusaka
6. Sichula Jerome, Age: 19, Sex: Male, Grade: 12, School: Muchinga Day, Muchinga
7. Simukonda Kingsley Age: 17, Sex: Male, Grade:12, School: Mungwi Tech, Northern
8. Sawanda Gift, Age: 17, Sex: Male, Grade: 12, Solwezi Urban, North_Western
9. Bwalya Humphrey, Age: 18, Sex: Male, Grade:12, School: St.Raphael, Southern A
10. Silungwe Mulonda, Age: 17, Sex: Male, Grade:12, School: Canisius, Southern B
11. Liywa Aongola, Age:19, Sex: Male, Grade:12, School: Limulunga, Western

C. Mathematics Olympiads

1. Chipulu Mapalo, Age: 18, Sex: Female, Grade: 12, School: Kabwe Sec, Central
2. Ezekiel Sichende, Age:18, Sex: Male, Grade:12, School: St. Marcelline, Copperbelt
3. Mvula A.Richard, Age:18, Sex: Male, Grade:12, School: Chipata Day, Eastern
4. Mwelwa Sherherd, Age: 18, Sex: Male, Grade: 12, School: Samfya Sec, Luapula
5. Kaleka Patrick, Age:17, Sex: Male, Grade:12, School: David Kaunda, Lusaka
6. Sichinga James, Age: 19, Sex: Male, Grade:12, School: Isoka Boys, Muchinga
7. Sinkamba Nkumbu, Age:16, Sex: Male, Grade:12 School: Kasama Boys, Northern
8. Kaleji Noah, Age: 17, Sex: Male, Grade:12, School: Solwezi Day Sec, North Western
9. Mumba Bornface, Age:17, Sex: Male, Grade:12, School: David L/stone,Southern A
10. Siluonde Niza, Age:17, Sex: Male, Grade:12, School: Canisius, Southern B
11. Mapembo Corday, Age:17, Sex: Male, Grade:12, School: Kaoma, Western

D. Physics Olympiad

1. Mwiinga Stanely, Age:18, Sex: Male, Grade: 12 School: Highridge Sec, Central
2. Emmanuel Sichivula, Age:18, Sex: Male, Grade:12, Katanshi Sec, Copperbelt
3. Mwamba Mukuka, Age:17, Sex: Male, Grade:12, School: Chassa Sec, Eastern
4. Mambwe Lovemore, Age: 18, Sex: Male, Grade: 12, School: Lubwe Sec, Luapula
5. Phiri Isaac, Age:17, Sex: Male, Grade:12, School: David Kaunda, Lusaka
6. Chanda Mushota, Age: 18, Sex: Male, Grade: 12, School: Chinsali Day, Muchinga
7. Chilufya Chansa, Age: 16, Sex: Male, Grade: 12, School: Kasama Boys, Northern
8. Musumya Pathias, Age:17, Sex: Male, Grade:12, Solwezi Day, North Western
9. Munyama Aaron, Age:17, Sex: Male, Grade:12, School: Hillcrest, Southern A
10. Nchimunya Milimo, Age: 17, Sex: Male, Grade:12, School: Canisius, Southern B
11. Chinya Anold, Age: 17, Sex: Male, Grade:12, School: Kanyonyo, Western

E. Quiz

1. Kazombo Chinyama ,Age: 17 Sex: Male, Grde: 12, Serenje Boys Tech, Central
2. Kumwenda Kumbukani, Age:17 Sex: Male, Grde:12,School:Serenje Boys, Central
3. Luckson Sinjela, Age: 16, Sex: Male, Grade: 12, School: Lubuto Sec, Copperbelt,
4. Chisaba Chisanga, Age: 17, Sex: Male, Grade: 12, School: Lubuto Sec, Copperbelt,

