Technology-Enhanced Learning for Improved Quality of Teaching and Learning

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University of Zambia

UNESCO Partnership Forum on ICTs in Education | Lusaka, Zambia
Outline

• Part I: Information and Communication Technologies (ICTs)
• Part II: Quantifying ICTs in Zambia
• Part III: ICTs Infrastructure in Zambia
• Part IV: Classification of TEL Interventions
• Part V: Evaluating TEL Interventions
• Part VI: Challenges and Opportunities
Part I: Information and Communication Technologies (ICTs)

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Part VI: Challenges and Opportunities
Information & Communication Technologies (ICTs)

“Diverse set of technological tools and resources used to create, store, transmit, share or exchange information.”

• These technological tools and resources include:
  • Computers, the Internet (websites, blogs and emails),
  • Live broadcasting technologies (radio, television and webcasting)
  • Recorded broadcasting technologies (podcasting, audio and video players and storage devices) and
  • Telephony (fixed or mobile, satellite, visio/video-conferencing, etc.).

Information System (IS) are typically used to create, store, transmit and share information.

An IS is a set of interrelated elements or components that collect (input), manipulate (processes), and disseminate (output) data and information and provide a feedback mechanism to meet an objective.
A computer-based IS is an organized combination of people, hardware, software, communication networks and the data resources that collects, transforms and disseminates information.
The technological infrastructure—hardware, software, communication networks and the data resources—used to collect, transform and disseminate information in the organization.
Illustration of IS for ICTs in Education

- Hardware—Tablet device
- Software—Android Operating systems and Application software
- Communication—SIM, wireless connection
- Data Stores—Cloud services, device storage
- People—Educators, students, parents
- Procedures—Interaction with tablet content
Part II: Quantifying ICTs in Zambia
Total Number of Schools in 2017

2017 Statistical Bulletin: All Schools

<table>
<thead>
<tr>
<th>Province</th>
<th>Number of Schools</th>
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<tbody>
<tr>
<td>Central</td>
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<tr>
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</tr>
<tr>
<td>Eastern</td>
<td>1130</td>
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<tr>
<td>Luapula</td>
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<td>Muchinga</td>
<td>724</td>
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<tr>
<td>North Western</td>
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<td>Northern</td>
<td>1008</td>
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<tr>
<td>Southern</td>
<td>1256</td>
</tr>
<tr>
<td>Western</td>
<td>1044</td>
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</table>

Number of Schools

May 30 2019
Regional Ratio of Computers/School

2017 Statistical Bulletin: Schools vs Computers

Province | Schools | Computers
---|---|---
Central | 1216 | 2851
Copperbelt | 1095 | 7738
Eastern | 1130 | 3248
Luapula | 701 | 2103
Lusaka | 869 | 6209
Muchinga | 724 | 1457
North Western | 809 | 2113
Northern | 1008 | 1529
Southern | 1256 | 5932
Western | 1044 | 1692

Number of Schools and Computers

- Blue bars represent Schools
- Dark blue bars represent Computers
“The number of computer laboratories is very low compared to the number of schools. There is need to build more ICT laboratories in schools if the issues of ICT are to be addressed in the long run.”

“Copperbelt has the highest number of computer laboratories with 384, while Muchinga has the least number with only 51 computer laboratories.”
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Increased Regional Internet Connectivity

- Nation-wide network infrastructure is now available
  - Last mile connectivity seems to be an issue

http://www.zesco.co.zm
The Zambia Research and Education Network (ZAMREN) provides subsidised Internet services for research and education institutions

- Possibility of integrating schools to the growing network
- Seamless connection to Colleges of Education and Universities

### Cost-effective Internet Service Providers

<table>
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<th>#</th>
<th>Member Entity</th>
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<tr>
<td>1</td>
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<td>Colleges of Education</td>
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<td>3</td>
<td>Trade Institutes</td>
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With potentially larger network coverage area, MNOs could provide Internet connectivity to remote areas and, possibly, Zero-Rated services.
• Private Cloud Service Providers like the Zambia National Data Centre could provide storage facilities for data
Partnerships with hardware vendors could ensure that reliable hardware is made available in schools.
Experimentation With Low Cost Devices

• Pilot studies could be conducted to explore the possibility of using low-cost devices

India launches Aakash tablet computer priced at $35

5 October 2011

India has launched what it says is the world's cheapest touch-screen tablet computer, priced at just $35 (£23).

Costing a fraction of Apple's iPad, the subsidised Aakash is aimed at students.

It supports web browsing and video conferencing, has a three-hour battery life and two USB ports, but questions remain over how it will perform.

Officials hope the computer will give digital access to students in small towns and villages across India, which lags behind its rivals in connectivity.
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TEL Interventions (1/6)

- **Technology Focused**
  - Hardware; software; communication; datasources

- **Content Focused**
  - Curriculum; OERs; social media

- **End User Focused**
  - Educators vs Learners

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On Educator vs Learner Focused Interventions [...]

“Teachers: Nationally there has been an aggregate increase in the number of teachers from 96,288 in 2016 to 106,270 in 2017, an increase of 10,042.”

“Enrolment: Nationally there was an increase in enrolment by 114,040-from 2016 (4,025,380) to 4,139,907 in 2017.”

