**1.0 PROPOSAL TITLE;-Production, and Distribution of 100Units of Homegrown Multifunctional Mobile Teaching Aid for Schools with Training Workshops for Teachers and aftermath Automation**


LEAD RESEARCHER/INVENTOR

**ENGR. DR. Sadiq S.LAWAL**

**B.Eng, M.Eng, PhD (FUT Minna), HDoEng(CUB/LGS),MNIMechE ,R.Eng(COREN),FIMC,CMC,FI-FAIR)**

**The Inventor/Invention General Manager/Founder**

**SSL SEMILAB START-UP AND CONSULTANCY SERVICES,**

**Operations Manager, Directorate of Intellectual Property and Technology Transfer(DIPTT),**

**Senior Lecturer and Researcher, Mechanical Engineering Department,**

**sadiq.lawal@futminna.edu.ng, 07064358815 (WhatsApp) and 08054197676**

**FEDERAL UNIVERSITY OF TECHNOLOGY, P.M.B 65,MINNA,NIGER STATE**


# OTHER RESEARCH TEAM MEMBERS


2. Dr. Bashir Ahmad Usman/Senior Lecturer and HOD, Science Educationist, FUT Minna/PhD **08065542625**

3. Prof M.A Olutoye/Professor, Chemical Engineering, FUT Minna/PhD **08034059454**

4. Engr.Baba Suleiman/Assistant Chief Engineer, Scientific Equipment Development Institute, Minna, NASENI/Masters (M.ENG) 08036337828

5. Dr. Lawal Adamu/ Senior Lecturer, Mathematics, FUT Minna/PhD 08036011769

6. Momoh Hadi/Mentee and Technical Assistant, Mechanical Engineering Department, FUT Minna/M.Eng (in view 08146419989

7. Mrs. Halimat Ohunene Bello / Marketing and Commercial Officer, SSL START-UP AND CONSULTANCY SERVICES/ HND **08035871312**


## 2.0 Brief Background and Statement of the Problem (Why does this research need to be conducted?

In Nigeria, the use of practical supports for theoretical teachings of science had always been through the conventional laboratories which contain auxiliaries like retort stands, clamps, beakers, burettes, ray boxes, pulley system and other experimental functionaries usually in small confinement that is not only conducive and convenient enough for effective participatory teaching and learning, but is also very expensive and expansive in space utilization (Lawal,2008).There have been several challenges facing the educational system of Nigeria; one of these challenges is the lack of proper equipment and teaching aids for the teachers to properly demonstrate the theoretically acquired knowledge for more understanding. These challenges were identified and finding lasting solutions propelled Lawal in 2008 to invent and patented (RP:NG/P/2014/398) a multifunctional mobile teaching aid that also serves as intervention laboratory for basic, science and secondary schools

## 3.0 Proposal Niche Market

| S/N | Criteria | Remarks |
|---|---|---|
| **1** | **Niche Market Identification and Analysis** | |
| **1.1** | Market Identification | **COMMERCIAL PROSPECTS of the Research once completed**<br>**1. ALL STATES OF THE FEDERATION INCLUDING FCT/PRIVATE SCHOOLS OWNERS**<br>**2. FEDERAL GOVERNMENT THROUGH** *NASENI/SEDI MINNA/SEDI ENUGU/FMST AND FMOE (Currently on course……..).*<br>**3. NECO, WAEC, NABTEB TO REPLACE ALTERNATIVE TO PRACTICALS AND ALSO COLLABORATIONS FOR DIGIDALIZATION AND COMPUTER BASED PRACTICALS AND COMPUTER BASED PRACTICAL EXAMS**<br>**4. NNPC**<br>**5. NORTH EAST DEVELOPMENT COMMISSION (NEDC)**<br>**6. NIGER DELTA DEVELOPMNT COMMISION (NNDC)**<br>**7. PTDF/TETFUND/UBEC/SKILL G/ NCDMB** |