5. Pethias Chikonde, Age: 18, Sex: Male, Grade: 12, School: Anoya Zulu, Eastern
6. Martin Zimba, Age: 19, Sex: Male, Grade: 12, School: Anoya Zulu, Eastern
7. Rose Chisanga Age: 18, Sex: Female Grade: 12 School: Musonda Girls, Luapula
8. Sakamuna Given Age: 17, Sex: Female Grade: 12 School: Musonda Girls, Luapula
9. Mulenga Ben, Age: 17, Sex: Male, Grade: 12, School: David Kaunda, Lusaka
10. Phiri Isaac, Age: 17, Sex: Male, Grade: 12, School: David Kaunda, Lusaka
11. Chitalima Mwiza, Age: 17, Sex: Male, Grade:11, Chinsali Day Sec, Muchinga
12. Namutowe Tasha, Age:18, Sex: Female,Grde:11, Chinsali Day Sec, Muchinga
13. Chilufya Chansa, Age: 16, Sex: Male, Grade: 12, School: Kasama Boys, Northern
14. Sinkamba Nkumbu, Age: 16, Sex: Male, Grade: 12, School: Kasama Boys, Northern
15. Kapemda Edina, Age:17,Sex:Female,Grade:12,School: Mukinge, NorthWestern
16. Malenji Mable Age: 16 Sex: Female Grade: 12 School: Mukinge, NorthWestern
17. Munkombwe Berrlyce, Age: 18, Sex: Male, Grade:12, School: St.Marks, Southern A
18. Kabenya Aphias, Age: 18, Sex: Male, Grade:12, School: St. Marks, Southern A
19. Katanda Alfred, Age: 17, Sex: Male, Grade:12, School: Munyumbwe, Southern B
20. Mayumbu Isaac, Age: 17, Sex: Male, Grade:12, School: Munyumbwe, Southern B
21. Mapembo Corday, Age: 17, Sex:Male, Grade:12, School: Kaoma Sec, Western
22. Mundia Mwangelwa, Age: 17, Sex: Male, Grade:12, School: Kaoma Sec, Western

Category Four: Skills

A. Bricklaying

1. Mutasa West, Age: 16, Sex: Male, Grade: 11, School: Kabwe Skills, Central
2. Banda Allif, Age: 18, Sex: Male, Grade:12, School: Twalubuka Sec, Copperbelt
3. Banda Muleza, Age: 19, Sex: Male, Grade: 9, School: Mphamba CCAP Day, Eastern
4. Mwape Emanuel, Age: 99, Sex:Male, Grade:12, School: Milenge Sec, Luapula
5. Chalwe Gift Age: 17, Sex: Male, Grade: 11, School: Munali Boys Sec, Lusaka
6. Musakanya Emmanuel, Age: 17, Sex: Male, Grade:11, Chitulika, Mpika, Muchinga
7. Mwamba Chomba Maybin, Age: 16, Sex: Male, Grade: 12, Mukanga, Northern
8. Chirwa Macdonald, Age:17, Sex: Male, Grade:12, School: Soltech, North_Western
9. Moonde Victor, Age: 19, Sex: Male, Grade:12, School: Zimba Sec, Southern A
10. Hamaundu Steven, Age:12, Grade:12, School: Siavonga Sec, Southern B
11. Mike Chilwalo, Age: 18, Sex: Male, Grade: 12, School, Sesheke Sec, Western

B. Carpentry and Joinery

1. Shanduba Meleck, Age:17, Sex: Male, Grade:11, School: Mumbwa Sec, Central
2. Kasaloka Douglas, Age: 17, Sex: Male, Grade:12, Twalubuka Sec, Copperbelt,
3. Innocent Mfune, Age: 18, Sex: Male, Grade:12, Chizongwe Tech Sec, Eastern
4. Mumba John, Age: 99, Sex: Male, Grade: 12, School: Mansa Trades, Luapula
5. Kalwizi Edmond, Age: 18, Sex: Male, Grade:12, School: Lusaka Boys, Lusaka
6. Kunda Luise, Age: 17, Sex: Male, Grade:12, School: Kasama Boys, Northern
7. Tembo Chakufa, Age: 18, Sex: Male, Grade: 12, Chitulika Seco, Mpika, Muchinga
8. Emmanuel Mulenga, Age: 11, Sex: Male, Grade: 11, Solwezi Skills North Western
9. Haluwa Mwendalubi, Age: 19, Sex: Male, Grade:12, Choma Sec, Southern A
10. Hamangaba Hamungu,Age: 19, Sex: Male, Grade:12, Pemba Sec, Southern B
11. Lipenda Daniel, Age: 17, Sex: Male, Grade:12, School: Kambule Sec, Western

C. Electrical Installation

1. Choboola Maunga, Age:18, Sex: Female, Grade: Kapiri Girls Tech, Central
2. Zimba Zizwachi, Age: 18, Sex: Male, Grade:Out of School, Copperbelt

