2017

THE GEEK TOOLBOX

IMPROVING TEACHING AND LEARNING OUTCOMES IN RESOURCE-DEPRIVED RURAL & URBAN COMMUNITIES

BY DESMOND A. ASIEDU

THE GEEK TOOLBOX

VALUE PROPOSITION

A CASE FOR LEARNING MANAGEMENT SYSTEMS & A CALL-TO-ACTION

The Geek Toolbox

IT Solutions for the third world

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Introduction

In an Encyclical titled "Laudato Si'", published in 2015, Pope Francis said that "*We are faced not with two separate crises, one environmental and the other social; but rather with one complex crisis which is both social and environmental. Strategies for a solution demand an integrated approach to combating poverty,* ***restoring dignity to the excluded*** (sic), *and at the same time protecting nature*"

In the year 2000, the United Nations General Assembly agreed on eight (8) Millennium Development Goals (MDGs) with the aim of addressing some of the most pressing issues of the time. While laudable progress was made towards the attainment of the MDGs objectives, it is widely accepted that Sub-Saharan Africa and Southern Asia have consistently lagged behind other regions of the world.

The MDGs focused on national average indices, thus, obscuring what happened within different demographics within countries. It has been established that the poorest and most marginalized sectors of society often experience the least progress. Exclusion has, in the said regions, been largely determined by factors such as gender, disability, ethnicity and location.

In 2011, Ban Ki Moon - then Secretary-General of the United Nations – set up a panel to define a vision for global development. The aim was to create universal goals addressing the social, economic and environmental dimensions of sustainable development. **The 2030 Agenda for**

Sustainable Development (commonly referred to as the Sustainable Development Goals [SDGs]) was born in September 2015, as a result of the panel's work in broad consultation with governments and civil society organizations, to succeed the less-comprehensive MDGs of 2000.

The fourth of the seventeen (17) SDGs is a call-to-action to "***ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all***".

The Problem

Most sub-Saharan African countries' educational systems are bedevilled by a myriad of similar problems; Inadequate learning and teaching material, lack of access to online teaching aids, lopsided student-teacher ratios, low numbers of trained teachers etc.

A statistical analysis Ghana Annual Schools Census describes the current situation aptly.

Source: Ghana Annual Schools Census (Basic Schools Information) 2012-2013, Twenty Fourth Round

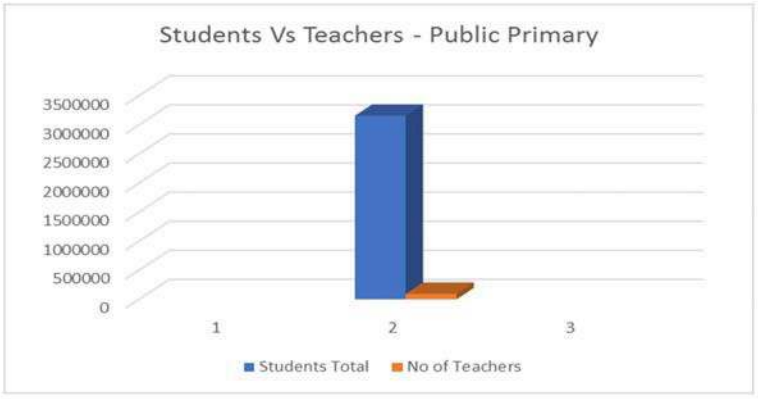
Producer: Ghana Statistical Service, Ministry of Education, Government of Ghana.

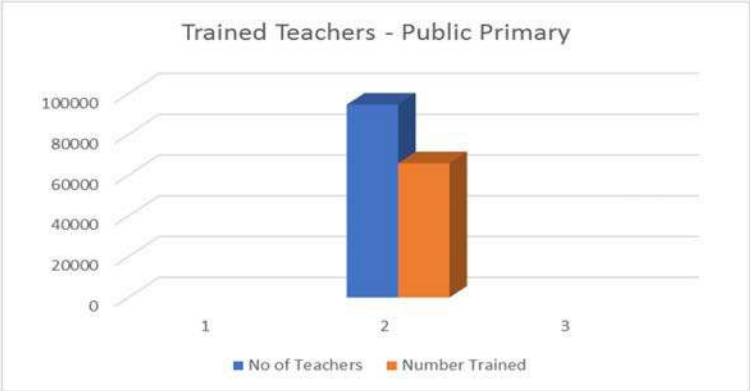
The census was conducted across public and private basic schools from KG level, through Primary to Junior High levels.

Our own analysis of the census figures highlights four main areas:

- Student-Teacher Ratio
- Ratio of Trained Teachers
- Comparison of Writing and Seating Places and
- A comparison of pedagogical tools (Mathematics, English, and Science Textbooks) and student numbers.

Here we present a **nationwide overview**. A region-by-region analysis is presented later in an appendix.

