

# Approaches to the Production and Use of OERs: The African Virtual University Experience

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## Introduction

Information and communication technologies (ICTs) are at the forefront of the post-industrial economy (Diallo 2005). As we enter the second decade of the 21st century, the Internet, the World Wide Web, computers, mobile devices and their applications have impacted nearly every aspect of our lives. They have redefined our perception of time and space by providing the possibility to see, interact, share information and speak to anyone from anywhere. Social media has empowered individuals and communities, who can generate, manage, distribute, share, publish and access text, sound and images.

New types of learners and learning are emerging through online communities. The academic literature reveals that all aspects of education have been affected by ICTs (Germain-Rutherford and Diallo 2006).

In this context, it is crucial to think innovatively and to act strategically and promptly in order to adapt and improve the role of universities in this fast-changing environment (Diallo et al. 2010). One of the core activities of higher education or education at large, teaching and learning, is being recalibrated to align not only with the pedagogical theories and principles of integrating ICT, but also with the needs and interest of learners.

The design, production and delivery of academic content has largely benefited from possibilities offered by digital devices, Web 2.0, learning management systems and social media. The flexibility to access academic content, synchronously and asynchronously, has made it possible to reach multiple learners in multiple locations. In this situation, Open Educational Resources (OER) are opening a new horizon for formal and informal learning. OER can facilitate access to educational resources and quality education while reducing cost.

In this chapter, we consider the OER in a practical way, moving beyond their definition and policy consideration. Our focus is primarily on the approach used by the African Virtual University (AVU) to develop and use OER in Africa. We examine the use of OER for accredited programmes and for non-formal learning, as well as the need to make OER relevant to the local context. Thus, this material will contribute to understanding how OER can be developed and used in the African context and may lead others to apply principles and processes learned by the AVU in their situation.

## **The AVU Approach to the Production and Use of OERs**

The AVU is a pan-African intergovernmental organisation established by charter with the mandate to significantly increase access to quality higher education and training through the innovative use of ICTs. The charter has been signed by several African nations. The AVU has its headquarters in Nairobi, Kenya, and a regional office in Senegal. It has host-country agreements and diplomatic status with the two governments.

The AVU Business Plan 2009–2014 has two main thrusts: (a) educational and support services provided on a fee basis; and (b) not-for-profit development services. The not-for-profit development services focus on building the capacity of AVU partner institutions with the objective of increasing access to quality education through the following activities:

- updating and developing content,
- OER development,
- training of trainers,
- distance and eLearning infrastructure,
- developing professional networks through communities of practice,
- research and development, and
- quality evaluation and benchmarking.

## **Developing and Delivering OER Collaboratively**

Recognising the importance of increasing access to tertiary education in Sub-Saharan Africa and the role of ICT as a key component of development, the AVU implemented a project that demonstrated the possibilities of open distance and eLearning strategies.

With primary funding from the African Development Bank (AfDB) and partial funding from the United Nations Development Program (UNDP) Somalia, the project, called the AVU Multinational Project, was implemented in ten countries. The 12 institutions involved in this initiative include:

- Jimma University in Ethiopia
- University of Nairobi in Kenya
- Université d'Antananarivo in Madagascar
- Universidade Pedagógica in Mozambique
- Université Cheikh Anta Diop (UCAD) in Senegal

- Amoud University, University of Hargeisa and East Africa University in Somalia
- Open University of Tanzania
- Kyambogo University in Uganda
- University of Zambia
- University of Zimbabwe

While the selection of participating countries was executed by the African Development Bank, the selection of a participating institution in each country was undertaken by the AVU in conjunction with the ministries of education in the various countries. A competitive process was meticulously executed to ensure that only those institutions that were capable of implementing the project were selected.

A comprehensive approach was introduced to address the untapped potential among academic staff. Also, many challenges that limit the effective use of ICT in education in the Sub-Saharan African context were addressed. These include lack of or restrictive institutional policies, lack of infrastructure, limited access to the Internet and ICT equipment, lack of reliable power, limited availability of quality eLearning programmes, lack of professional development opportunities for faculty and poorly motivated faculty members.

In order to develop the OER in a collaborative manner and to address the challenges associated with the deployment and support of the learning materials, four main activities were conducted as outlined below.

