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How E-Learning Within Teacher Education Might Develop: A Case Study of the ELATE Project

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Abstract:

This paper will explore how e-learning within teacher education might develop synergies which make a contribution to closing that gap in learning resource provisions in secondary schools in Africa.

In particular the presentation will outline the aims and objectives of a new E-learning and Teacher Education (ELATE) Project. This is a joint venture between Makerere University School of Education and The Open University in the UK, and is being funded by the British Council. The broad aims of the project are to develop an enhanced e-Learning module within initial teacher education at Makerere and to establish ongoing research on the impact of e-Learning within both teacher education and schools in Uganda.

A central part of the work will involve creating web- and CD-ROM-based e-learning materials to support teachers and trainee teachers in the main secondary subject areas of English language, mathematics, physics, chemistry, biology, geography, history and information technology as well as in cross-curricular areas such as health and environmental education. The project will take an instrumental approach in assembling content that meets the perceived needs of teachers and, hence, of trainees. The web portal will bring together in one place syllabuses, past exam papers, schemes of work, sample lessons, teaching and learning activities, useful websites and a range of professional support tools.

The project will pay particular attention to the low resource base of schools, the need to operate with large classes and to cope with either no computers in school, small numbers of computers, limited or no access to the Internet and attendant slow download speeds.

The project has the potential to transform the resource position in schools and to provide the means to disseminate good educational practice to both trainee and practicing teachers across Uganda and beyond.

How E-Learning Within Teacher Education Might Develop: A Case Study of the ELATE Project

“Network technologies have the potential to deliver timely and appropriate knowledge and skills to the right people, at a suitable time, in a convenient place. This is what e-training/e-learning is all about. It allows for personalized, just-in-time, up-to-date, and user-centered educational activities.” (Haddad & Draxler, 2002, p. 12)

Introduction

“E-learning can be defined as the use of computer network technology, primarily over an intranet or through the Internet to deliver information and instruction to individuals” (Welsh, Wanberg, Brown, & Simmering, 2003 p. 246). According to Halkett (2002) “e-learning offers a number of new tools to teaching — e-lectures, message boards, chat rooms, interactive assessment marked by computers, [and] prospects of unlimited access to electronic resources” (p. 81). However, in our view, e-learning is more than computers and the internet given that it may include all electronic devices such as CD ROMs, DVDs, radio, TVs, satellites, mobile phones, and other mobile-technologies that could be used to enhance teacher education through traditional and new pedagogical strategies.

Increasingly, recent years have witnessed advancement in e-learning use in the field of distance education and virtual learning given the rising demand for knowledge-based skills, especially to the growing higher education clientele. In particular, e-learning has become an important aspect in teacher education given the fact that ICT technologies (e-learning and mobile-technologies) are now accessible in schools, Internet cafes, etc. Therefore, teacher trainees need to be equipped with relevant e-learning skills and pedagogical strategies to enable them to execute flexible educational programs to meet the diverse needs of students in schools. There is also a pressing need to widen access to materials which reflect current good practice among teachers delivering Universal Secondary Education. Especially since, in this context, many teachers will need to teach outside their area of special expertise.

ICT has been used to promote distance teacher education to more than 3500 BeD students at Makerere University (Aguti & Fraser, 2006). Furthermore Flood (2002) contended “e-learning can offer a rich choice of learning experiences that fit in with ...[specific needs, aspirations, and] learning styles, and so it can... facilitate personal growth and professional development.” E-

learning capabilities could be a powerful tool or means to facilitate collaboration between different teacher trainees and practicing teachers across the nation and beyond (MacGonald & Thompson, 2005). An important arching question is then; how might e-learning develop within teacher education?

Developing e-learning within teacher education will not happen without challenges. Haddad and Draxler (2002) rightly put it that:

The challenges to integrate ICT into education are enormous, but so are the potential benefits. With technology, the sky is the limit, but with educational technologies, the sky is not the limit. The limit is human imagination and societal creativity (p. 17).