“Overwhelming evidence indicates that educators play a crucial role in improved quality of teaching and learning”
TEL Interventions (3/6)

- End-to-end platform for sharing of composite OER resources
  - Client player used to playback of appliances
  - Repository component used to store OER objects and metadata

TEL Interventions (4/6)

- Web-based application implemented to facilitate organised technology-driven orchestration, during Peer Tutoring
  - Pre-session management instrumental

Learning Management Systems are popular Content Management Systems used for the management of teaching and learning activities

- Lesson planning
- Online quizzes
- Managing assessments

TEL Interventions (5/6)
• The Mwabu Tablet is marketed in three main versions
  • Student edition
  • Teacher edition
  • Home edition
• Devices preloaded with content aligned with curriculum
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• ICT-based interventions need to be evaluated in order to determine their impact on teaching and learning
  • Effectiveness of technology on teaching and learning
  • Impact on teaching and learning experience
Effectiveness is a Crucial Aspect of ICT Evaluation

- Comparative analysis aimed at assessing the effect of organised technology-driven orchestration of learning
  - Results for two user interfaces compared

**Portfolio Presentation**

**PortableApps vs. Workbench**

<table>
<thead>
<tr>
<th>Hedonic Quality (HQ)</th>
<th>Pragmatic Quality (PQ)</th>
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<tbody>
<tr>
<td>Self-oriented</td>
<td>too self-oriented</td>
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<tr>
<td>Self-oriented</td>
<td>neutral</td>
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<tr>
<td>Desired</td>
<td>task-oriented</td>
</tr>
<tr>
<td>Superfluous</td>
<td>too task-oriented</td>
</tr>
</tbody>
</table>

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“Ad hoc vs. Organised Orchestration”.
In: Proceedings of the 8th IEEE International Conference on Technology for Education.
DOI: 10.1109/T4E.2016.48
Usefulness of ICTs Needs to be Ascertained

- Systematic review of usefulness and user experience of Web-based user interface
  - Standard measurement instruments used

Technology does not always work, especially when deployed without prior assessment of environment

- Identifying factors that influence adoption of educational technology crucial

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Identifying Key Stakeholders is Crucial

- Partnerships with key stakeholders
  - Policy makers
  - Researchers
  - Practitioners
  - Hardware and software vendors
  - Educators
  - Technologists
  - Not-for-profit organisations

http://www.parliament.gov.zm/node/200
Technology is constantly changing and so the curriculum needs to be aligned with changing needs

- Hardware upgrades
- Software upgrades
- Digital content
The UNZA has been working towards moderation and alignment of programmes offered by affiliate colleges

- Staff exchange workshop regularly held
- Examination moderated

A number of Colleges of Education in Zambia have affiliated to the University of Zambia.

These include:

<table>
<thead>
<tr>
<th>NO.</th>
<th>COLLEGE NAME</th>
<th>TOWN</th>
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<tbody>
<tr>
<td>1.</td>
<td>Chalimbuna College of Education</td>
<td>Chongwe</td>
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<td>David Livingstone College of Education</td>
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<td>10.</td>
<td>Evelyn Hone College</td>
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</table>

https://education.unza.zm
The rapid increase in the amount of digital content available presents challenges

- Identification of content relevant to the curriculum and country necessary
- Identification of authentic sources of data and information crucial
• Well-known aggregate services could be employed to extract relevant data and information
  • Additionally, trusted individuals—educators—could be used to verify content from unknown sources
Content Verification Necessary (3/3)

- Siyavula, in South Africa, takes advantage of the “Wisdom of the Crowd” to write Open Textbooks
  - Similar initiatives could be employed in Zambia
Data-Driven Approaches Required (1/3)

• How can data generated by ICT-based solutions be used?
  • With the increase in the use of ICT-based interventions, there is an increase in the amount of data being generated

http://www.laceproject.eu
Data-driven intervention-level prediction modeling for academic performance

Full Text: PDF

Authors: Mvurya Mgabe, University of Cape Town, Cape Town
Audrey Mbohgo, University of Cape Town, Cape Town

Published in:
- Proceeding
  ICTD '15 Proceedings of the Seventh International Conference on Information and Communication Technologies and Development
  Article No. 2

Singapore, Singapore — May 15 - 18, 2015
ACM New York, NY, USA ©2015

https://doi.org/10.1145/2737856.2738012
Data-Driven Approaches Required (3/3)

- We are working towards building models for predicting student performance on a fairly small scale—for specific courses
  - Exploration of effect of student digital trails
With the numerous ICT-based interventions, rigorous evaluation techniques need to be conducted to ascertain effectiveness of interventions:

- Learning outcomes
- Usability studies
- User experience studies

What our evidence says:

- Mwabu-trained teachers deliver active, engaging, child-centred lessons
- Mwabu pupils achieve better learning outcomes than their peers
- Mwabu is cost-effective and affordable for use in ordinary primary schools across Africa
- Mwabu supports untrained teachers working with large classes in difficult conditions
- Mwabu is popular with teachers and pupils, and builds support for education in the community
Evaluation Results Need to Be Shared

• How can we ensure that results from empirical studies are made available to concerned stakeholders?
  • Audit of studies conducted required
  • Platforms for sharing research results need to be implemented
Addressing “The Digital Divide” Challenges (1/3)

• How can the so-called “Digital Divide” problems be addressed?
  • Powering devices
  • Content distribution
  • Internet connectivity

https://youtu.be/PqR3rUGbrxl
The Digital Doorway project is a CSIR project aimed at providing ICT infrastructure in remote areas in South Africa

- Durable material used for integrating hardware

http://www.digitaldoorway.org.za
The ICT4RED project is a South African initiative aimed at equipping educators in remote area with digital tools

- Low-cost Android-based tablets installed with educational tools
- Training cited as central to project success
Conclusion

• Quality of teaching and learning fundamentally focused on two main actors
  • Educators and learners
• Evaluation is central to identifying appropriate and effective interventions for improved quality of teaching and learning
• Multi-faceted approach is required to solve problems associated with teaching and learning
  • Technological infrastructure needs to be in place
  • All key stakeholders need to be fully involved
• The conversation must continue beyond this forum
Bibliography

http://www.moge.gov.zm/educational-statistical-bulletin

http://ischool.zm
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