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80000
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40000
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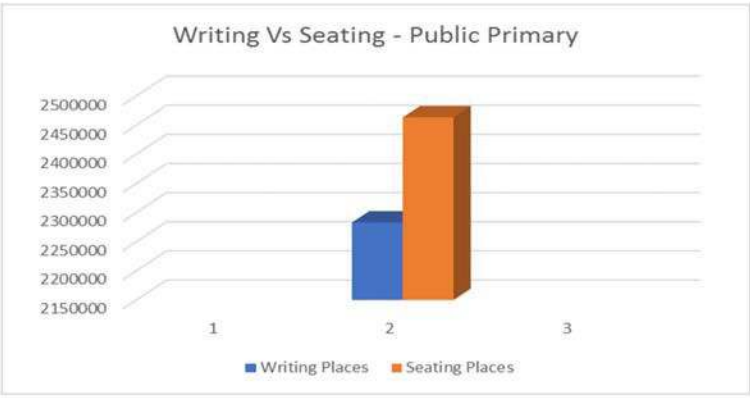
1
2
3
No of Teachers
Number Trained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2
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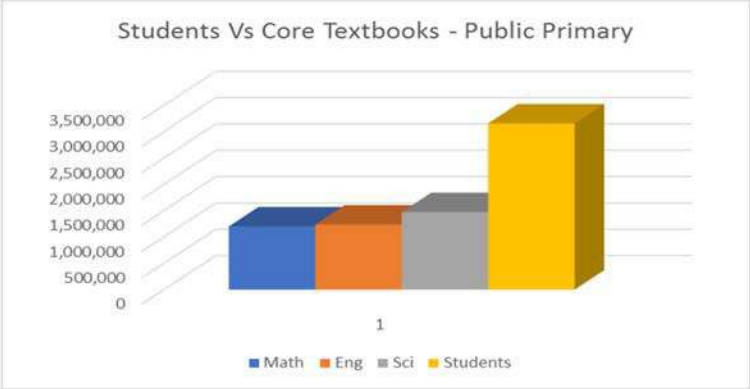
Writing Places
Seating Places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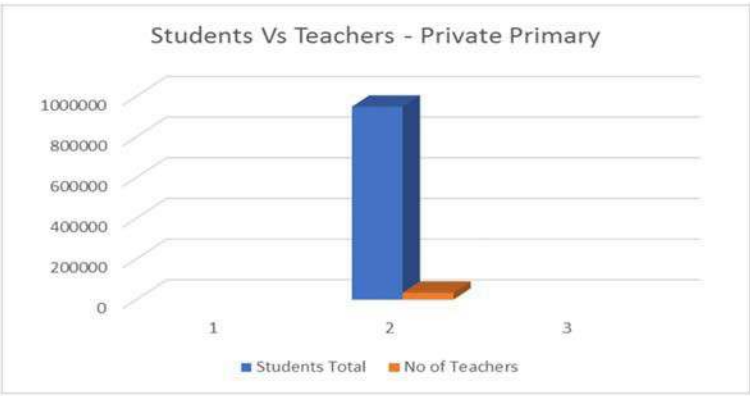
500,000
0
1
Math
Eng
Sci
Students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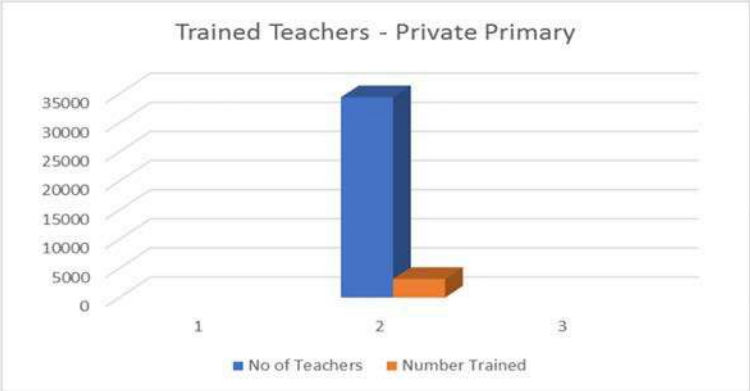
1
2
3
Students Total
No of Teachers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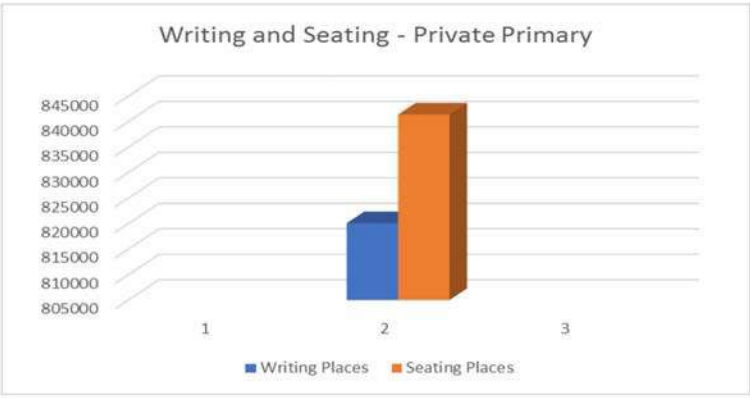
20000
15000
10000
5000
0
1
2
3
No of Teachers
Number Trained


Writing and Seating - Private Primary
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805000
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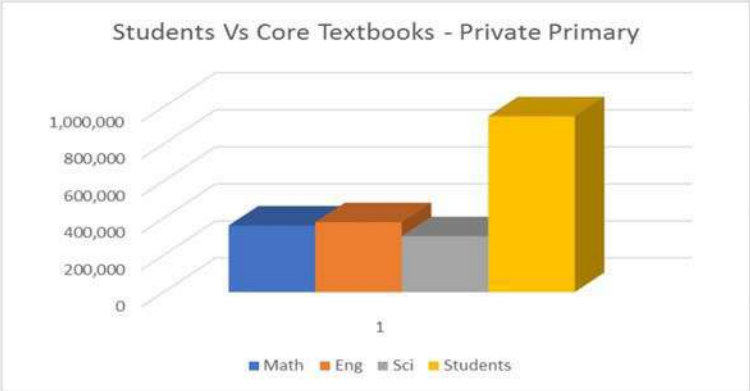
2
3
Writing Places
Seating Places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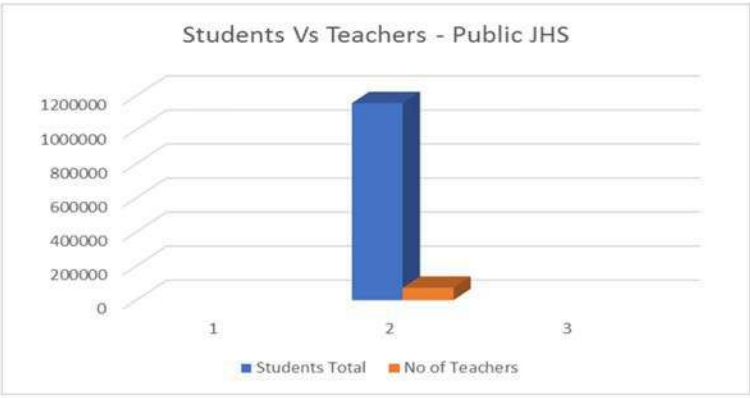
600,000
400,000
200,000
0
1
Math
Eng
Sci
Students


Students Vs Teachers - Public JHS
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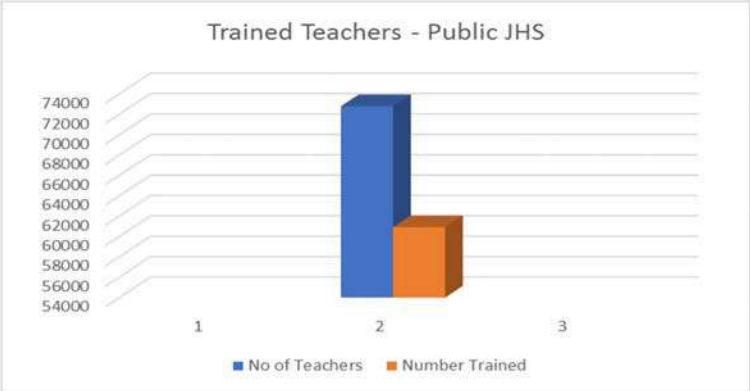
1000000
800000
600000
400000
200000
0
1
2
3
Students Total
No of Teachers