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| | | **8. INTERNATIONAL ORGANIZATIONS, NON-GOVERMENTAL ORGANIZATIONS, CONSULTING FIRMS, CONSTITUENCY PROJETCS, EDUCATIONAL ACTION AIDS AND GRANTS**<br>**(a) UNESCO**<br>**(b) UNDP**<br>**(c) UNCTAD**<br>**(d) UNICEF**<br>**(e)NGOs and Global Partnership for Education (GPE) through the Federal Government**<br>**(f) Dolf Madi International Consulting**<br>**(g) Science and Technology TV Game Shows and University TV Station** |
| **1.2** | Market Size Data | According to report by statistia(an educational, society and social impact auditing platform in 2018 reported there are over 580 schools nationwide with each having over 10clasrooms. This report was later amplified by the Federal Ministry of Education in 2024 during a presentation to them recommending the need for over Two(2) million unit across Nigeria suggesting at least three(3) units in each classroom of schools in Nigeria, |
| **1.3** | Needs or Gaps Analysis | From locally available materials, a multifunction mobile teaching aid customized with some auxiliary materials will be developed to aid , display, demonstrate and teach in the classroom(or anywhere) particularly in all Basic, Science and Secondary Schools/educational system and that can be deployed Virtual unlike the conventional laboratories occupying huge space and high cost of acquiring it and far less effective improvement and functionality of impactful teaching and learning in the STEM/STEAM educational system. |
| **2** | **Uniqueness and Differentiation** | |
| | | The Innovation is Multifunctional ,mobile, flexible and users 'friendly that is homegrown and purpose- |

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| **2.1** | Innovation Features | built from local materials, cheaper in cost compared with conventional and imported teaching aid/laboratory and it also utilizes very manageable space deploy and use in any section of the schools. |
| **2.2** | Competitive Advantage | The Innovation simply presents a situation that, if all the students can't move to the laboratory to learn, the laboratory simply moves to all the students with this home-grown and Purpose-Built *and Game –Changer that will positively enhance the quality STEM/STEAM Education in Nigeria* |
| **2.3** | Innovation Potential | This innovative project has the potential to transform the science and technological education in Nigeria and globally by providing a unique and engaging learning experience for students, teachers, educators, educational stakeholders, agencies, state and federal ministries as well as sponsors and grant awarding local, national and international organizations. |
| **3** | **Scalability and Adaptability** | |
| **3.1** | Scalability Potential | The innovation has a unique scalability potential of 90% as the design and production processes have been creatively made simple but yet sophisticated in the product outputs and functionality. The remaining 105 accounts for the plan of automating the production workshop /factory and innovation hub to scale up outputs in volume and precisions of designs and fabrication and aesthetic finishing. |
| **3.2** | Adaptability Plan | The plan is that the fund gotten from grants and awards such as this from RMRDC and Royalties/proceeds from full commercialisation shall be channeled to establishing state-of-the art Factory and innovation hub with automated technology and fully equipped studios for both Virtualization and Science/Technology TV Game Shows for Nigerians. |
| **3.3** | Scalability Evidence | The evidence is right here at the Mechanical and Engineering Workshops of the Federal University of Technology, Minna where some modest |

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| | | equipment have been bought to scale up the volume of our present production volumes. |
| **4** | **Market Fit and Demand Validation** | |
| **4.1** | Market Fit Evidence | Recommendations obtained from relevant educational bodies, including the Federal Ministry of Education (FMOE) and the Nigerian Educational Research and Development Council (NERDC) has culminated into market interests from educational managers as listed earlier above. |
| **4.2** | Customer Feedback | The overwhelming feedbacks from teachers and schools that have used this innovation has been a strong endorsement of its utility and versatility culminating into many local, national and international recognitions and awards leading to prospective huge market demands being implemented with the available resources. |
| **4,3** | Interest from Buyers | The Following relevant educational stakeholders and potentials buyers have being in Market discussion ;-<br>1. Kaduna State Government purchased through the FUTMIN Ventures Ltd of the Federal University of Technology, Minna.<br>2. Federal Ministry Of Education(FMOE), Abuja<br>3. Federal Ministry of Science, Technology and Innovation(FMSTI)<br>4. National Agency for Science and Engineering Infrastructure(NASENI)<br>5. Niger State Ministry of Education<br>6. Zamfara State Ministry of Education<br>**The letters for these buy-in interests are attached in Figure in 4.3.** |
| **5** | **Technological Feasibility and Innovation** | |
| | | The innovation is 100% feasible and tested for very viable market niche as it has passed through the needle eyes of technological and regulatory |

