



PROPOSED DESIGN FOR A FUNCTIONAL

Secondary School Computer Laboratory

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Chapter 1 - Introduction

Digital literacy is an essential skill that students should be well equipped with. ICT, STEM, Robotics are skills that should be learnt practically in secondary schools. This tends to provide better opportunities for students and also expose them to the world of technology at a young age before they get into the higher institutions. Students who are privileged to get acquainted with these skills tend to be ahead of others in the job market.

A well designed computer lab is at the forefront of promoting this initiative and achieving this objective. It is essential that secondary schools provide their teachers and students with access to cutting-edge computer laboratories to promote learning.

However, there are lots of factors to be put into consideration in the design of a modern day laboratory.

Influencing Factors under Consideration

Some of the influencing factors to put into consideration in the design of a standard ICT laboratory for secondary schools is highlighted below

i. Space

Space is a very crucial factor to put in designing a laboratory. A well functional laboratory has to take into consideration the number of students expected to use the laboratory, the equipment required, the necessary safety measures, flexibility in the arrangement of chairs and equipment. It should also be designed with ergonomics in mind, to ensure that students can work comfortably.

ii. Equipment

Equipment is a factor just as crucial as space is. Modern equipment to put into consideration for a functional laboratory for ICT, STEM and robotics activities laboratory include:

- **Computers:** Desktops, laptops, tablets, and server
- **Peripherals:** Printers, scanners, projectors, and interactive whiteboards
- **Networking equipment:** Routers, switches, hubs, and access points
- **Storage devices:** such as Hard drives, solid-state drives, flash drives, and memory cards
- **Input devices:** Keyboard, mouse, microphone, and digital cameras
- **Output devices:** Speakers, headphones, and digital displays
- **Communication devices:** Modems, fax machines, and telephones

- **Security equipment:** Firewalls, antivirus software, and intrusion detection systems
- **Software:** Operating systems, productivity software, graphics software, and programming languages
- **Mobile devices:** Smartphones, tablets, and wearable technology.
- **Robotics:** Robot kits, Sensors, controllers(Arduino, Raspberry Pi, and BeagleBone Black), Actuators, Computer-Aided Design (CAD) software
- **The durability of the equipment** and the ability to get spare parts at the event of failure shall also be considered.

Iii. Ergonomics

This shall be considered effectively when designing a laboratory. Students' comfort and their safety shall be considered. The chairs and tables shall be adjustable enough to accommodate different heights and body types. The lighting shall be sufficient to prevent eye strain.

Iv. Accessibility:

The laboratory should be very accessible to students with disabilities. This will necessitate the use of ramps, elevators, or other necessary equipment to ensure that all students can use the facility

v. Security

The laboratory should be designed with security measures such as CCTV cameras, access control systems, and fire alarms in situations of fire outbreaks in order to ensure the safety of the students and the equipment.

vi. Curriculum

The laboratory should be designed to adhere to the school's curriculum. School curriculum related to ICT, STEM and robotics must be put into consideration and effort must be made to design the laboratory in such a way it provides students the skills needed to excel in those areas. The laboratory should also provide a good platform that allows students to try out new technology and promote innovativeness amongst them. Below consist of the recommended curriculum for ICT, STEM and robotics.

Foundation Curriculum: Digital Literacy and ICT	General: STEAM	Specialization: Robotics	Specialization: Advanced Robotics
<ul style="list-style-type: none"> • Understanding the basic concepts of digital technology • Introduction to computer hardware, software, and operating systems. • Basic computer troubleshooting and maintenance. • Introduction to productivity software (word processing, spreadsheet, and presentation software) • Introduction to Internet research. • Advanced computer troubleshooting and maintenance. • Advanced use of productivity software (word processing, spreadsheet, and presentation software). • Advanced internet research and online safety. • Web development and design. • Introduction to game development. • Introduction to video and audio production. 	<ul style="list-style-type: none"> • Introduction to the scientific method and engineering design process. • Basic arithmetic and science concepts related to STEAM. • Introduction to coding and programming concepts. • Application of the scientific method and engineering design process to solve real-world problems. • Advanced arithmetic and science concepts related to STEAM. • Introduction to digital tools for data analysis and visualization. • Introduction to 3D printing. • Advanced arithmetic and science concepts related to specific fields like physics, biology, and chemistry. • Digital tools for modeling and simulation. • Introduction to artificial intelligence and machine learning. 	<ul style="list-style-type: none"> • Introduction to robotics and the basic components of a robot. • Basic programming concepts related to robotics. • Building and programming a basic robot. • Advanced programming concepts related to robotics. • Building and programming more complex robots with specific applications (autonomous vehicles or drones). 	<ul style="list-style-type: none"> • Introduction to types of sensors used in robotics (light sensors, touch sensors, and ultrasonic sensors). • Introduction to types of actuators used in robotics (motors and servos) • Interfacing sensors and actuators with a microcontroller. • Introduction to robot control systems (open-loop and closed-loop control). • Introduction to feedback control and PID control. • Programming Robot's movement using control systems.

vii. Connectivity

The computer laboratory must have a reliable and fast internet connection to enable students to access online resources and collaborate with others.