The potential of utilizing e-learning in teacher education is enormous, as indicated by Haddad et al. to facilitate the work of teacher trainees and practicing teachers in the field. The ELATE project will explore how e-learning within teacher education might develop synergies which make a contribution to closing the gap in learning resource provision in secondary schools in Africa. The caveat for the ELATE project is that it does not provide formal e-learning programmes per se but rather utilises the internet and other alternative ICT capabilities to deliver perceived useful materials, good teaching ideas, and advice to teacher trainees and practicing teachers in the field.

In particular we outline the aims and objectives of a new E-Learning and Teacher Education (ELATE) Project. This is a joint venture between Makerere University School of Education and The Open University in the UK, and is being funded by the British Council.

SPECIFIC AIMS

- (1) Develop an e-learning programme to support trainees and practicing teachers in the context of the introduction of Universal Secondary Education.
- (2) Create web- and CD-ROM-based teacher-support materials in: mathematics, physics, chemistry, biology, English, geography, history, and computer studies (with some cross-curricular content).
- (3) Train the trainees to disseminate the materials and new practices among teachers during their school practice.

(4) Produce an action research programme and research outputs to inform the future development of e-learning, especially in large classes where resources are limited.

To embed the work in a new “Centre for E-Learning” this presentation focuses on points (1) and (2) above.

A central part of the work will involve creating web and CD-ROM based e-learning materials in the main secondary subject areas of English Language, mathematics, physics, chemistry, biology, geography, history and information technology as well as in cross-curricular areas such as health and environmental education. The project will take an instrumental approach in assembling content that meets the perceived needs of teachers and, hence, of trainees.

ELATE Strategy

The web portal will bring together syllabuses, past exam papers, schemes of work, sample lessons, teaching and learning activities, useful websites and a range of professional support tools. The main focus target what will be useful to teachers when they are coming to a subject for the first time, as well as what those practicing teachers labouring in resource-poor schools across Uganda.

- Syllabuses
- Exam papers
- Schemes of work
- Lesson plans
- Sources of information (useful books, other sources, selected web links)
- Activities (inquiry-based pedagogies)

The project will pay particular attention to the low resource base of schools, the need to operate with large classes (Nakabugo et al., 2007) and to cope with either no computers in school, small numbers of computers, limited or no access to the Internet and attendant slow download speeds.

The project has the potential in time to transform the resource position in schools and to provide the means to disseminate good educational practice to both trainees and practising teachers across Uganda and beyond. With the help of innovative e-learning tools teacher trainees and

practicing teachers could compensate and complement for the meagre resources through the use of basic traditional and new pedagogies.

Traditional and New Pedagogies:

- Worksheets (with answers & suggestions)
- Interpreting text, data & graphs
- Data collection and analysis (Excel)
- Simple simulations
- Science experiments
- Decision-making role plays

Activities will have meaning to students here in Uganda — e-learning is flexible and can be tailored to local needs. Teacher Trainees and practising teachers will be able to compare a variety of pedagogical delivery strategies in their own teaching subjects as well as in other subject disciplines provided on the ELATE web portal: <http://www.ugandaschoolresources.org>.

Resource Setting

Uganda has a relatively under-resourced school system, with limited supplies of appropriate books, but it is embracing micro-technology as rapidly as it has taken to the mobile phone and other m-technologies. Our imagination and creativity as teacher trainers will determine our success in optimising advancing technology to promote teacher education.

How teachers will access our materials:

- (1) Online at home and in Internet cafés.
- (2) In the several hundred schools that already have computers with many more to come in the future (on CD-ROM if they have no Internet access, maybe on paper?).
- (3) Trainees will use them within their courses (open content can be used by all training establishments and schools).

Mode of Development

The curriculum materials are being developed by a team of experts comprising an experienced curriculum coordinator, a curriculum writing team of experienced teachers and a subject teacher trainer, and web developers who are IT specialists.