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| **5.1** | Feasibility Assessment | experts for assessment and critique by states' educational resource centers, Federal Ministries of Education and that of innovation, Science and Technology, Nigerian Educational Research and development Council(NERDC) with all overwhelmingly recommending and hence the Kaduna and Niger States' pilot buy-in |
| **5.2** | Innovation in Technology | It is my pleasure to write this on this Science/Engineering Innovation to support quality education and to urge education managers to take advantage of this home-grown and purpose-built invention to enhance practical science class delivery in their various schools and therefore, address effectively the often pervading dearth of equipment that is the usual narrative in our educational system. The equipment is also usually accompanied with an operational Manual (Monograph) that has been developed in a manner that it is user friendly and provides clear guide as to how to mount and use the mobile teaching aid stress-freely, effectively and efficiently. |
| **5.3** | Feasibility Evidence | The evidence of the feasibility of this innovation is the feedbacks and appreciations of those that the prototype have successfully been produced, trained and distributed for. They are 1. Kaduna state Ministry of Education Policy Document in their customized Operational Manual (Monograph).<br><br>2. Letter of Appreciation by Habisah Science College ,Minna<br>3. Letter of Appreciation by the Supreme International School, Chanchaga, Minna, Niger State.<br>4, Humanitarian Award for donating to some schools in Ajaokuta LGA, Kogi State<br>Letter evidence for these feasibility are attached in Figure 5.3 |

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| **6** | **Economic Impact on Niche Market** | |
| **6.1** | Economic Benefits | ❑ Value for money/cost effectiveness in acquiring this invented Multifunctional mobile Teaching aid and intervention Laboratory and hence saving the country and educational manager capital flights and over dependence of foreign technologies at higher costs. Buying of spare part and repair of the innovation is also of economic beauty of this homegrown technology. |
| **6.2** | Job Creation | ❑ Jobs and wealth creation for citizenry and institutions is created for the Inventor, citizens directly and indirectly involved in all the various design, production, transportation ,training and capacity building, consultancies, distribution and the institutions involved through royalties, labour costs, honorarium and consultancies fees. The innovation is capable of creating over 500,000 direct and indirect job across the Nigeria and higher globally when eventually scaled up through virtualization. |
| **6.3** | Value Generation | **Benefits of the research to the Nigerian Education System**<br>❑ Effective teaching and learning of STEM in all schools across the country.<br>❑ Total control by Teachers and total participation of all the students in practical classes<br>❑ More young Nigerians will be interested in studying sciences. |

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| | | ❑ Eradication/reduction of mass failure at al levels of Examinations and better performances in WAEC, NECO, UTME, IJMB & NABTEB.<br>❑ Better & sophisticated students being churned out from elementary schools to excellent university/ polytechnics undergraduates and hence the quality of the graduates.<br>❑ Science/technological cradle with endless positive ripple effects in STEM /STEAM Education culminating into technology, innovation and boosted economy for National Development of the Country |
| **7** | **Tangible and Measurable Objectives and KPIs** | |
| **7.1** | Clear Objectives | The clear objectives of this innovation is that From locally available materials, a mobile science educational instructional material /science teaching aids customized with some auxiliary materials will be developed and distributed with training to aid, display, demonstrate and teach in the classroom (or anywhere) particularly in all Basic, Science and Secondary Schools/STEM-STEAM educational system and that can also be deployed Virtually. |
| **7.2** | KPIs Plan | The Key Performance Indication Plans are to:-<br>1. Assess the level of Training Experience of the benefitting Teachers/schools before and after the utilization of this educational product.<br>2. Follow up the feedbacks on students acceptability, access and participation on the full utilization of the innovation<br>3. Check out the students' performance in their internal and external examinations.<br>4. Feedbacks on capital flights reduction<br>5. Measure of value for Money and outputs from the teachers in term of their Job interests and satisfaction. |