Chapter 2 - Planning and Designing the Computer Laboratory

Without planning, we are preparing for a big failure, and that's why we put into account the location, human and facility capacity, and flooring, which are necessary factors in the design of the computer laboratory.

Ensuring the computing laboratory is accessible is very important hence, we take this into account when choosing a suitable location for setting up our laboratory.

NB: *The structure to be used in terms of the arrangements of the computer systems and the number of computer systems that can be installed are highly dependent on the size of the available space.*

Location

The purpose of this laboratory is to allow students to interact with the computers as the instructor directs (primarily for teaching purposes). Since this will be a computer laboratory for a secondary school, we propose to select a room from the school building as the location of the laboratory. We will choose a room that has plenty of evenly spaced outlets and enough space to fit the number of computers we want to have in the lab. For this project, we will opt for a square room with sharp angles. Depending on the structure of the school, the computer laboratory should be easily accessible by the students and their instructors.

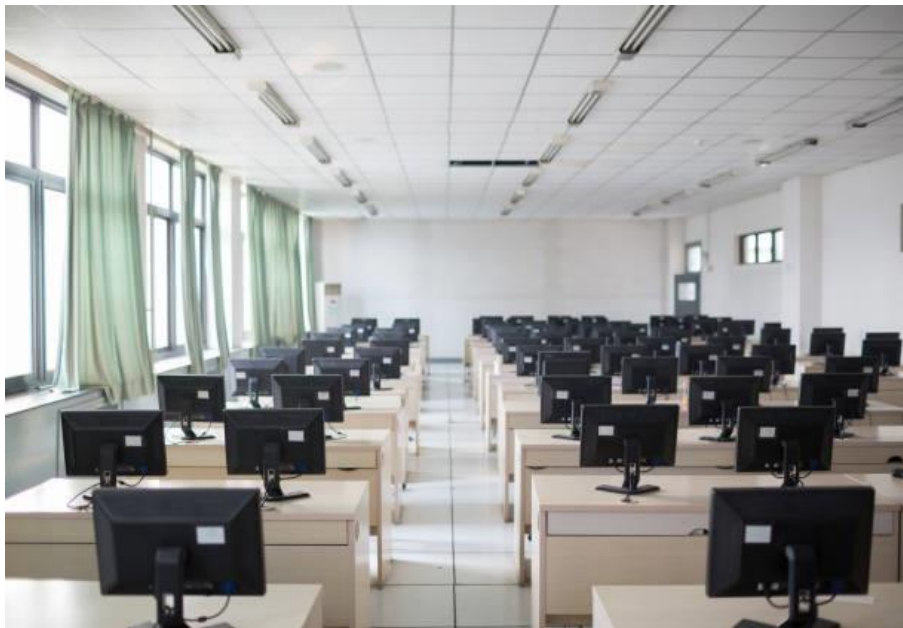
Detailing the Laboratory

Structure of the lab

- A fairly large square room with sharp angles.
- Large double windows on each side of the rows.
- Two diagonal doorways across the room; both serving as points of entry and exit.
- Large whiteboard placed at the front of the class, in the center.
- Air conditioning units at each vertex of the lab.
- Two fans on each row of the lab.



Computer laboratory sample image



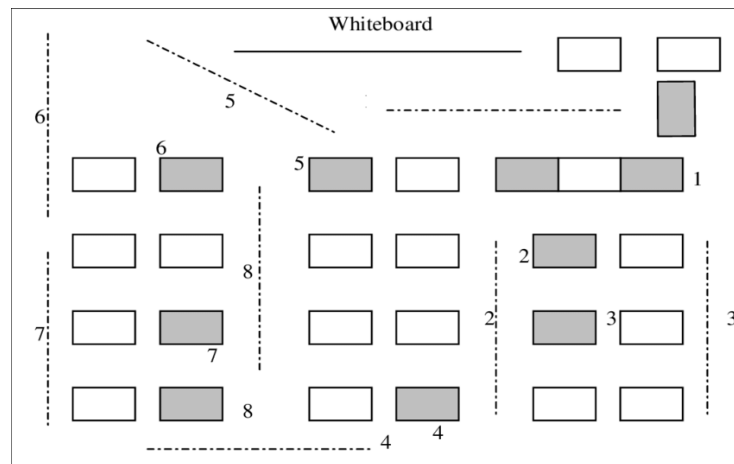
Computer laboratory sample images - from this images, the laboratory is rectangle space with sharp edges, there are large windows on each side of the room. The second image show one of the doors (entry) to the laboratory, the other door will be on the other side of the room for exit. An air conditioner can also be sighted in the second image.

Source - Google images

Layout of the laboratory

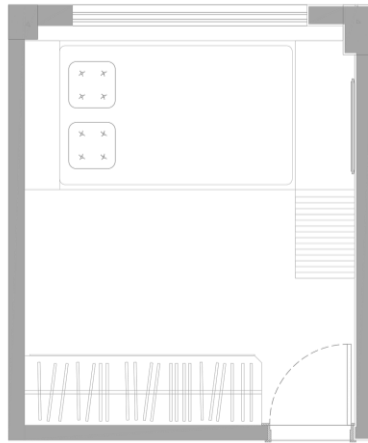
We propose that the computer laboratory be 9 m by 8 m (72 square meters or 775 square feet), which is able to comfortably contain 40 students and 2 instructors, along with the necessary facilities and equipment. Out of the entire laboratory size, a cubicle (about 10

square meters) will be created to store equipment like a printer, scanner, robotic kits, etc. that will not be easily accessible to the students unless permission is granted.