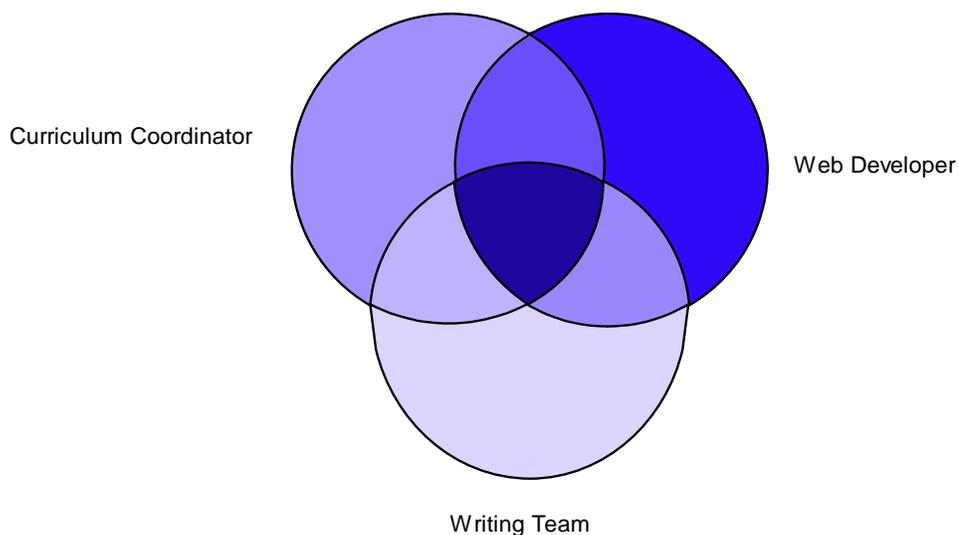


Figure 1. Curriculum Development Model

The curriculum coordinator liaises with subject specialists in the eight subject areas at secondary level, namely mathematics, physics, biology, chemistry, English, geography, history, and computer studies plus some cross-curricular topic materials. In addition, some substantial content will be provided to give teacher trainees and practicing teachers advice and professional development opportunities. Important topics such as e-learning, research, curriculum, assessment and learning, etc., are to be made available with the aim of providing current relevant information that may be difficult to find by many less experienced teachers.

Writing Team

The added value of the ELATE website curriculum resources and materials draws on the expertise of long serving teachers (writing team) in various subject disciplines who have written materials relevant in terms of meeting the specific needs of Ugandan teachers and students. Teachers will also have access to carefully selected curriculum materials from national and international web sites that supplement/complement the available meager national resources.

The ELATE 'web portal' will be packed with useful information and advice for teachers who are just starting to use ICT. It will include:

- (1) General guidance on the use of ICT: How to use computers and ICT software, how to search the Internet for useful information, and how to use computers for school administration,

assessment and lesson preparation. There will also be advice and examples of how to use computers for teaching large classes (Nakabugo et al., 2007).

(2) Guidance for subject teachers: This will be organised on a subject basis (e.g. science, history). For each subject there will be information on syllabuses, examination papers and schemes of work; examples of how ICT can make existing tasks easier; and examples of how ICT and e-learning can enrich current practice.

(3) "Material to enhance teachers' professional development": There will be access to useful articles, information and discussion on developments in general education, subject teaching and new developments in each subject. There are plans to develop an e-mail-based discussion forum in which trainees and teachers in schools can share ideas on the use of computers, ICT and e-learning. It will also be used for capturing data from users for research purposes. For schools with limited or no access to the Internet, materials will also be made available on CD-ROM.]

Web Developer

The web developer will ensure that the ELATE web portal facilitates easy downloads of materials given the low internet speeds and small bandwidth in most parts of the country.

Stakeholders Involved Include

- Subject experts
 - practising teachers
 - authors and publishers
 - NCDC: National Curriculum Development Centre
 - UNEB: Uganda National Examinations Board
- Consultation with U-Connect, SchoolNet, MOES: Ministry of Education and Science
- University academics

Ensuring Success of E-learning Development within Teacher Education

Introducing e-learning alone in teacher education--is not enough. As Haddad and Draxler (2002) rightly put it, "*Technology is only a tool no technology can fix a bad educational philosophy or compensate for bad practise...Educational choices have to be made first in terms of objectives, methodologies, and roles of teachers and students before decisions can be made about*

appropriate technologies” (p. 13). Assessing educational philosophies and practises this is extremely important, because e-learning innovations could only make a difference in teacher education if they meet the perceived needs of trainees and practising teachers in the field. If, at the same time, How much better, then, if we can simultaneously move teachers gently towards more active pedagogies and improve their effectiveness in dealing with large classes.