Trained Teachers - Public JHS
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66000
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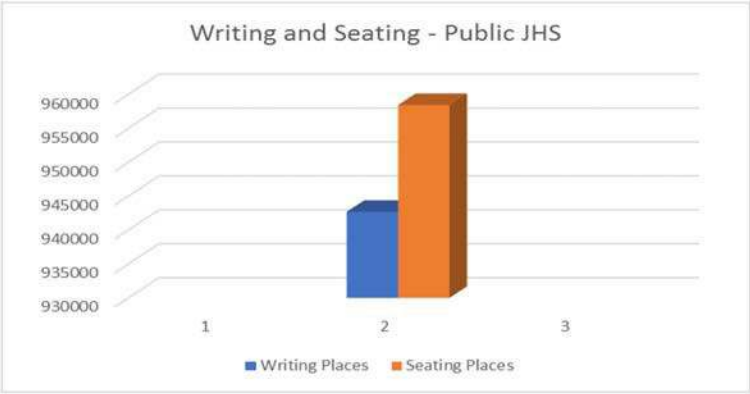
62000
60000
58000
56000
54000
1
2
3
No of Teachers
Number Trained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930000
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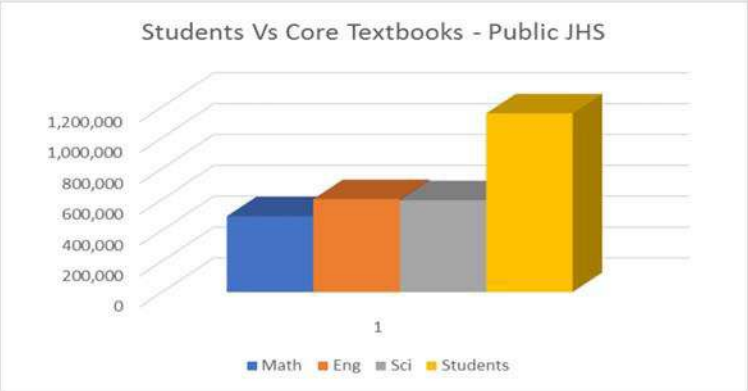
2
3
Writing Places
Seating Places


Students Vs Core Textbooks - Public JHS
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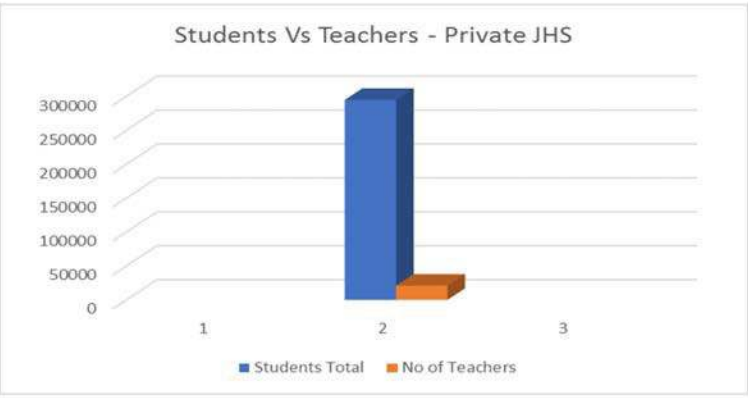
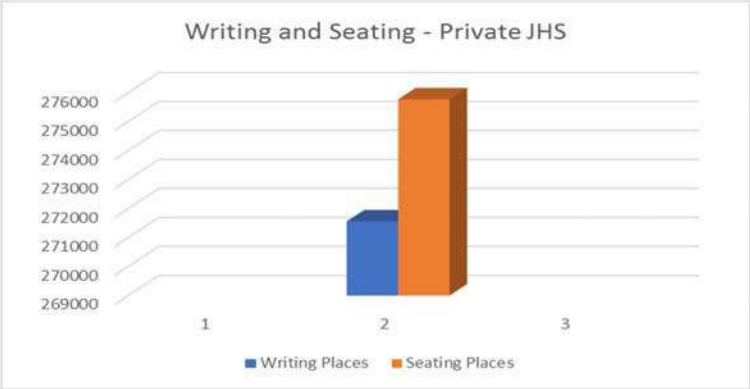
1,000,000
800,000
600,000
400,000
200,000
0
1
Math
Eng
Sci
Students


Students Vs Teachers - Private JHS
300000
250000
200000
150000
100000
50000
0
1
2
3
Students Total
No of Teachers


Writing and Seating - Private JHS
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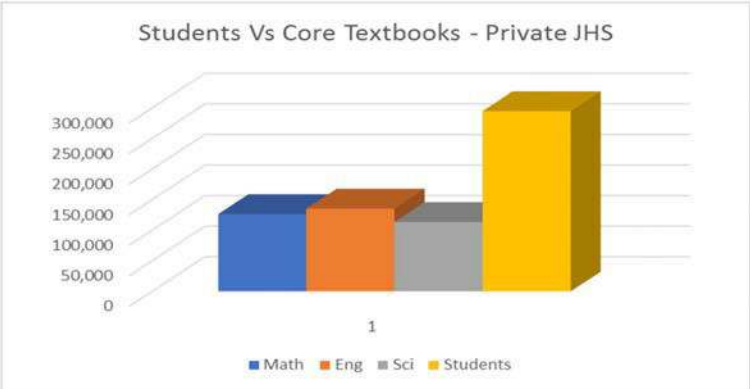
274000
273000
272000
271000
270000
269000
1
2
3
Writing Places
Seating Places


Students Vs Core Textbooks - Private JHS
300,000
250,000
200,000
150,000
100,000
50,000
0
1
Math
Eng
Sci
Students

Broad Objectives

This proposal is aimed at seeking funding to implement an idea to help in the achievement of SDG 4 in rural Ghana and also in resource-poor urban communities.

Our vision is to drive a continuous and mass deployment of high-quality Learning Management Systems/centres across the length and breadth of Ghana in identified (targeted) needy communities and schools over a five (5) year period.

Over the same 5-year timeframe we are making it our mission, donor support permitting, to provide a high-quality, curriculum-based, multiple format and immersive learning and teaching experience for upwards of 100,000 basic school children in Ghana, and their teachers.