Computer laboratory layout - The rectangles represent computers, and the dashed lines represent the pupils' walk paths. The numbers indicate which group was assigned to which computer and which walk path.

Source - https://www.researchgate.net/figure/Set-up-of-the-computer-laboratory-dimension-9m-8m-The-rectangles-represent_fig1_251715268



Computer laboratory cubicle for storage sample

Source - Google images

Flooring

We recommend a raised floor. This flooring system provides easy access to the wires, cables, and pipes under the floor. After installation, it can be covered with a variety of finishes, such as carpet tiles, wood, or rubber tiles.

It is important that, before ordering a raised floor panel, we consider the load-bearing capacity, cables, maintenance, and budget accessibility. For this computer laboratory, we will use the High Pressure Laminate (HPL) and will be 6 inches above the ground.



Furniture needs and options

The height of the desks that the computers are placed on is very important. The ideal desk height is one that allows users to type on the keyboard with their arms parallel to the desk. Chairs with adjustable heights are the best option for a computer lab so that all users can be comfortable while working. More on the furniture requirements can be found in Chapter 3.

Seating Layout

A classroom-computer laboratory (instructional computer) layout is recommended for this type of lab as it enables students to learn topics from an instructor (or whiteboard) at the front of the room while allowing instructors to see the faces with which to read non-verbal cues as to whether students need more help. More on the seating layout can be found in Chapter 3.








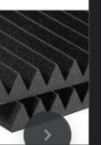
Sound System

A computer room needs to be provided with an adequate sound system to enhance proper communication with clarity and ease. Due to the size of the computer room, a medium sized, rechargeable, and Bluetooth speaker and microphone would be used. It also would aid in playing audio from the projected slide or somewhere else.



Soundproofing Requirement

A computer laboratory has twice the noise sources as a non IT classroom because, in addition to the normal noise sources as other classrooms (students, chairs, antsy feet, lights, HVAC, and general school ambient noises) you also have computer systems – each one with it's on cooling fan(s), monitors, printers, keys clicking, mouse clicking, chairs rolling around etc. Soundproofing equipment will be necessary for the proposed computer laboratory to reduce noise generated in this laboratory. We recommend for this purpose the soundproofing foam acoustical wall panel.

							
Vicoustic Flat Panel VMT Wall and...	Luxor RECLAIM Acoustic Room...	Luxor RECLAIM Acoustic Room...	12 Pack Set Acoustic Foam...	Vicoustic Flat Panel VMT Wall and...	Ultimate Support 2" Wedge-Style...	Acoustic Foams And Soundproofin...	Auralex 2 x 24 x 24 Studiofoam Wedg...
NGN 202,734.59 B&H Photo-Video-...	NGN 207,791.41 B&H Photo-Video-...	NGN 221,049.97 B&H Photo-Video-...	NGN 27,527.00 Ubuy Nigeria	NGN 405,930.99 B&H Photo-Video-...	NGN 133,920.28 B&H Photo-Video-...	NGN 4,500.00 Jumia.com.ng	NGN 27,242.17 B&H Photo-Video-...
\$439.00 + tax	\$449.95 + tax	\$478.66 + tax		\$879.00 + tax	\$289.99 + tax		\$58.99 + tax

Soundproofing equipment and their prices in Nigeria (<https://www.bhphotovideo.com> and <https://www.jumia.com>)

In case there is no space for the computing center with the floor plan or structure required, construction of a new building will be recommended.

Chapter 3 - Furniture Arrangements

We propose to design an instructional computer laboratory. An instructional lab is a specialized type of computer lab that is designed specifically for teaching purposes.

Asides from equipping the instructional computer lab with specialized hardware and software that is used to facilitate learning and provide hands-on experience to students, the furniture arrangement should also be designed to promote a conducive and productive learning environment. Below, we propose to install some furniture and gadgets that are recommended for a functional computer laboratory.

3.1 Seating Arrangement & Desk Configuration

3.1.1 Student Chairs and Computer Desks

We propose to install chairs and desks that are comfortable and adjustable (i.e. ergonomic) to suit the different sizes of students in the lab. We recommend purchasing ergonomic chairs and desks to reduce strain on the eyes, neck, and back of the students.

The size of these chairs are usually between 40-50cm. Ergonomic chairs have adjustable good back and height to allow students to access different parts of the desk without straining. We recommend having at least 1 chair per desk.

We recommend measurements for the desk to be at least 8feets long and 4feets wide. Each desk should have enough space to accommodate at least seven computers, keyboards, and mice.