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| **7.3** | Objective Alignment | ❑ To produce, design and construct this **equipment locally and cheaply making use of local available materials.**<br>❑ To construct a single apparatus that can be suitably adapted for performing series of experiments FOR BASIC ,Science and Secondary SCHOOLS and can also be deployed VIRTUALLY (Covid 19 experience)<br>❑ To come up with equipment that should be able to fit in easily into the organization of existing laboratories conveniently.<br>❑ To help the students to gain familiarity with scientific methods and techniques in the laboratory as well as in class.<br>❑ With the INNOVATED EQUIPMENT, the students can learn to acquire training in scientific methods of observations, collections and analyses of data and their graphical presentation more easily and efficiently. |
| **8** | **Collaboration with Niche Market Stakeholders** | |
| **8.1** | Stakeholder Engagement Plan | With strategic collaboration with the Kaduna and Niger state governments, Federal Ministries of Education and that of innovation, Science and Technology and the National Agency for Science and Engineering Infrastructure (NASENI), the invention is gradually becoming game-changing and cutting edge product that will positively disrupt and breath in new life into the Basic, Science, Secondary, Tertiary and Virtual STEM/STEAM educational system across Nigeria offering mobile, flexible and cost effective solutions to teaching and learning.<br>The Patent granted for the Innovation is the real pathfinder for the registration and protection of this intellectual property assets from theft and unlawful proliferation |

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| | | and utilizations. The patent Corticated, FMOE and NERDC recommendations are attached in Figure 8.1. while others are also of Figures 4.3 and 5.3 |
| **8.2** | Partnerships | The Innovation already had a partnership with the Federal and state governments mentioned above. There is also an ongoing Partnership with the FUTMIN Ventures Ltd and Intellectual Property and Technology Transfer Office (IPTTO) of the Federal University of Technology, Minna, Niger State for the full institutional operationalization of the commercial plans and Market Niche of this innovation.<br><br>The commercialisation of the invention is being fostered through the SSL SEMILAB START-UP AND CONSULTANTACY SERVICES, Federal University of Technology, Minna, Niger State skillfully transitioning from the University Marketing Model to a more direct and focused approach, fostering strong relationship with Federal and state governments of Nigeria and globally, school owners, educational funding agencies and professional bodies in the push and pursuits to make tangible differences in the lives of the students and teachers benefitting from the impacts of the innovation for overall National Development. |
| **8.3** | Community Involvement | The Innovation has a vast and deep rooted engagements with the communities as some samples are being utilized by the Model Secondary School of the Federal University of Technology, Minna, Niger state and other stakeholders mentioned earlier benefitting from this educational support innovation.<br>This effective community engagement has further led credence to the pool of feedstock of ToT and resource persons available for training and |