3. Innocent Mwanza, Age: 17, Sex: Male, Grade:11, School: Kafumbwe Sec, Eastern
4. Njeko Saviour,Age:17, Sex: Male, Grade: 12, School: Mansa Trade, Luapula
5. Mande Mapalo, Age: 16, Sex: Male, Grade:11, School: Munali Boys Sec, Lusaka
6. Mulenga Osward, Age: 18, Sex: Male, Grade:12, Kalwala Day Sec, Chins, Muchinga
7. Sikazwe Daries, Age: 18, Sex: Male, Grade:12, School: Kasama Boys, Northern
8. Kyakilika Bupe, Age: 17, Sex: Male, Grade:11, Meheba Boarding, North Western
9. Bwali Prosper, Age:19, Sex: Male, Grade:12, School: Kalomo Sec, Southern A
10. Kasanda Benedict, Age:15, Sex: Male, Grade:10, School: Rusangu Sec, Southern B
11. Kafutubiji Venias, Age: 20, Sex: Male, Grade:12, School: Kalabo Sec, Western

D. Fashion Technology

1. Monica Musonda, Age: 18, Sex: Female, Grade: 12, Mpelembe Sec, Copperbelt
2. Banda Patricia, Age: 17, Sex: Female, Grade: 12, School: Kasenengwa Sec, Eastern
3. Mulenge Sylvester,Age: 18, Sex:Male, Grde:12, School: Mansa School CE, Luapula
4. Zulu Deborah, Age: 20, Sex:Male, Grde:12, School: Kamwala Sec, Lusaka
5. Chama Aaron, Age: 16, Sex: Male, Grade: 12, School: Kapinda Sec, Northern
6. Kapeya N Beatrice, Age: 19, Sex: Female, Grade: 11, Chinsali Girls, Muchinga
7. Chabala Dorcus, Age: 16, Sex: Female, Grade: 11, Meheba Boarding, North Western
8. Munyanga Ronald, Age: 17, Sex: Male, Grade: 11, School: Jembo Sec, Southern B
9. Moonga Potpher, Age: 20, Sex: Male, Grade: 12, School, Kambule Sec, Western

E. Food Technology

1. Lungu Grenda, Age: 17, Sex: Female, Grade: 12, Chindwin A Sec School, Central
2. Veronica Bwanga, Age: 17, Sex: Female, Grade:12, School: Ibenga Girls, Copperbelt
3. Kabuse Daisy, Age: 17, Sex: Female, Grade:12, School: Lundazi Day Sec, Eastern
4. Chola Cabre Linah, Age: 17, Sex: Female Grade: 12, New Matero Sec, Lusaka
5. Kapema Foster, Age: 18, Sex: Female Grade: 12 School: Missing... Luapula
6. Kalikeka M Mary, Age: 18, Sex: Female, Grade: 11, Sch: Lwitikila Girls, Muchinga
7. Chansa Gift, Age: 16, Sex: Female, Grade:12, School: Kasama Girls Sec, Northern
8. Ng'andu Memory, Age: 17, Sex: Female, Grde: 12, Meheba Sec, North Western
9. Kayinjelwa Ackim, Age: 16, Sex: Male, Grade: 12, School: Choma Sec, Southern A
10. Muyumbwe Anita, Age: 16, Sex: Female, Grade: 11, Makoye Sec, Southern A
11. Chawezi Gift Tembo, Age: 18, Sex: Male, Grade: 12, School: St. Johns Sec, Western

F. Landscaping and Gardening

1. Mubanga Godfrey, Age: 18, Sex: Female, Grade: 12, Makululu Day Sec, Central
2. Mulenga Kateule, Age:18, Sex:Male,Grade:12,School:Butondo Sec, Copperbelt
3. Siantumbu Raymond, Age:17,Sex:Male, Grade:11, School: St.Francis Copperbelt,
4. Mwale Peter, Age: 18, Sex: Male, Grade:11, School: Nyimba Sec, Eastern
5. Sakala Oscar, Age: 18, Sex: Male, Grade:12, School: Nyimba Sec, Eastern
6. Chisenga Lungu, Age: 18, Sex: Male, Grade:12, School: David Kaunda, Lusaka
7. Phiri Onious, Age: 17, Sex: Male, Grade:12, School: David Kaunda, Lusaka
8. Mulyansalu Danny, Age:18, Sex: Male, Grade: 12,School:Chitulika Sec, Muchinga
9. Chama Emmanuel, Age:19 Sex: Male, Grade: 12, School: Chitulika Sec, Muchinga
10. Mulenga Elvis, Age: 17, Sex: Male, Grade:12, School: Kasama Skill, Northern
11. Mulenga Raphael, Age:17,Sex: Male,Grade:12, School:Kasama Skill, Northern
12. Lupinda Bedon, Age: 17, Sex: Male, Grade: 11 School: Kabompo, North Western
13. Biemba Mengo, Age:16, Sex: Male, Grade: 12, School: Choma Sec, Southern A
14. Ndui Allan, Age:18, Sex:Male, Grade:12, School:Choma Sec, Southern A
15. Chipo Chindima, Age:17, Sex: Male, Grade:11, School:Rusangu, Southern B
16. Sejani Elijah, Age:17, Sex: Male, Grade:11, School: Rusangu Sec, Southern B
17. Mukela Nawa, Age: 18, Sex: Male, Grade: 11, School: Kalabo Sec, Western
18. Sikota Namatama, Age:17, Sex:Female, Grade:11, School:Kalabo Sec, Western