- Establishment of ten functional eLearning centres to serve as institutional and country hubs for the development, delivery and management of eLearning programmes – The centres also serve as physical locations for research and a revenue generator for the institutions.
- Training of university staff members in course material development, Web design, instructional technology, and the delivery and management of eLearning.
- Development and delivery of ICT-integrated teacher education programmes structured as four Bachelors of Education in Mathematics, Physics, Chemistry and Biology – In addition, diploma and certificate programmes were also developed.
- Mainstreaming of gender issues in tertiary education through the development of a guiding framework and gender-responsive materials, and the awarding of scholarships in science-based programmes in order to promote the educational development of women.

The results of the actions taken above include: the installation of ten functional eLearning centres; the training of 459 faculty members; the production of 219 textbooks available in three languages; the provision of 537 scholarships to females and other disadvantaged groups; and, as of January 2011, enrolment of 4,000 students. One of the most important accomplishments is the production of the 219 textbooks that were released as OER and that are available through an interactive portal called OER@AVU.

## **The Consortium Program Model**

The objectives for developing the programmes were to improve the quality of teaching and learning in schools through the use of ICTs; to increase the number of mathematics, science and ICT basic skills teachers; and to promote regional integration as well as strengthen relevant partnerships with other teacher education initiatives in Africa. The key components of the Consortium Program Model are related to policy and curriculum conceptualisation, curriculum design, content development, content production, content delivery, quality assurance and accreditation, and management of the consortium and OERs. These components are described below.

### **Policy and Curriculum Conceptualisation Workshop**

To ensure that the programme was well conceptualised and that it addressed the needs of the participating countries, the AVU convened a Policy and Curriculum Conceptualisation Workshop that drew participation from the ministries of education, the Teachers Service Commission (or their equivalent) and representatives from the selected co-ordinating institutions. To enrich the workshop's outcomes, teacher education and open distance and eLearning experts from all over the world were invited to the workshop. The outcomes of this workshop included the development of policies to guide the programme and to conceptualise the curriculum (AVU 2005). The collaborative process and the engagement of experts in the relevant areas ensured that the outcomes of the workshop presented the programme with guidelines that would ensure high-quality outputs.

### **Curriculum Design Process**

In line with the collaborative approach adopted by the AVU, subject matter experts from the participating institutions and seasoned ICT educational experts from all over the world engaged in the curriculum design process. During the curriculum design workshop, the items below were accomplished.

- Through a curriculum mapping process, the Mathematics, Chemistry, Physics, Biology and Teaching curricula were analysed and harmonised for all 12 universities. In addition, recommendations for developing open distance and eLearning modules were drafted.
- Common thematic areas in the curriculum of the 12 universities from the ten countries were identified, as well as how ICTs would be used in the teaching and learning of Mathematics, Chemistry, Physics, Biology and Teacher Education.
- The following items were established based on the policy and curriculum conceptualisation deliberations: learning objectives, learning outcomes, assessment strategy, learner support requirements and a quality assurance framework.
- Basic ICT competencies needed by the teachers were identified and recommendations for an appropriate in-service and pre-service teachers' curriculum were drafted.

## **Content Development Process**

The content development process, structured in three phases, led to the production of 73 textbooks which were translated into two other languages, making it a total of 219 textbooks. All textbooks were developed and peer-reviewed by African subject matter experts from the 12 participating institutions. This process was supervised by ICT integration educational consultants who were competitively engaged from both the African continent and beyond. The subject matter experts or authors and peer reviewers were recruited in collaboration with the participating institutions.

Each phase of the development process started with a content development workshop during which the subject matter experts were trained in the skills of identifying and presenting eLearning content. Subject matter experts were required to insert subject matter, learning activities, assessment activities and references into an adopted template. For each workshop, a gender expert trained the subject matter experts on developing material that are gender responsive. Once the textbooks were drafted, they were given to the peer reviewers for comment. Then, the authors were given the opportunity to revise and finalise the material. Peer reviewers did not review a draft written by a colleague from the same institution.

Authors and peer reviewers were contracted and paid by the AVU and agreed to waive their intellectual propriety rights to the AVU. All content strictly adhered to copyright regulations and was developed as open education resources, with the authors signing a Creative Commons Agreement to this effect.