Executive Summary

Webducator is a project which seeks to improve teaching and learning outcomes in resource- deprived communities by setting up Onsite and Online Learning Management Systems (LMS)to give tutors and students an **on-demand** and **immersive** education experience. The target student group for this project are in the Junior High School bracket.

Webducator is a call-to-action based on the United Nations' 2030 Agenda for Sustainable Development (Sustainable Development Goals); specifically, it is a call-to-action on the fourth (4th) SDG which seeks to "***ensure inclusive and equitable quality education and to promote lifelong learning opportunities for all***".

Webducator is a multiple format Learning Management system with curriculum-based content as well as skill-based content. Content is delivered via a Server-Client Architecture on a Local Area Network.

Formats include:

- Text notes (PDF)
- Lecture Slides (Video)
- Video Tutorials
- Audio Tutorials

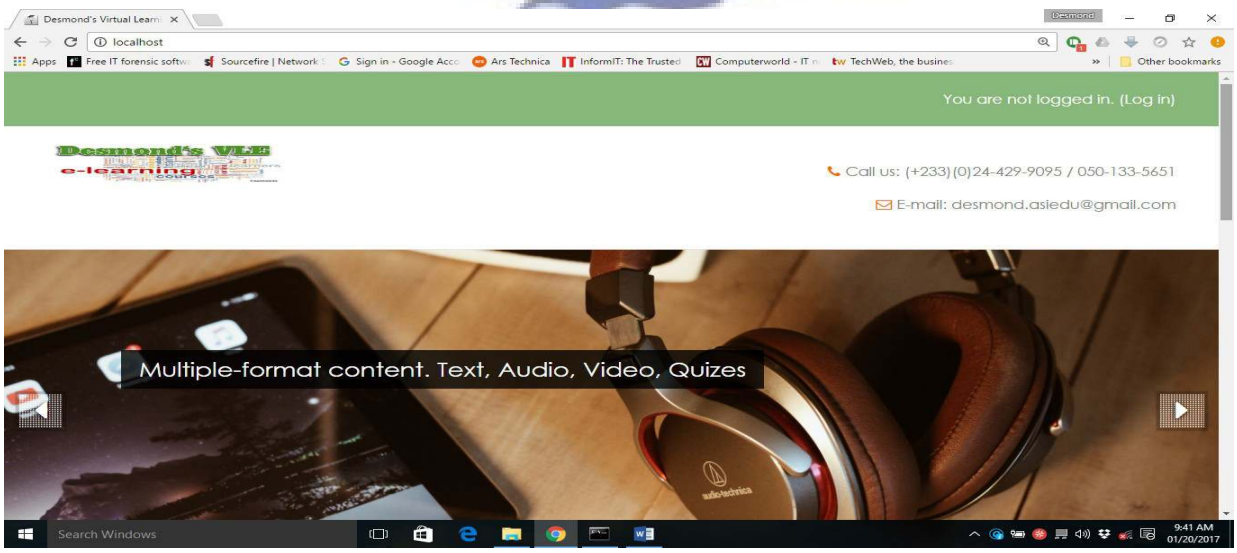
The system's modules include:

- Lessons
- Quizzes - Automated

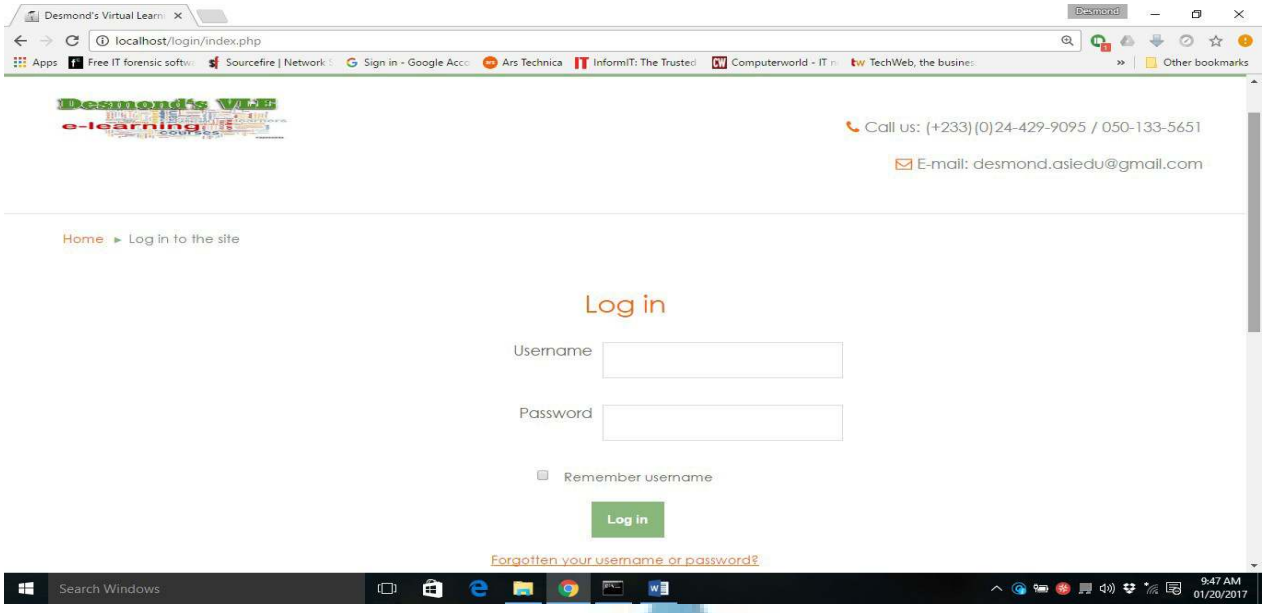
- Assignments
- Messaging and Announcements
- Subject-based discussion forums
- Progress-Tracking and Comprehensive Reporting

The purpose of this proposal is to:

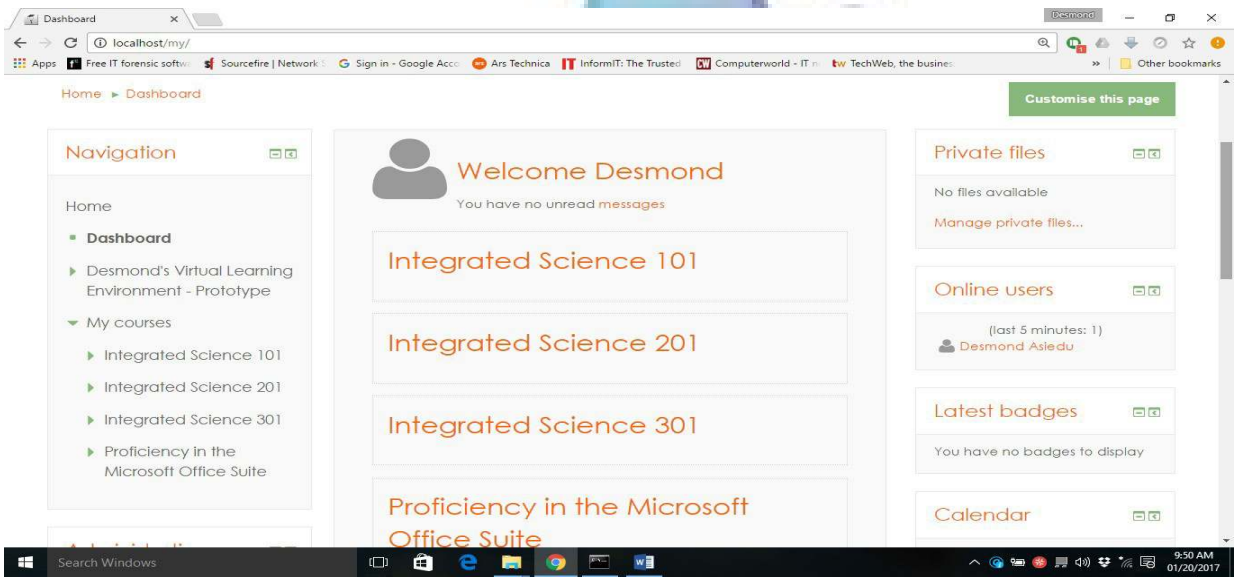
- Layout, comprehensively, our vision and mission for improving teaching and learning outcomes through the Webducator project
- Explain in full what Webducator will look like in practice
- Request for funding/sponsorship deployment of the project on the basis of one sponsor – one LMS.



Sample Home Screen from our Prototype



Sample Login Screen from our Prototype



Sample Student Dashboard from our Prototype

Please see more screenshots in the attached Value Proposition.

WEBDUCATOR SUMMARY

Our Learning Management System (LMS) also known as an e-Learning Solution, is code-named "**Webducator**". It is built on an Open Source Modular Object-Oriented Programming Platform that promotes rapid development of solutions in a scalable and modular format. The end-product is an **online** or an **onsite** e-learning application.

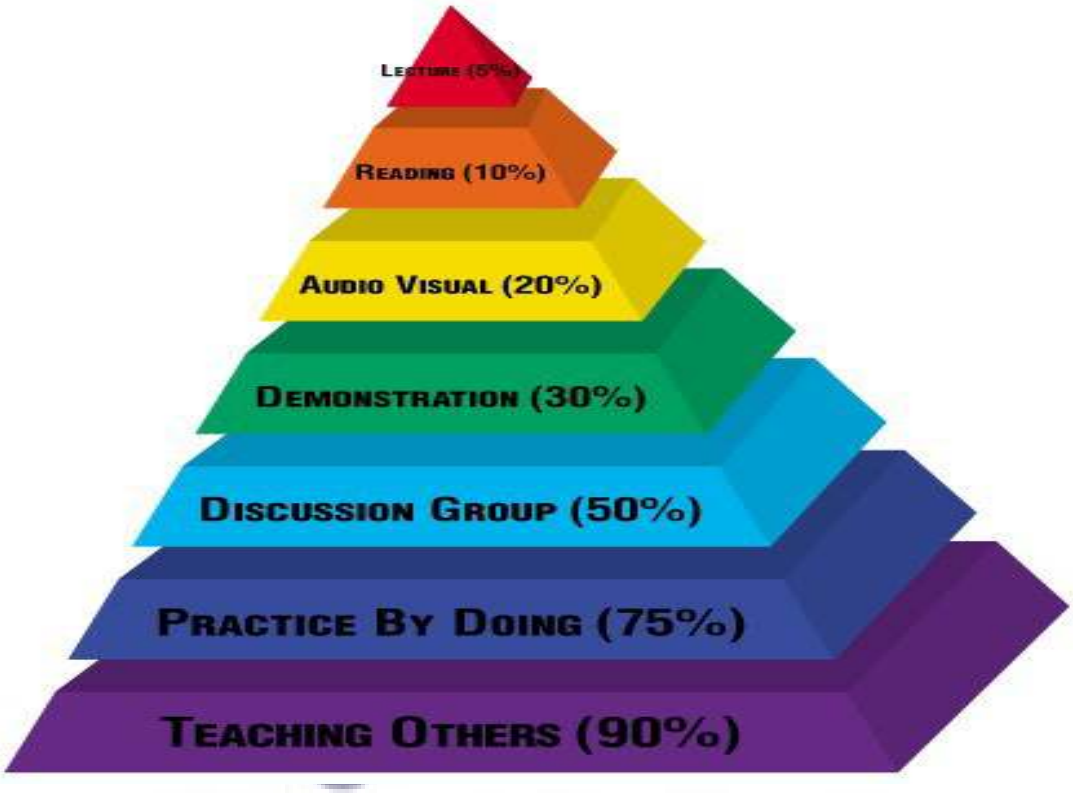
For the purpose of this project, we intend to concentrate on onsite solutions owing to the fact that the very exclusion of our target communities and schools owes much to their remoteness (physical and technological). Where technology (like Internet) is available it is mostly unreliable and invariably too expensive for natives.

Teaching and Learning in Ghana, especially in public institutions, is almost invariably by rote (based on repetition and memorization of mostly text-based content). Students in more affluent schools and communities would have access to science and computer laboratories for practical learning, and they also tend to have better teachers and are also more likely to have access to the internet. They thus have a broader spectrum of material for additional learning and research.