Ergonomic chairs and their prices in Nigeria (<https://www.konga.com> and <https://www.jumia.com>)



Ergonomic desk (https://meet.wustl.edu/wp-content/uploads/2017/04/Room_100_Training_Desk.jpg)
Price of each desk is about \$483,000 each (<https://m.indiamart.com/proddetail/conference-table-18187318330.html>)

3.1.2 Space between desks

We propose a lab that has enough space to allow students and instructors / teachers to move freely between the desks. We plan to have a minimum of 36 inches of space in between each desk to allow for comfortable movement and easy access to the computer.

3.1.3 Teacher's Desk and Chair

We plan to provide a teacher's desk and chair to allow the teacher to conduct lessons and supervise students' activities in the lab. The desk will be large enough to accommodate a computer and other materials. The chair will also be comfortable and adjustable.

3.1.4 Projector and Screen

We also plan to provide a projector and screen to allow the teacher to present materials to the class. The projector will have a minimum brightness of 3000 lumens and a resolution of at least 1024x768. We propose to install one alongside a screen that is large enough to allow all students to see the presentation.

3.1.5 Whiteboard

We plan to install a whiteboard to allow the teacher to write notes and diagrams for the students to follow. The board will be large enough to allow the teacher to write clearly and the students to see from their desks.



L-R: Teacher's desk and computer, long whiteboard and large projector screen. https://meet.wustl.edu/wp-content/uploads/2017/04/Room_100_Training_Desk.jpg

3.1.6 Storage Cabinets

The storage cabinet would be located at the corridor of the computer room to allow students to drop their bags and luggage in there before going into the computer room. This is majorly to avoid petty theft and disrupting of wires and cables with bag ropes and handles. Also to avoid taking in food substances into the lab. Students are only permitted to go into the lab with their writing materials.



3.1.7 Fire Extinguisher

In case of a fire outbreak, a fire extinguisher is to be made use of, before the fire service officials shows up. Because electronic gadgets are in the computer laboratory, gaseous CO₂ extinguishers or residue-free extinguishers such as water mist extinguishers containing deionized water would be used.



<https://www.fireproof.com.ng/shop/fire-proof-services/fire-extinguisher-refilling-servicing/co2-extinguishers/refill-service-of-5kg-co2-fire-extinguishers/>

3.1.8 Other Gadgets

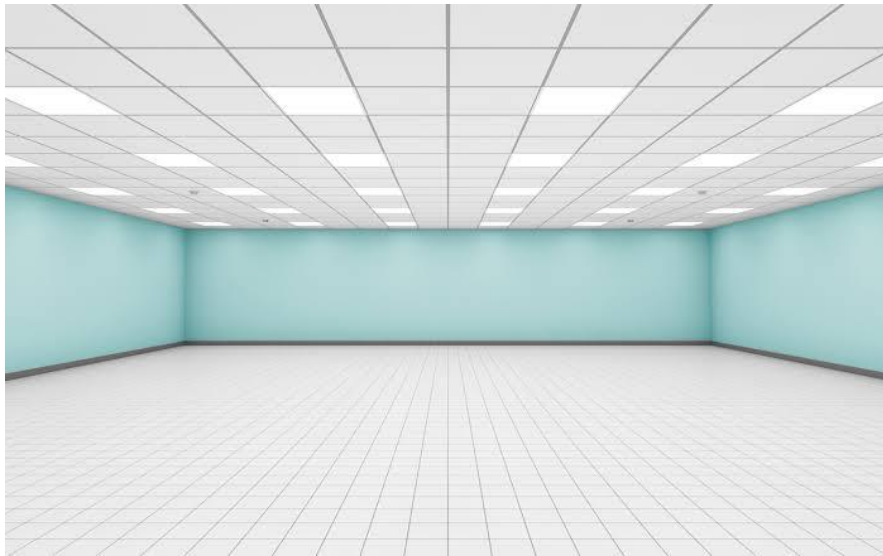
Other gadgets that we propose to be included in the computer lab are a printer, scanner, and external hard drive.

3.2 Power

We propose power outlets and network ports that are strategically located within easy reach of each student's desk. The following are the proposed installations:

3.2.1 Lighting and Backup

We plan to install indirect LED panel light fixtures to provide an ambient light source for satisfactory illumination and to avoid veiling glare on computer screens. There will also be a provision of Uninterruptible Power Supply (UPS) to provide power in the event of a power outage or voltage drop ensuring that all devices receive clean and stable power.



Indirect LED panel light to avoid veiling glare on computer screens

[Edge-Lit LED Technology](#)

3.2.2 Sockets/Cable Management

There will be a provision of Grommet-mounted sockets that will be installed directly into a hole in the desk, providing a clean and tidy solution for power and data connections. This will be provided for every workstation to get rid of complicated wiring and keep floors clear of wiring.



Grommet-mounted sockets that to be installed directly into a hole in the desk [Floorbox](#)

3.2.3 Surge protection

We plan to implement surge protection and electrical grounding equipment by installing surge protectors and Ground Fault Circuit Interrupter (GFCI) respectively to filter out electrical noise and electromagnetic interference.

[GFCI: Ground Fault Circuit Interrupter. Types, Working & Applications](#)

3.2.4 Network and Electrical Cables

We plan to provide sufficient network and electrical cables to ensure all computers are connected to the internet and power source.

3.3 Accessibility

Accessibility in the furniture arrangement of an instructional computer lab for any regular secondary school cannot be overlooked.