Conclusion

Teachers still play a major role in implementing the school curriculum with minimal instructional materials, quite often of poor quality. The ELATE project attempts to fill this gap, with the help of Internet and e-learning capabilities to make available perceived useful relevant curriculum materials, teaching advises and ideas to teacher trainees and practicing teachers. For instance, the Appendix section a sample of might an effective way to teach chemical reactions. Clear instructions and procedures for experiment 1 are given for both students and teachers. An experimental sheet designed to allow students to carry out the experiment in a systematic manner is also available, as well as teachers’ notes explaining the possible outcomes of the experiment. All the curriculum materials could be downloaded and printed off from the web portal. Therefore, the teacher work is made easy, irrespective of whether the teacher is teaching this lesson for the first time or not could independently create a successful lesson.

The ELATE project is grounded on the assumption that when more teacher trainees and practicing teachers gain more access to and use these locally relevant curriculum materials, the quality of educational provisions in secondary schools will improve. Although individual teachers have their own ways of good teaching and pedagogical strategies, by putting curriculum materials of various subjects’ disciplines in one place, the teachers will gain the opportunity to appreciate the different delivery approaches available.

In ELATE, we are putting ourselves in the shoes of new teachers going to teach a subject for the first time in poorly resource environments, and making available what they might need to excel. We recognise the fact that teachers often tend to reject curriculum regardless of its quality, unless they do realise the relevance to their work. However, ELATE’s use of long-serving teachers in the field may offer the best practises to the teacher trainees and less experienced practicing teachers, combating the problem of rejected curriculum.

References

- Aguti, J. N., & Fraser, W. J. (2006). Integration of information communication technologies (ICTS) in the distance education Bachelor of Education Programme, Makerere University, Uganda. *Turkish Online Journal of Distance Education-TOJDE*, 7(3), 89-104.
- Flood, J. (2002). E-learning- a driver for continuing professional development? [Electronic Version]. *TOJDE*, 3. Retrieved Sept. 26th, 2006 from <http://elin.mak.ac.ug/elin?func=getFtxt&resid=885b9a8d7eb02f61158...>
- Haddad, W. D., & Draxler, A. (2002). The dynamics of technologies for education. In W. D. Haddad & A. Draxler (Eds.), *Technologies for education: potentials, parameters, and prospects* (pp. 3-17). Paris: UNESCO.
- Halkett, R. (2002). E-learning and how to survive it. *Industrial and Commercial training*, 34(2), 80-82.
- MacGonald, C. J., & Thompson, T. L. (2005). Structure, content, delivery, service, and outcomes: quality of e-Learning in higher education. *International Review of Research in Open and Distance Learning*(July-2005).
- Nakabugo, M. G., Opolot-Okurut, C., Masembe, C. S., Mugimu, C. B., Ezati, B., & Hurd, S. (2007). *Large class teaching in Uganda: Implications for E-Learning*. Paper presented at the Distance Education and Teacher Training in Africa (DETA Conference 2007), Makerere University Kampala.
- Welsh, E. T., Wanberg, C. R., Brown, K. G., & Simmering, M. J. (2003). E-learning: emerging uses, empirical results and future directions. *International Journal of Training and Development*, 7(4).

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Appendix

A. Students' Instructions

Experiment 1: CHEMICAL REACTIONS

The science of chemistry started in the 9th century. Geber (or Jabir Ibn Haiyan), a Moslem scholar from Persia, was the “father of chemistry”. Before Geber, and for centuries after, many people practiced “alchemy”; they were called “alchemists”. The alchemists believed that one substance could be turned into another one, and many of them tried to turn lead into gold. But none of them succeeded. Imagine what the world would be like now if you could easily make any substance that you wanted. What would you make?

The science of chemistry replaced alchemy. Chemistry set out to use science to understand the properties of substances. Chemists soon found that it was possible to swap over the parts of chemical compounds and make new compounds. This was done by causing a chemical reaction to happen. It was often done by making a solution of the compounds by dissolving them in water.

Chemists carry out experiments to make reactions happen, and then they record carefully what happens. Looking for colour changes is one way to find out that a chemical change has occurred. Another is to watch for a new chemical appearing as solid particles, called “precipitates”, when two solutions are mixed together. In the following experiments you will need to look out for both colour changes and the formation of precipitates. The precipitates do not dissolve in water – so they are called “insoluble”.