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| | | capacity building of the benefiting teachers/schools before distribution to them. |
| **9** | **Risk Management and Mitigation** | |
| **9.1** | Risk Identification | The only risks identified are the common risk associated with research and workshops involved in fabrication. But observing all safety measure and provision of well safety equipped workshop which we considered highly is a sure way out to the bearest minimum of the risk levels. |
| **9.2** | Mitigation Strategies | 1. Safety precaution awareness and education/training and capacity building for all the personnel involved in all the production processes.<br>2. Provision of all necessary safety equipment and facilities in the workshop.<br>3. Strict enforcement of observant of all safety rules and precaution in the workshop during production |
| **9,3** | Risk Monitoring | 1. Appointing Risk Monitoring officers<br>2. Provision of safety gadgets and uniform to ease identification of defaulters.<br>3. Automation of some of the maintenance and Safety processes<br>4. Routine inspections and wastes disposals from the workshop<br>5. Cameras to monitor the activities in the workshop |
| **10** | **Sustainability and Long-Term Viability** | |
| **10.1** | Sustainability Assessment | The research has no negative environmental impacts especially if the wastes from production processes are safely recycled and or discharged. The effective implementation of an appropriate Maintenance and safety measures further enhances safe sustainable environmental impacts of the research. |
| **10.2** | Social Impact | The social impacts of this project create an endless scientific, educational, technology and economic ripples with multifaceted impacts for National and Global Development. |
| | | The outcomes of this project/Invention, promises to be a game changer in the conduct of practical science classes leading |

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| **10.3** | Long-Term Viability | to improved quality of delivery and hence enhanced students' performance and value for money. It will also lead to reduced capital flight if deployed in large numbers to schools in the country and hence strengthening the Science, Technology. Engineering and Mathematics (STEM)/STEAM education in Nigeria and globally once scaled up through virtualization which is the next phase of the innovation.<br>The project as very high potential of being notable innovation hub of quality education support innovations, training and capacity building, automation and manufacturing hub and TV/Radio science. Education and Television shows. |
| | **TOTAL** | |

# 4.0 Project Methodology

Some major factors like cost, availability of raw materials and weight among others were put into consideration during the design of the project.

Selection of the right materials during construction is a vital decision to make as it is a major factor that determines the success of project as the design engineer's understanding of engineering materials and their properties is critical. The impact of production methods and heat treatment on the properties of materials must be understood by a construction engineer. The following are the key categories of engineering materials namely metals and their alloys, such as Iron and Mild steel pipes, copper, aluminum and Non-metals, such as glass, polymers etc. The materials selected and required for this research are as in the Table below.

Hundred (100) units shall be mass produced, selected teachers from benefitting schools from Kogi State as a PILOT shall be trained and equipment distributed to them for utilization with the operational Manual customized with STARTUP and NASENI Logo as a game changing special intervention. Royalties gained is to be used to Automate the Height Adjustment Mechanism of the Equipment scaling up.

## Table of Parts and Materials

| PART NO | PART DESCRIPTION | QUANTITY REQUIRED X 100 | MATERIALS |
|---|---|---|---|
| 1 | Square pipe | 5X418 feet 1x1 | Mild steel |
| 2 | Square pipe | 5X18 feet, 3⁄4x3⁄4 | Mild Steel |
| 3 | Rectangular pipe | 2X118 feet, 2x1 | Mild Steel |
| 4 | Laminated plywood | 5X1 4ft by 8ft | MDF Wood |
| 5 | Hinges | 12 | Mild steel |
| 6 | Angle brackets | 28 | Mild steel |
| 7 | Rollers | 4 | Steel and plastic |
| 8 | Contact adhesive | 1 | Wood adhesive |
| 9 | Bolts and nuts | 120X28M4, | Mild steel |
| 10 | Screws | 150X 8 3"/4, | Mild steel |
| 11 | Spur gears | 2 | Mild steel |
| 12 | Microcontrollers | | |
| 13 | Edges tape | | Plastic |
| 14 | Dc Inverter Welder Top Flexing Machines | 10 | Machines |

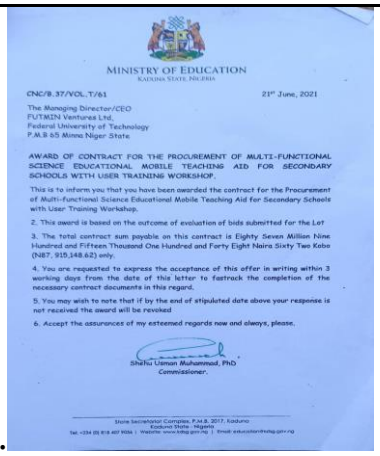
15. Reuters, Computers and virtualization materials, softwares and mini-studio