Earlier on, we proposed the purchase of ergonomic chairs and desks that are adjustable. This is greatly needed by students with physical disabilities who may use wheelchairs or other mobility aids because the desks can be adjusted to be wheelchair-accessible. Adjustable chairs also have adequate support for students with back or posture problems.

We also proposed the estimated measure of space needed between desks to ensure that students can move around freely and work on their computers without disturbing their

neighbors. Additional equipment such as the printers, scanners, etc. will also be placed behind the classroom with professionals to operate them.

For students with visual disabilities, we proposed the installation of indirect LED panel light fixtures to provide an ambient light source for satisfactory illumination and to avoid veiling glare on computer screens. We proposed the installation of power outlets and network ports in areas that are easily accessible for each student, to ensure that they can work without any hindrance. We propose the design of furniture with high contrast colors to help students with low vision to distinguish between different surfaces and objects.

The lab will have emergency procedures and plans in place to meet the needs of all users. This will involve providing a first-aid kit, fire extinguisher, and emergency supplies such as blankets and water should be readily available in the lab and making emergency information and evacuation routes available. Finally, we propose the provision of clear signage and labels for the furniture and equipment in the lab to make it easy for students with disabilities to locate and use what they need.



Computer laboratory equipments and their names, to be printed to assist students with visual disabilities
(<https://1.bp.blogspot.com>)

Chapter 4 - Hardware Purchase Consideration

3.4 Overview

We propose a computer lab that will be equipped with the latest hardware to ensure that students have access to the best possible learning resources.

1. Computers

These are the primary hardware devices that we plan to purchase.

We propose that the laboratory invests in high-performance computers that meet the required specifications for a STEAM and Robotics laboratory.

We recommend the HP EliteDesk 800 G3 SFF computers

Link to purchase

[Click here to check it out](#)

Features

- Model: HP EliteDesk 800 G3 SFF Desktop PC.
- Processor: Intel Core i7-7700 Processor 8M Cache, 3.4 GHz, up to 4.00 GHz with turbo.
- RAM: 16 GB DDR4 SDRAM, 2133 MHz.
- Storage: 512GB Solid State Drive, Drive Performance: 550/470-500MB/S, Interface: SATA3 6.0Gbps.
- Operating System: Windows 10 Pro (64-bit).
- Graphics: Inbuilt Graphics: Intel HD Graphics 530.
- Connectivity: Front I/O Ports: 1 x USB-C, 2 x USB 3.0, 2 x USB 2.0, 2 x Audio Connectors, Back I/O Ports: 4 x USB 3.0, 2 x USB 2.0, 2 x Audio Connectors, 2 x DisplayPort, 1 x LAN
- Monitor: 18.5" Monitor Full HD (1080p) 1920 x 1080, Input Connectors: HDMI.
- Package Contents: Desktop Computer, Monitor with AC Adaptor, New Keyboard & Mouse Combo

REFERENCE ([Here](#))

2. Peripherals

We plan to provide the essential I/O devices such as keyboards, mice, and monitors to enable students to interact with computers more efficiently and comfortably.

These will provide the peripherals to support different forms of interactions and learning.

We recommend purchasing Hp Mice and keyboards for their durability.

Link to purchase

[Click here to check the keyboard out](#)

[Click here to check the mouse out](#)

Features

Mouse:

- Buttons: The mouse has two primary buttons and clickable scroll wheel.
- Connector: It uses a USB-A wired connector.
- Sensor resolution: 800 DPI sensitivity
- Compatibility: The HP USB Optical Mouse is compatible with most PCs.
- Dimensions (W X D X H): 2.5 x 4.5 x 1.5 in

Keyboard:

- Model: K200
- Color: The main color for this keyboard is black.
- Body: the primary material on the keyboard is Plastic and it is a full-size standard keyboard with 104 keys.
- Connectivity: The primary connectivity interface for the keyboard is through a USB-A wired connection.
- Weight (kg): 0.5

REFERENCES

[Keyboard](#)

[Mouse](#)

3. Internet Connectivity

We plan to provide the lab with a reliable and high-speed internet connection to enable students to access online resources, research information, and collaborate on projects with others.

We also plan to provide adequate internet connectivity that will facilitate online communication and remote learning opportunities.

We recommend FiberOne Broadband for the necessary internet services.

LINK TO PURCHASE:

[Click here to visit](#)

Features:

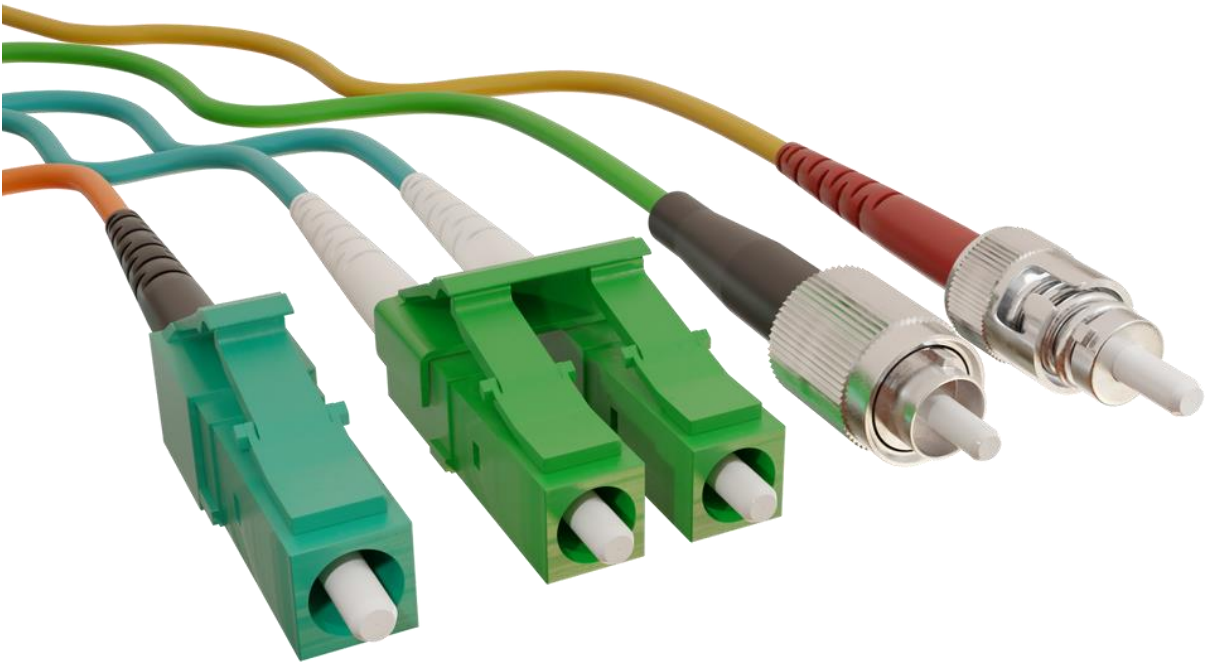
One of their plans includes an Enterprise package that will be well-suited for organizations. This plan also comes with a support package and a team of hands-on experts to make sure that your connection remains a top priority.

REFERENCE([Here](#))

4. Networking Equipment

We plan to purchase a reliable networking infrastructure to connect computers and enable internet connectivity.

We also plan to provide seamless communication and efficient resource sharing between different computers in the lab. The vendors mentioned in the Internet Connectivity section above will also handle this. One of the likely components that will be used in the process will be Fiber-Optic cables.

**Features:**

Fiber Type: The fiber type will likely be Multi-mode since that is better suited for travelling over relatively shorter distances.

Core diameter: The core diameter is approx. 55 μ m.

Cable Jacket Material: The protective covering most used for a centre like this would be the low-smoke zero-halogen (LSZH) jacket.

5. Printers

We propose high-performance printers with colour printing capabilities and wireless printing to make the process more efficient and convenient for students.

For this we recommend the **HP Color LaserJet Pro MFP M477fdw**

The HP Color LaserJet Pro MFP M477fdw is a versatile color laser printer that provides a range of functions, including printing, scanning, copying, and faxing.

**Link to purchase:**

https://www.amazon.com/HP-Laserjet-Multifunction-Wireless-Replenishment/dp/B014CSKE7E/ref=sr_1_5?keywords=HP%2BColor%2BLaserJet%2BPro%2BMFP%2BM477fdw&sr=8-5&th=1

Here are some of the features of the **HP Color LaserJet Pro MFP M477fdw**

Size and Weight:

- It measures 16.4 x 18.6 x 15.7 inches and weighs 51.6 pound

Speed:

- It can produce up to 28 pages per minute whether it's in color or black and white.

Connectivity:

- It is equipped with wireless connectivity options, which include Wi-Fi, Wi-Fi Direct, and NFC. This makes it effortless to print from various devices like tablets and smartphones.

Additionally, the M477fdw comes with automatic duplex printing, a 50-sheet automatic document feeder, and a 4.3-inch color touchscreen. These features make it easier to scan, copy, and print double-sided documents, and simplify the operation of the printer.

Overall, the HP Color LaserJet Pro MFP M477fdw is a versatile and reliable option for this secondary school lab because of its color printing and multifunctional capabilities and wireless printing options.

6. Projectors and Screens

We plan to purchase projectors that allow for large group presentations, video displays, and other visual aids—considering the nature of the laboratory.

We recommend the **Epson PowerLite 2247U** because it is a high performance projector that is well-suited for this particular laboratory.



Link for purchase :

https://www.amazon.com/Epson-V11H871020-Powerlite-2250u-Projector/dp/B01MR0EMOV/ref=sr_1_2?keywords=Epson+PowerLite+2247U&sr=8-2

Here are some of the key specs of the Epson PowerLite 2247U

Brightness:

- 4200 lumens

Resolution:

- WUXGA (1920 x 1200)

Contrast Ratio:

- The PowerLite 2247U has a contrast ratio of 15,000:1, which means it can display deep blacks and bright whites with exceptional clarity

Lamp Life:

- The PowerLite 2247U can last up to 12,000 hours in eco mode

Other Technologies

- Wireless connectivity options
- Keystone correction and lens shift for flexible installation

We also plan to purchase screens that enable us to show images and videos on a larger screen for easy viewing by the entire class.