Experiment 1: CHEMICAL REACTIONS

How can you find out that a chemical change has happened?

One way is to watch for a new chemical forming as solid particles when two solutions are mixed together.

Solids that form within solutions are called "precipitates".
Precipitates do not dissolve in water - so they are called "insoluble".

In the following experiments you will need to watch out for the formation of precipitates and note their colour.

Objectives of the experiments:

- To show that when two solutions are mixed, a chemical reaction can take place.
- To show that the formation of solid precipitates are a sign of a reaction.
- To learn the name of the precipitate produced in each reaction and their colour.
- To learn how to write down the reactions in words or equations.

Safety:

- Several of the chemicals are toxic or corrosive.
- If they get on your skin wash them off immediately.
- If any gets in your eye, wash it out with water for 10 minutes.
- Wash the benches and your hands at the end of the experiment.

Materials you need:

- A copy of the Chemical Reactions Worksheet inside a clear plastic folder.
- A glass liquid dropper with a rubber bulb.
- One or more of the pairs of chemicals listed on the Worksheet.
- A wet cloth for cleaning up after the experiment.

Instructions:

To the blank square in the middle column of the Worksheet:

1. Add exactly 1 drop of Solution 1, in the left column of the sheet.
2. Add, on top of the first drop, a drop of Solution 2, in the right column.
3. If necessary, gently stir the two together

Observation and record keeping:

Each experiment should lead the compounds in each drop of liquid to exchange their elements.

(So compounds $AB + CD$ become $AD + CB$)

One of the new compounds will be a liquid solution (because it is soluble in water), the other one will form a coloured solid precipitate (because it is insoluble).

Your conclusions:

1. See if you can figure out:
 - the names of the new substances
 - the colour of the insoluble precipitate
2. Try to describe each reaction in words.
3. Try to write the chemical equations for each reaction.

B. Teachers' Guide

Experiment 1: CHEMICAL REACTIONS

This experiment allows students to produce simple chemical reactions. They learn that during each reaction the chemicals exchange their chemical components. The result is that two new chemical compounds are formed.

For example:

Sodium carbonate and calcium chloride react to form calcium carbonate and sodium chloride:



In general: $\text{AB} + \text{CD} \rightarrow \text{AD} + \text{CB}$

As the teacher we leave it to you to decide whether you want to give this sort of reaction a name. In chemistry textbooks, two alternative names are used:

1. **Double Decomposition** because the reaction starts with each chemical decomposing (i.e. breaking up) and then recomposing (i.e. joining together) to form two new chemicals.
2. **Double Replacement** because a part of each chemical is replaced by part of the other chemical.

Table of Results:

This is what students should observe in each experiment:

| Experiment | Colour of precipitate | Name of precipitate | Name of solution |
|------------|-----------------------|---------------------|-------------------|
| 1 | Yellow | Lead iodide | Potassium nitrate |
| 2 | White | Silver chloride | Nitric acid |
| 3 | Yellow | Lead chromate | Potassium nitrate |
| 4 | White | Lead sulphate | Magnesium nitrate |
| 5 | Red | Silver chromate | Potassium nitrate |
| 6 | White | Lead sulphate | Nitric acid |

C. Experiment Sheet

Experiment 1 CHEMICAL REACTIONS

| | Place 1 drop of Solution 1 | | Add 1 drop of Solution 2 | | |
|---|---------------------------------------|---|-----------------------------|-------------------------------|---------------------------------|
| 1 | Pb(NO₃)₂ | Lead nitrate | | Potassium iodide | KI |
| 2 | AgNO₃ | Silver nitrate | | Hydrochloric acid | HCl |
| 3 | Pb(NO ₃) ₂ | Lead nitrate | | Potassium chromate | K ₂ CrO ₄ |
| 4 | Pb(NO ₃) ₂ | Lead nitrate | | Magnesium sulphate | MgSO ₄ |
| 5 | AgNO₃ | Silver nitrate | | Potassium chromate | K ₂ CrO ₄ |
| 6 | Pb(NO ₃) ₂ | Lead nitrate  | | Sulphuric acid | H ₂ SO ₄ |