## 5.0 ESTIMATED BUDGET

A total sum of **₦75,750,800** is being proposed over a period of Twelve months to accomplish the research aim and objectives of producing, training and distributing 100 Units for Schools and carrying out aftermath Automation of the Height Adjustment Mechanism of the Innovation. The breakdown of the details are provided as follow

| | Item | Cost (₦) | |
|---|---|---|---|
| **1** | **Personnel Cost** | 9,127,284.60 | (12.05%) |
| **2** | **Equipment** | 11,914,824.60 | (15.63%) |

| | | | |
|---|---|---|---|
| **3** | **Supplies/Consumables of Fabrication Materials and Auxiliaries and aftermath Automation of the Innovation** | 30,200,061.00 | |
| **4** | **Training Workshops, Capacity Building, Workshop Materials and Organisation, Data Collection & Analysis, Honorarium for Resource Persons and Benefitting Teachers and Transportation of equipment to Venue of Workshop and to Schools** | 16,353,140.00 | |
| **5** | **Dissemination in National and International Journals/Conference** | 3,367,948.92 | (4.45%) |
| **6** | **Indirect cost to Institutional** | 3,787,540.00 | (5.00%) |
| **TOTAL** | | **₦75,750,800.00** | |



MINISTRY OF EDUCATION
KADUNA STATE, NIGERIA

CNC/B.37/VOL.T/61 21st June, 2021

The Managing Director/CEO
FUTMINA Ventures Ltd,
Federal University of Technology
P.M.B 65 Minna Niger State

AWARD OF CONTRACT FOR THE PROCUREMENT OF MULTI-FUNCTIONAL SCIENCE EDUCATIONAL MOBILE TEACHING AID FOR SECONDARY SCHOOLS WITH USER TRAINING WORKSHOP.

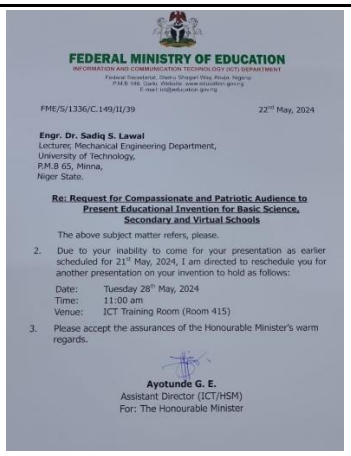
This is to inform you that you have been awarded the contract for the Procurement of Multi-Functional Science Educational Mobile Teaching Aid for Secondary Schools with User Training Workshop.

2. This award is based on the outcome of evaluation of bids submitted for the Lot
3. The total contract sum payable on this contract is Eighty Seven Million Nine Hundred and Fifteen Thousand One Hundred and Forty Eight Naira Sixty Two Kobo (N87, 915,148.62) only.
4. You are requested to express the acceptance of this offer in writing within 3 working days from the date of this letter to fastrack the completion of the necessary contract documents in this regard.
5. You may wish to note that if by the end of stipulated date above your response is not received the award will be revoked.
6. Accept the assurances of my esteemed regards now and always, please.

Shehu Usman Muhammad, PhD
Commissioner.

State Secretariat Complex, P.M.B. 2017, Kaduna
Kaduna State - Nigeria

Kaduna State Ministry of Education Award LetterLetter



FEDERAL MINISTRY OF EDUCATION
INFORMATION AND COMMUNICATION TECHNOLOGY (ICT) DEPARTMENT

Federal Secretariat, Shehu Shagari Way, Abuja, Nigeria
P.M.B 146, Garki, Website: www.education.gov.ng
E-mail: ict@education.gov.ng

FME/S/1336/C.149/II/39 22nd May, 2024

Engr. Dr. Sadiq S. Lawal
Lecturer, Mechanical Engineering Department,
University of Technology,
P.M.B 65, Minna,
Niger State.