For this we would recommend the **Elite Screens Manual B Series** due to its large aspect ratio and low cost.

The Elite Screens Manual B Series is a manual drop-down screen that comes in sizes ranging from 100 to 120 inches diagonally. It has a 16:9 aspect ratio, which is ideal for widescreen images and videos.



Link for purchase:

https://www.amazon.com/Elite-Screens-Tripod-50-INCH-Lightweight/dp/B01G5JYQDQ/ref=sr_1_2?keywords=Elite%2BScreens%2BManual%2BB&sr=8-2&th=1

The Elite Screens Manual B Series is designed for easy installation and comes with a built-in mounting system that can be wall or ceiling-mounted. The housing is made of durable steel and is finished with a white enamel coating that complements any decor.

7. Interactive Whiteboards

As earlier stated, we plan to purchase interactive whiteboards that allow for a more interactive and collaborative learning environment.

These will ensure that students can easily annotate diagrams, collaborate on projects, and participate in gamification of learning.

For this we would recommend the Smart Board 7000 series



Link to purchase

https://www.amazon.com/Quartet-Magnetic-Whiteboard-Aluminum-SM538B/dp/B00H3QT4BK/ref=sr_1_18?keywords=interactive%2Bwhiteboard&sr=8-18&th=1

The smart board 7000n is a well-designed interactive whiteboard that is used majorly in educational settings. I propose this white board because it allows the teachers and students to have real time interactions making teaching for fun and engaging

The Smart Board has the following specs

Sizes:

- 65", 75", and 86"

Display

- 4K Ultra HD resolution

Other Technologies

- Pen ID™ technology that allows students and teachers to write simultaneously
- Object awareness™ technology that detects whether you're using a finger, pen or palm, and automatically adjusts the tool accordingly.
- Built-in speakers
- Multi-touch capability that allows up to 16 simultaneous touch points

8. Robotics Kits

We plan to provide robotics kits that provide hands-on experience and practical application of STEAM concepts.

The kits will engage students in problem-solving, creativity, and critical thinking.


9. Virtual Reality/Augmented Reality

We plan to purchase virtual reality/augmented reality equipment that allows for immersive learning experiences that help students visualize and interact with abstract concepts in a more tangible way.

The equipment will enhance the learning experience and help students understand complex concepts better.

For this we would suggest the **Oculus go**





The Oculus Go is a standalone virtual reality headset that was released by Oculus in May 2018. It has the following specs

Price

- \$267

Display

- Resolution: 2560x1440 (1280x1440 per eye)
- Pixel density: 538 PPI
- Display type: Fast-switch LCD

Processor:

- Qualcomm Snapdragon 821
- Quad-core CPU
- Adreno 530 GPU

Memory and Storage:

- 3GB of RAM
- 32GB or 64GB of internal storage (depending on the model)

Battery:

- 2600mAh Lithium-ion battery

Audio:

- Integrated spatial audio
- 3.5mm headphone jack

Input:

- Touchpad
- 3DoF controller
- Head tracking

Weight

- 0.467kg

Operating System

- Oculus OS

10. Backup and Security

We propose the purchase of backup devices such as external hard drives and cloud storage to help protect sensitive data and information.

For this we recommend the **Seagate Backup Plus Hub**

The **Seagate Backup Plus Hub** is a desktop external hard drive that comes in capacities ranging from 4TB to 16TB of storage. It is compatible with both Windows and macOS and uses USB 3.0 for fast data transfer.



Link to purchase:

https://www.amazon.com/Seagate-Backup-Desktop-Recovery-Services/dp/B07KFG2ZYN/ref=sr_1_2?keywords=Seagate+Backup+Plus+Hub&sr=8-2

Here are some of the key features of the **Seagate Backup Plus Hub**

Design

- It has a sleek, black case with a textured finish that resists scratches and fingerprints.

Size and Weight

- It measures 4.65 x 1.61 x 7.8 inches and weighs 2.34 pounds.

Overall, the Seagate Backup Plus Hub is a reliable option for this secondary school laboratory because of its large capacity and multiple USB ports.

11. Headphones

Each computer should have a headphone with a microphone attached to it. The purpose is for students to listen quietly to videos or audio individually and quietly without disturbing anyone. The purpose of the attached microphone is for projecting their voice when making contributions.



https://www.konga.com/product/mk-2688-pc-and-noise-cancellation-headset-with-mic-for-voice-call-and-gaming-4908593?gclid=CjwKCAjwitShBhA6EiwAq3RqAzG0hmntkwQ52L-IUYcZNk33NRBxCFmuWVJW5y3yM7h5eTjSPi9ZQBoCvHIQAvD_BwE

Chapter 5 - Sustainability Plan

Outlined below are several factors to be considered as part of sustainability plans:

5.1 Factors to be considered when installing computer system

The installation has to be successful in meeting the demands of both the students and the teachers, by giving them maximum efficiency.

Some of the factors that we will be taking into consideration when installing a sustainable computer systems laboratory are;

5.1.1 Ensuring Compatibility

It is important that the hardware devices purchased are compatible with the existing infrastructure in the school.