All 73 modules were written in the language of the subject matter experts: English, French and Portuguese. Then the material was translated into the two other languages. The translated versions were peer reviewed once more.

## **Content Production**

All final textbooks were sent to the Materials Development Coordinator who was responsible for the production of the textbooks. This individual led a team of editors, instructional designers and graphic designers.

Ensuring all had access to the learning materials in ten participating countries was of absolute importance to the AVU. It was for this reason that the developed learning materials were produced in various formats and made available through different media that support open distance and eLearning. The materials were uploaded onto Moodle, an open source learning management system (LMS) that supports online interactive course delivery. The main LMS was located at the AVU and the LMS was installed on mirror servers at each participating institution. Thus, the materials were accessible through the Intranet of these institutions. The materials were also made available in digital video discs (DVDs) and in printed booklets. All the materials were posted on the AVU interactive OER portal for access beyond the 12 participating universities and ten countries.

The delivery options outlined above were implemented to ensure that the materials were accessible to all learners — those with continuous access to the Internet and those with limited or no access. Participating institutions were encouraged to identify strategies for efficient and effective ways of ensuring student access to learning materials.

## Quality Assurance

It was important to ensure that high standards were maintained in the development, implementation, delivery and management of the teacher education programmes. Quality assurance becomes even more critical because of the various modes of delivery: online, blended and face-to-face. It was also important to maintain quality in order to ensure the credibility of the programme in all ten countries. Thus, internal quality assurance was built into the development and delivery processes. These mechanisms included:

- the meticulous selection of participating institutions;
- the curriculum conceptualisation and policy formulation that stipulated standards to be employed;
- selection of top quality experts to carry out curriculum design and development as well as production of the materials;
- the training of trainers;
- an effective student support system and effective assessment strategies for multiple delivery modes;
- the development of institutional readiness;
- admission strategies that defined minimum entry points; and
- the implementation of a pilot to test the materials, programme delivery, and monitoring and evaluation structure.

A Teacher Education Advisory Committee was established to act as the governing body for the teacher education programme in the ten participating countries and to oversee the implementation of quality. Its membership includes: Pro Vice Chancellors/Deputy Vice Chancellors/Deputy Rectors and Deans at each participating partner institution, and the programme team at the AVU. The committee reported to the participating university and AVU top management. The committee met once a year to carry out the following tasks:

- co-ordinating the AVU teacher education programme at the partner institutions;
- representing interests of the programme within the governing bodies of partner institutions (e.g., Senate/Council);
- drafting legal agreements between the AVU and the partner institutions;
- developing a quality assurance mechanism;
- developing financial models for the programme, including those that generate revenue and will sustain the programme;
- managing the inter-institutional development and implementation of the programme in ten countries; and
- developing and implementing a monitoring and reporting system for the programme's activities and progress.

A quality assurance framework (AVU 2007) was developed for the teacher education programme by using and improving the existing quality standards from seven of the participating institutions. The common framework was adopted by all participating institutions. The quality assurance framework is a descriptive

and not a prescriptive document. It allows institutions to adapt or adopt it to suit the realities of their respective countries. The document outlines the following six steps through which the framework can be implemented:

- establishment of a Quality Assurance Unit at the AVU for the teacher education programmes, to co-ordinate officials responsible for quality assurance in each participating institution;
- interpretation of the quality assurance framework, including self-evaluation, prioritisation and planning by individual participating institutions;
- conducting of a SWOT (strengths, weaknesses, opportunities and threats) analysis;
- review of the SWOT analysis and support by the Quality Assurance Unit at AVU;
- continuous monitoring; and
- sharing of best practices and information amongst the participating institutions.

Another important quality assurance tool was the legal agreements signed between the AVU and the participating universities. Each agreement stipulates the roles and responsibilities of each party, and is centred on a collaborative approach in order to achieve their respective objectives. It established the legally binding principles that regulated the development and delivery of each teacher education programme. It detailed collaboration in the two following areas:

- the development of a policy and curriculum framework that would guide the design, development, delivery and accreditation of the programme, together with a quality assurance framework that would govern all e-programme in the participating institutions; and
- the design, development and delivery of an open and distance eLearning teacher education programme that would be of high quality and benefit from the pool of expertise available from other participating universities in Africa – To achieve this, it was necessary for a partner institution to acquire skills that will build and enhance its capacity to design, deliver and manage its own open, distance and eLearning programmes. In addition, partner institutions must be willing to establish and actively participate in the teacher education consortium.