**Re: Request for Compassionate and Patriotic Audience to Present Educational Invention for Basic Science, Secondary and Virtual Schools**

The above subject matter refers, please.

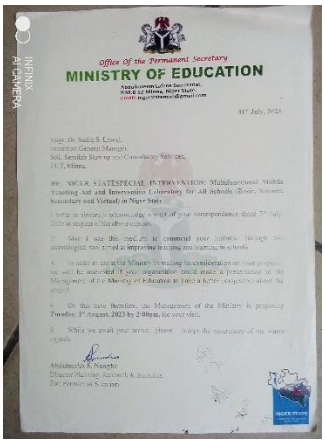
2. Due to your inability to come for your presentation as earlier scheduled for 21st May, 2024, I am directed to reschedule you for another presentation on your invention to hold as follows:

Date: Tuesday 28th May, 2024
Time: 11:00 am
Venue: ICT Training Room (Room 415)

3. Please accept the assurances of the Honourable Minister's warm regards.

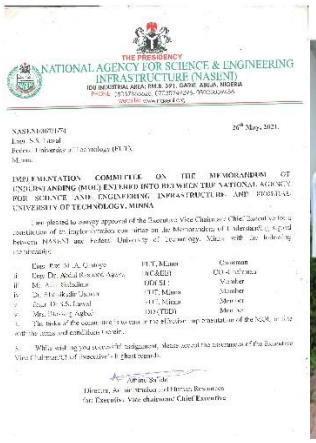
Ayotunde G. E.
Assistant Director (ICT/HSM)
For: The Honourable Minister

Federal Ministry of Education



Office of the Permanent Secretary
MINISTRY OF EDUCATION

Niger state Ministry of Education




National Agency for Science and Engineering Infrastructure (NASENI)



Zamfara State Ministry of Education

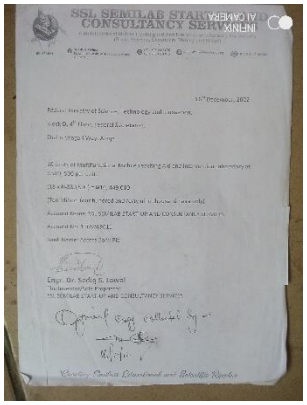



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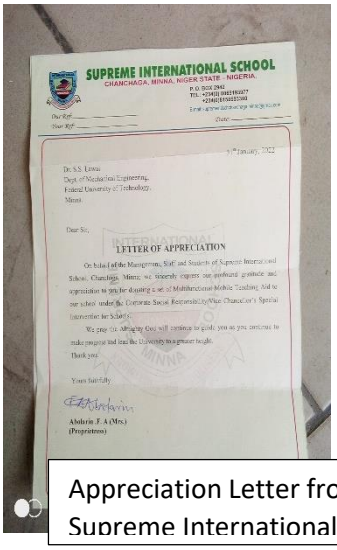
Figure 4.3: Letter of Evidence of interest from Buyers


Kaduna State Ministry of Education Policy


Appreciation Letter from Habisah Science

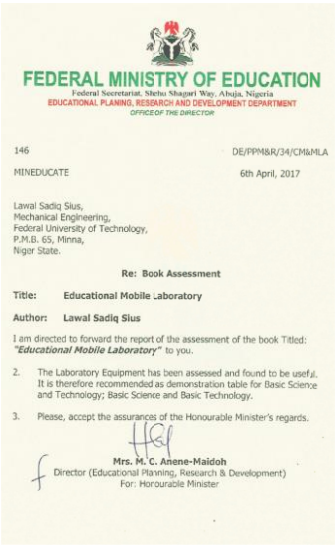



Appreciation Letter from Supreme International


Humanitarian Award for Feasibility in Ajaokuta LGA of Kogi state

Figure 5.3: Feasibility Evidence Letters


Patent Certificate




FMOE Recommendation


NERDC RECOMMENDATION

Figure 8.1: Stakeholders Engagement Evidence and Market Fit Evidence(4.2)