One way we will ensure this is knowing the voltage and wattage of the present power supply of the school, and making sure that the hardware purchased is compatible with that specification to avoid electronic damages during or after installation.

The compatibility also includes the software that is needed to be run on these computer systems. Due to software compatibility, we will ensure that the systems purchased are not lower than 64 bits.

With compatibility solved, it will ensure an easy system installation and maximum efficiency through the life of the systems.

5.1.2 Maintainability and Energy Efficiency

- Preventive measures are needed to be done to maintain computer systems from time to time, so before installation, we will check these systems to make sure they are easy to maintain and repair and have their spare parts readily available in the case of replacement.
- We would also inform the school prior to installation to create a plan for the maintenance and regular updates of the systems. Addressing the time of maintenance early on is important so that the school timetable will exclude those times of the day from using the laboratory and they will be strictly dedicated to system maintenance.

- Systems that are not energy efficient will drastically increase the school's energy usage and bills. It hereby is an important factor to consider before installation, we will ensure that all models purchased will be modern and energy efficient to save energy bills.

5.1.3 Security

- We will ensure the computer laboratory is equipped with a secure lock when not in use and the windows are opaque to obscure the systems inside from the easy view of passersby.
- Also, the software will be secured through the installation of a firewall and antivirus software called **Symantec Endpoint Protection** to protect the system from malicious and unauthorized access. There will also be regular updates and patches to address any security vulnerabilities.
- Periodic data backups will be planned to guard against data loss in the event of hardware malfunction or security breaches.
- Access for students will be limited to the programs they require for academic purposes.

5.1.4 Conducive Temperature and Atmospheres

To handle the heat produced by these computers, it is crucial for the atmosphere to be cool and conducive before installation.

Hence, three air conditioners will be placed at strategic locations in the laboratory and will always be left on for cooling of the hardware systems in use or without use.

Also system blow dryers will be purchased and left in the laboratory to remove dust from places in the system out of human reach occasionally.

5.1.5 User friendly systems and local support

- A computer system laboratory has to have a good user interface and experience because the sole purpose is to teach students how to use computers effectively. Hence, the system has to be easy to understand and use. We will also ensure this through customization of the desktop and organizing files to make it easy for users to navigate the desktop. Apps most likely to be used will be placed on the task bar for quick access.
- The use of intuitive software programs and operating systems like windows which is preferred to other OS like Linux will be adopted because of its user friendliness.
- Local support is also needed, hence a direct line will be set up to handle any foreseen issues which aren't easily solved. They will be easily forwarded to us by the teacher or person in charge.

5.2 Choice of Software, Hardware and Furniture Manufacturers

We propose the purchase of all software, hardware and furniture equipment from reputable computer technology wholesales companies in Nigeria such as Zinox Technologies (parent company of Konga - <https://www.konga.com>), Omatek, CIS (Computer and Information Systems Ltd), and online retail store - Jumia (<https://www.jumia.com>). These companies are tested and trusted to supply sustainable and durable materials.

5.3 Maintenance and Repair Plan

i. Regular Cleaning:

We propose that the computer lab should be cleaned regularly to keep it functioning properly and prolong its lifespan. This can involve tasks such as cleaning the floors, wiping down surfaces, etc.



ii. Regular Inspections:

To identify any issues that may require maintenance or repair, we propose the regular inspections of the computer lab and its contents. This includes fixing software bugs, and cleaning or replacing filters on printers or other equipment. For furniture, this includes checking for loose screws or bolts, wobbly legs or arms, or any other signs of wear and tear.

We propose having a designated staff member that will be responsible for carrying out these maintenance and repair tasks.

5.4 Plans for Upgrades

i. Furniture Items:

We propose that upgrades to current electrical equipment be made as needed to bring the lab up to date with new technology and improvements in power management, in addition to maintenance and growth. This involves installing advanced surge protectors and electrical grounding devices to better safeguard the lab's equipment from power surges and other electrical risks.

ii. Software and Hardware devices:

Regular update of software would be done in order to enhance the usage of newer software in the laboratory for more efficiency and effectiveness. Since there would be regular and stabled internet connection to all computers, the systems would automatically update when needed.

Staff Training

All staffs of the school would be trained professionally by qualified computer operators, in order to equip them for teaching the students and making sure that they can make use of all the devices available in the laboratory for educational purpose.

Also, on a periodic basic, some staffs would be sent out to professional companies to learn how they operate the computers in their IT units in order to enhance their knowledge about computer and to also replicate the same in the school laboratory.



Conclusion

This document has been able to identify and highlight the major features of a secondary school computer laboratory with specifications of materials and gadgets used.

However, this should not be used as a final guide to creating one as it is dependent on some other factors like geographical location, budget, topography and weather conditions of the proposed area of the computer laboratory. Furthermore, when considering where to situate a computer laboratory in a secondary school, several factors are to be considered, among which are noise level, accessibility, power and connectivity.

Prior to the opening of the laboratory, standard computer laboratory rules and practices would be pasted on the notice board outside the computer laboratory to inform users of the rules guiding the use of the computer and associated behaviors of users in the laboratory. Also, the walls of the laboratory, tips and guides on using the fire extinguishers would be provided in case of an emergency fire outbreak.