Modern teaching, the world over, has moved on from mere repetition and memorization to more immersive experiences which employ the use of multiple format content such as text, audio, video, quizzes

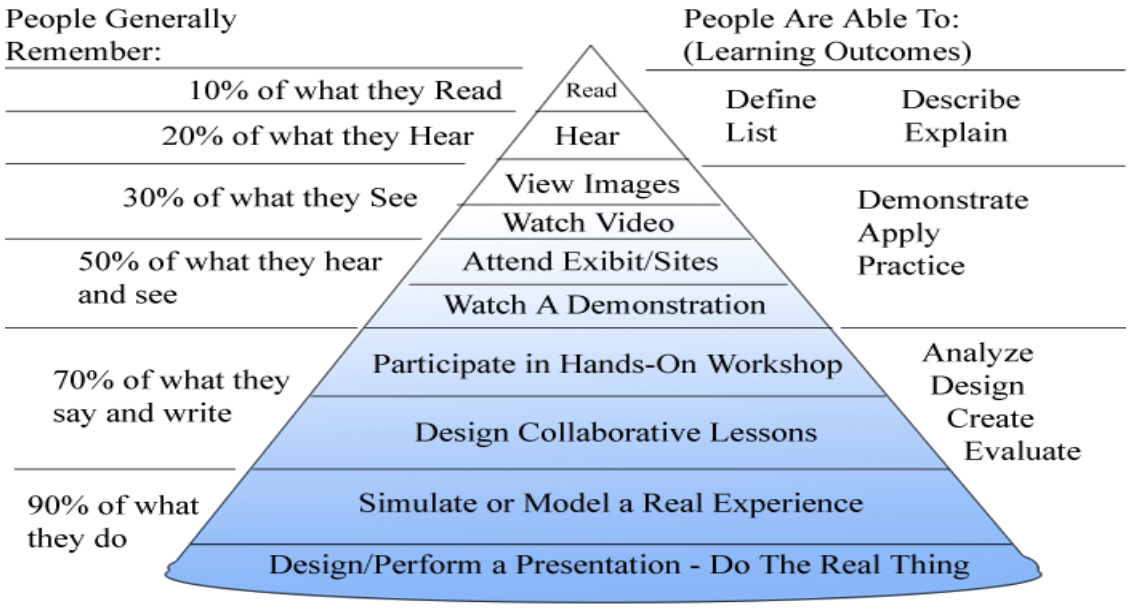
and assignments, discussion forums etc.

The William Glasser learning pyramid gives us the following assessment of learning (in Children):



A fully-functional LMS promotes the listed essential activities which highlight the essence of immersive learning experiences.

Edgar Dale's Cone of Learning (1969) supports Dr. Glasser's findings above:



Dale's Cone of Experience

WEBDUCATOR – The Building Blocks

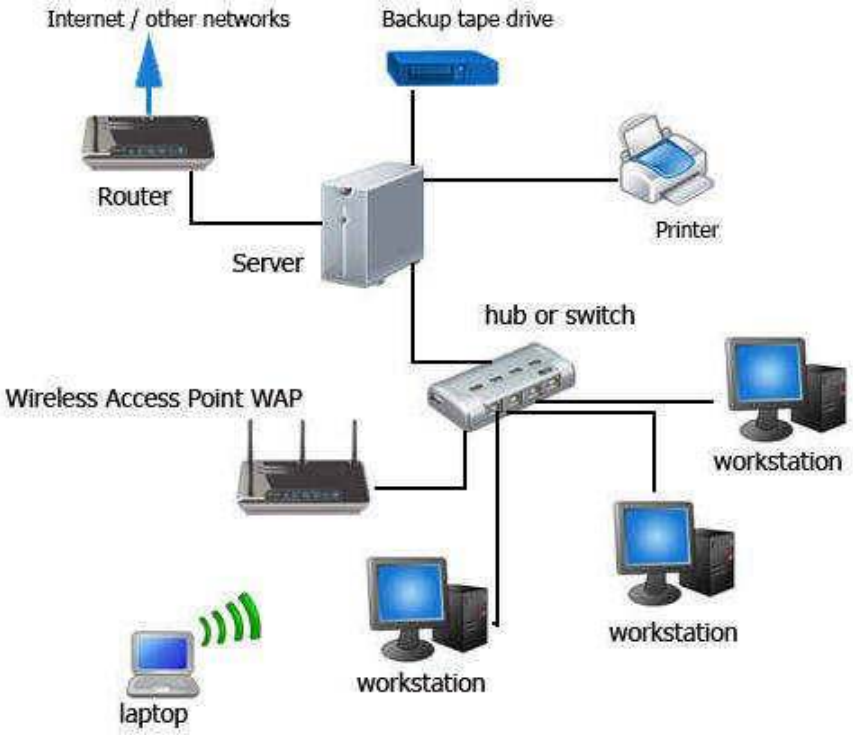
a) Infrastructure

An onsite LMS is built on a client-server architecture.

A high-performance **server** computer is required to process multiple and concurrent logins of end-users and to serve as the repository of the large volumes of data which make up the content. It is also runs the LMS application that serves the educational content to connected client workstations.

A wired or hybrid (wired and wireless) **Local area Network** (LAN) is needed to provide connectivity (and mobility where applicable), or the points of connection for all nodes (devices) on the network. A hybrid LAN promotes the use of wireless devices such as notebook computers, tablets and even smartphones as well as traditional cable- connected personal computers.

We envisage a 20-workstation setup as a scalable and manageable basis for an onsite LMS.



Client-Server Architecture – Typical Schematic

Large-capacity backup drives are needed to serve as backup repositories for the LMS to aid quick recovery from service disruption, security incidents and other disasters. Same drives will be needed for content mobilization and research.

a) Content

LMS content will be structured, curriculum-based and will include text notes (in PDF format) video and audio tutorials and lectures, lecture slides from reputable Open Education portals online.

Lessons are arranged in strict tandem with the industry regulator's syllabus.

Post-lesson automated quizzes are offered at

the end of lectures to aid improvement measurements. This quiz module is also adaptable to offer terminal examinations and are marked in real-time based on pre-programmed marking schemes and answers. This could greatly relieve teachers of a sizeable chunk of their script-marking workload.

A course discussion forum is incorporated to encourage subject or course-based peer discussions.

Messaging is possible among students/learners or between teachers/instructors and students and serves as a good means of making group announcements and also encourages individual mentoring.

Assignments can be delivered to students online, and submissions can also be made to teachers via the LMS.

One of the biggest selling points of our LMS is progress-tracking which gives us the metrics with which to measure student progress and to measure outcomes against projections. Reporting is made easy by this module.

b) Content Types

We aim for our content to be dynamic and responsive to industry trends but initially the LMS content will be categorized under **Academic content** and **Skill-based content.**

Academic content will initially and comprehensively cover the four core subjects of the Junior High School system as follows:

- Integrated Science
- Social Studies
- Mathematics
- English Language

Skill-based content will be added to aid learners acquire basic knowledge of some life skills. Prospective content here would include:

- An Introduction to the Microsoft Office Suite
- Proficiency in the Microsoft Office Suite
- D-I-Y Carpentry and Joinery
- Introduction to Professional Photography
- Introduction to Entrepreneurship
- Introduction to Computers
- Introduction to Computer Programming

Operational Model

Funding

This will require a major concerted effort from all stakeholders. Our deployment model is premised on the hope that our stakeholders will each be willing and able to fund at least one LMS. Our appeal will directly target the International Donor Community (through their agencies) in conjunction with Non- Governmental Agencies (NGOs), and Local Government Authorities.