G. Wall and Floor Tiling

1. Tolopo Blessing, Age: 17, Sex: Male, Grade: 11, School: Mukobeko Sec, Central
2. Margrate Mukuka, Age: 17, Sex: Female, Grade:12, School: Mufulira, Copperbelt
3. Mbewe Sandwell, Age: 18, Sex: Male, Grde: 9, Mphamba CCAP Day, Eastern
4. Bweupe Everty, Age: 17, Sex:Female, Grade: 12, Mansa School For Cont. Luapula
5. Sinkala Shadreck, Age: 19, Sex: Male, Grade:11, School: David Kaunda, Lusaka
6. Chiwala Ronald, Age: 19, Sex: Male, Grade: 12, Chinsali Day Secondar, Muchinga
7. Mukuka Castro, Age: 18, Sex: Male, Grde:12, School: Mbala Boarding Sec, Northern
8. Mukolo Chiza, Age:16, Sex: Male, Grade: 10 School: Soltech, North_Western
9. Phiri Obert, Age:17, Sex:Male, Grade: 12, School: Zimba Sec, Southern A
10. Mapulanga Joseph, Age:14, Sex:Male, Grade: 10, School: Rusangu Sec, Southern B
11. Simukonde Amos, Age:21, Sex: Male, Grade:11, School: Kalabo Sec, Western

H. Welding

1. Miyoba Choolwe, Age: 16, Sex: Male, Grade: 11, Chisamba Day Sec, Central
2. Foloko Kelvin, Age: 18, Sex: Male, Grade:12, School: Shimukunami, Copperbelt
3. Phiri Martin, Age: 19, Sex: Male, Grade:12, School: Lundazi Day Sec, Eastern
4. Richard Chishimba, Age: 18, Sex: Male, Grade: 12, School: Mansa Trades, Luapula
5. Bwalya Amon, Age: 19, Sex: Male, Grade: 11, Kalwala Secondary, Muchinga
6. Kantepa Funwell, Age: 17, Sex: Male, Grade:12, Mungwi Tech Sec, Northern
7. Chimuku Francis, Age: 16, Sex: Male, Grade: 10, Meheba Boarding, North Western
8. Kapepu Moses, Age: 16, Sex: Male, Grade:12, School: Linda Sec, Southern A
9. Mulube Obrine, Age: 17, Sex: Male, Grade:10, School: Pemba Sec, Southern B
10. Muyenga Bumango, Age: 18, Sex:Male, Grade: 12, School: Matauka Sec, Western

J. Panel Beating and Spray Painting

1. Mpoha Muchinga, Age: 16, Sex: Male Grade: 11 School: Serenje Boys Tech, Central
2. Banda Joyce, Age: 16, Sex: Female, Grade: 12, School: Tug Argan, Copperbelt
3. Banda Ernest, Age: 18, Sexr: Male, Grade: 11, School: Nyimba Boarding, Eastern
4. Chimpo Elizabeth, Age: 17, Sex: Female, Grade: 12, Mansa School For Con, Luapula
5. Tapiwa Banda, Age:17, Sex: Female, Grade: 12, Roma Girls Sec, Lusaka
6. Chama Emmanuel, Age: 20, SEx: Male, Grade: 12, Chinsali Day, Muchinga
7. Chimwasu Wana, Age: 17, Sex: Male, Grade: 12, Meheba Boarding, North_Western
8. Tembo Mike, Age: 16, Sex: Male, Grade:12, School: Linda Sec, Southern A
9. Habulembe Ishmeal, Age: 16, Sex: Male, Grade:11, School: Rusangu, Southern A
10. Bruce Samboko, Age: 19, Sex: Male, Grade:12, School: Sesheke Sec, Western

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Junior Engineers, Technicians and Scientists (JETS)
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