Funding will be in the form of money and other

logistics such as:

- Floor Space – A well-secured building or large classroom block to be donated or rented by a sponsor for designing and fitting into a standard computer laboratory structure.
- Hardware requirements including computers (Servers and Workstations), networking equipment (Local Area Network), and computer hardware for laboratory.
- Other project logistics such as travel and lodging costs, feeding costs etc.

Implementation

Our timeframe for system setup is six weeks following approval and availability of funding and/or logistics.

Week One (1) – Design and building of Local Area Network, testing and optimization of equipment.

Weeks Two to Four (2-4) – Content Mobilization, back-end (server) configuration, User-interface design and upload of structured content.

Week Five (5) – Enrolment of Learners/Students and Instructors/Tutors into the Learning Management System. Here we will also set permissions and access control parameters.

Week Six (6) – Orientation for participants/users and commissioning.

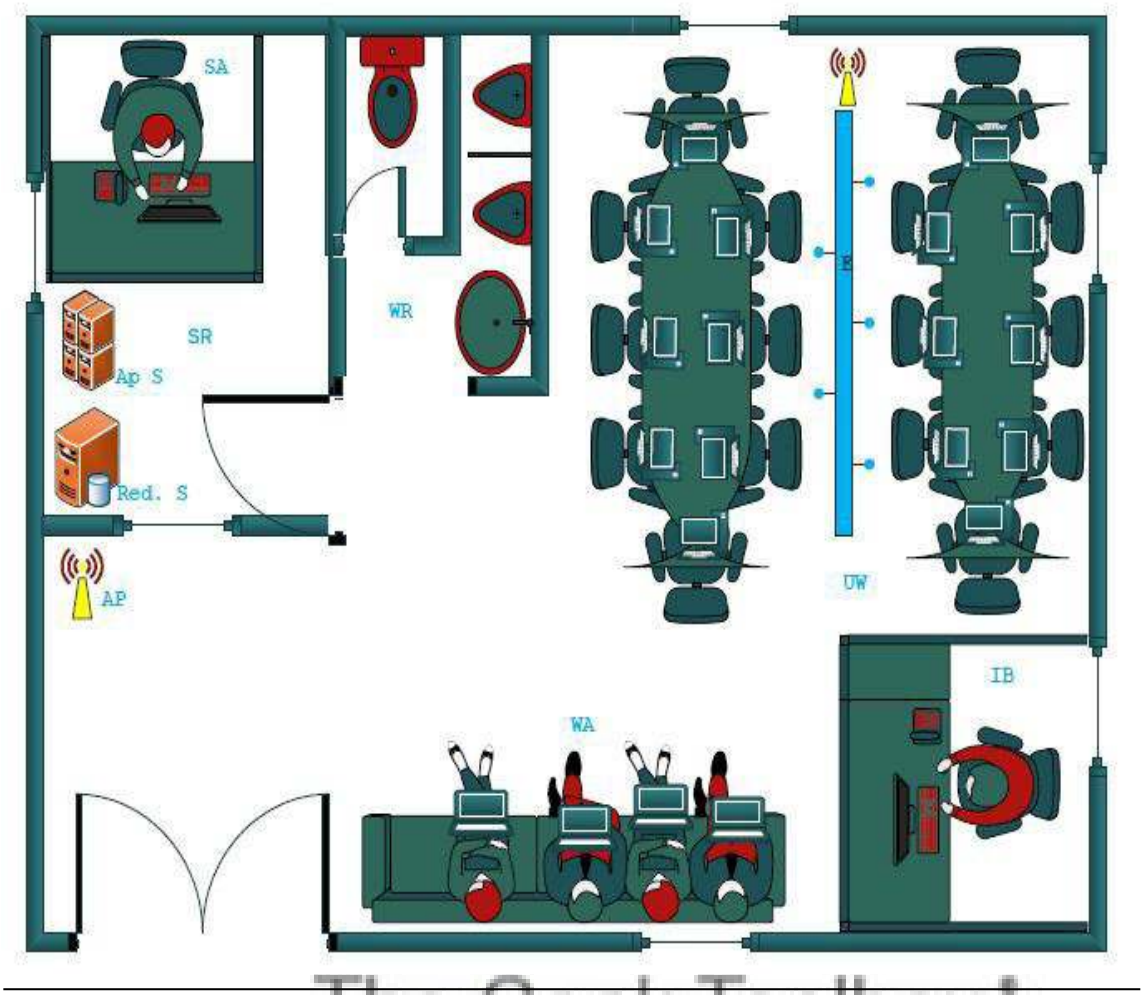
A progress and completion tracking module is built into the system give wide range of reports: from individual student-level reporting to group- level reports.

The orientation phase will always last a minimum of one (1) week as it is essential that instructors/tutors and learners/students are competent enough to navigate the user interfaces and to run the system with minimal intervention from the implementation and operations team(s)after commissioning.

Roll-out Model

For the purpose of co-ordination and to promote the prudent use of resources, identified target communities will be grouped based on physical proximity. This will mean the Implementation team will work across these communities in a structured manner to save costs – especially of transportation. As an example, target communities in Northern Ghana will be grouped as one; and implementation effected in all of them before focus is shifted to other similarly grouped communities.

Schematic Diagram



(i) Stakeholders, Administration, Roles and Responsibilities

Our stakeholder roles are broadly categorized into three as follows:

a. Sponsor

This is an entity that contributes financially or logistically to the project. Our projected Sponsors are of five main types:

- International Development Agencies

- Non-Governmental Organizations and Charities
- Local Government Authorities
- Corporations
- Philanthropists

Each stakeholder is expected to give input throughout the lifecycle of the project and to have representation on the administration of the project via the Implementation and Operations & Evaluation teams.

f. School/Community

This stakeholder group is made up of the primary or direct beneficiaries of the project. They may also serve as sponsors in that they may be willing and able to donate the floor space for the project.

They will be charged with ensuring **appropriate** (acceptable) **use** and **security** of the LMS. This group will also be represented on the operations and monitoring team.

g. Implementation Team

The point guys for the actual implementation of the project. Will include a project/operations manager, an ICT specialist, an Instructional Designer an Education consultant, and a support team consisting of technical support associates, a research and clerical team.

This is the team that will travel country- wide to implement, train users and handover completed systems.

They will have the majority of members of the Operations and Evaluation team, as the bulk of the team's work will involve such technical issues as system updates, and technical support in the shape of repair and maintenance.

Technical Support

It is easy to project severe logistical challenges owing to the projected country-wide implementation. A dedicated support team will be trained as a sub- group of the operations team. Their sole mandate will be to respond quickly and effectively to system operation incidents.

Response-to-fix schedules will be set for each beneficiary community/school depending on such factors as travel distance, workload of technical support team, scope of work to be done, and availability of qualified and/or competent local talent to aid the process.
This response-to-fix schedule will be explicitly spelt out in a **Service Level Agreement** (SLA) to be agreed and signed by all stakeholders.

We plan to deliver a large chunk of **technical support remotely**. This will greatly cut down on travel and associated costs.

Remote support technology is abundant and cheap. Technical support incidents will mostly arise from configuration changes and content modification.
Mechanical/equipment failure cannot be resolved remotely but we do not envisage regular occurrence, or many such incidents.

It is stated elsewhere that the responsibility

for securing the system, and for providing a healthy operating environment will be borne by a specific shareholder – the beneficiary school or community. This will be explicit in the afore-mentioned Service Level Agreement.

Remote support will come at a minimal recurrent cost in the shape of internet service subscription. There are many competitively-priced mobile broadband dongles and other devices on the market. Coverage area is another major factor to consider.

Mobile broadband is our preferred mode of delivery owing to a dearth in the supply of cable broadband services in most of Ghana; mobile telephony/internet penetration is substantial nationwide.

Use of the device (connection procedure, reload process etc.) and end-user activities in the remote connection process will all be demonstrated and documented during the orientation program.

Budget

LMS BUDGET

HARDWARE	UNIT COST ($)	QUANTITY	COST ($)
LMS Server	1,869.99	1	1,869.99
Failover Server	1,869.99	1	1,869.99
Client PC	500	20	10,000.00
LCD Projector	499.99	1	499.99
Projector Screen	149.99	1	149.99
Notebook Computers	555.55	3	1,666.65
MFP Printer	1,500	1	1,500.00
Gigabit Ethernet Switch	181.81	2	363.62
Wireless Access Point	170	2	340.00
Power Tools (Drill Kit)	70	2	140.00
Network Toolkit	79.98	2	159.96
CAT 5E/6 Cable (STP)	136.36	2	272.72
RJ-45 Connectors	111.11	1	111.11
Stereo Headsets	19.99	21	419.79
SUB-TOTAL			**19,363.81**

TECHNICAL COSTS		
Development	Content Mobilisation, Instructional Design,	**5,000**
	Networking (setup & configuration)	
Professional Fees	Consultants' compensation and training costs	**10,000**
Other Project Logistics	Equipment Transportation, Lodging etc	**5,000**
SUB-TOTAL		**20,000**
Total		**39,363.81**

Budget Notes: Being a social impact project rather than an enterprise, project costs can be cut significantly if a sponsor donates our hardware requirements and logistics. A sponsor may also appeal to corporate citizens, large pc vendors etc for such donations as Corporate Social Responsibility. Below is a budget which envisages the sponsor providing the required hardware and other project logistics:

LMS BUDGET

HARDWARE	UNIT COST ($)	QUANTITY	COST ($)
LMS Server	[redacted]	1	[redacted]
Failover Server	[redacted]	1	[redacted]
Client PC	[redacted]	20	[redacted]
LCD Projector	[redacted]	1	[redacted]
Projector Screen	[redacted]	1	[redacted]
Notebook Computers	[redacted]	3	[redacted]
MFP Printer	[redacted]	1	[redacted]
Gigabit Ethernet Switch	[redacted]	2	[redacted]
Wireless Access Point	[redacted]	2	[redacted]
Power Tools (Drill Kit)	[redacted]	2	[redacted]
Network Toolkit	[redacted]	2	[redacted]
CAT 5E/6 Cable (STP)	[redacted]	2	[redacted]
RJ-45 Connectors	[redacted]	1	[redacted]
Stereo Headsets	[redacted]	21	[redacted]
SUB-TOTAL			[redacted]

TECHNICAL COSTS		
Development	Content Mobilisation, Instructional Design,	**5,000**
	Networking (setup & configuration)	
Professional Fees	Consultants' compensation and training costs	**10,000**
Other Project Logistics	Equipment Transportation, Lodging etc	[redacted]
SUB-TOTAL		[redacted]
Total		[redacted]

In this second scenario, where the sponsor donates the hardware requirements as well as auxilliary logistical support, the cost of an LMS - being development and professional charges - is:

Fifteen Thousand Dollars ($15,000.00)

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Company Profile

The Geek Toolbox project was started by Desmond Atta Asiedu in 2007 with the mission to provide World-Class IT solutions to Small and Medium scale Enterprises in Ghana.

Its original portfolio included such services as computer networks (design and building), web development, systems administration etc.

Over the years it has expanded its services to include Video Surveillance Systems and Allied Security Systems (such as Electric Fencing with Alarm Systems).

We are increasingly leaning toward social entrepreneurship and have recently launched our flagship project codenamed "Webducator", which is a push to "Improving Teaching and Learning Outcomes in resource-deprived communities in Ghana".

The Geek Toolbox's principal is Desmond Asiedu, an IT Asset Manager with about two (2) decades of experience in industry in a broad-spectrum of roles ranging from entry-level technical support roles to mid-level managerial roles across a wide-array of industries (Internet Service Providers, A Government of Ghana Agency, A Spanish Multinational Building Technology, A leading Hospitality Industry player and others).

Apart from skills and qualifications listed in the

attached resume, Desmond has recently undergone training, and been awarded a certificate, in Design Driven Entrepreneurship by the Young African Leaders Initiative (YALI)instituted by ex-President Barrack Obama of the United State of America.

Service Portfolio:

- ✓ Computer Networking
- ✓ Web Development
- ✓ Business Process Improvements and Optimisation
- ✓ Data Recovery
- ✓ Digital Forensics
- ✓ Video Surveillance and Allied Security Systems
- ✓ Data Analytics
- ✓ Digital Marketing (Email and Social Media)
- ✓ Health Informatics & Healthcare IT
- ✓ Learning Management Systems (e-Learning Systems)
- ✓ IT and Network Asset Management