The 12 participating universities and the AVU decided to form the Teacher Education Virtual Consortium which will ensure sustainability of the teacher education programme beyond the Multinational Project. The goals of the consortium are:

- to develop and promote appropriate open and distance eLearning (ODeL) programmes for teacher education; and
- to enhance the capacity for members both in terms of quantity and quality, for the acquisition of necessary expertise in open and distance eLearning methodologies, as well as for the development and management of distance learning programmes.

## Accreditation

All 12 participating universities have adopted the programmes through their senates and are accrediting the programmes in their countries. A learner has to enrol in one of the universities in order to receive credits.

It was agreed that the participating institutions should commit themselves to exploring and determining mechanisms for encouraging and implementing cross-institutional recognition of credits gained by graduates of the teacher education programmes. These mechanisms must take into account national regulatory requirements of each country so that each partner institution can deliver, accredit and award certificates for the various programmes derived from the teacher education programmes.

## Programme Delivery

As part of the delivery process, the AVU conducted a pilot delivery (AVU 2010) in four of the participating institutions. The pilot indicated that the ICT-integrated teacher education program had the capacity to assist learners perform better in mathematics and sciences, and contribute to addressing the gender divide in performance in science. Female access to higher education was enhanced through eLearning, as this circumvented the time constraints faced by females with other competing personal issues, including family commitments. The approach enabled them to learn in a flexible manner at a time that is convenient to them. The pilot also demonstrated the innovative use of ICTs in designing and developing the programme, as well as the benefits that the learners receive from the flexible mode of delivery and increased access. Once the pilot was completed, the teacher education program was launched in all institutions for delivery within existing university structures.

Although the AVU played a central role in the development of the learning materials and other related activities (such as the establishment of the eLearning centres and hosting of the content on its eLearning platform and OER portal), it is the participating institutions that remain responsible for delivering and awarding certifications for the programme. However, the AVU entered into specific agreements with five of the participating universities to deliver joint certificate programmes in ICT basic skills and ICT integration in math and sciences.

Each institution used the developed learning materials and the quality assurance framework agreed on. To maximise the benefits of the programmes, the institutions were required to perform the following tasks:

- Sensitise all levels of the institution — councils, senates, faculty boards, staff and student community — to the eLearning programmes.
- Select modules and programmes to be taken.
- Examine the curricula to determine “fitness” for purpose.
- Provide students with learning materials in various formats.
- Select students to enrol in the various programmes derived from the teacher education modules.
- Make arrangements for effective student support, including pre-enrolment counselling, access to library resources and face-to-face sessions. If



necessary, institutions were required to identify study centres and select an effective LMS.

- Articulate an effective learner assessment strategy.
- Engage human resources from the relevant university departments such as the registrar's office, dean's office, and departments with a central dedicated team comprising a programme co-ordinator, course leader, subject tutors/lecturers, eLearning centres manager and a national co-ordinator from the Ministry of Education. Therefore, each institution ensured that all relevant human resources were available and motivated to deliver services efficiently and effectively.
- Monitor and evaluate the programme, thereby ensuring clear communication and reporting structures with all the aspects of the delivery of the programme. The outcome of the monitoring and evaluation activities is used to identify and address challenges and to provide for continuous improvement of the programme.

### **The Role of OER in Designing, Developing and Delivering the Teacher Education Learning Materials**

Since 2005, the AVU has had an OER strategy. The strategy was configured as a conceptual framework and architecture — the AVU OER Architecture — through which the creation, organisation, dissemination and utilisation of OER were expected to lead to the development of a dynamic, rational and comprehensive strategy for collaborative partnerships for African higher education and training institutions.

The AVU OER strategy recognised the importance of collaborative partnerships in advocating and raising awareness for OER in the African higher education sector. By involving African institutions in the OER evolutionary process, the AVU envisaged addressing the issues pertaining to epistemological, ideological, cultural and social relevance as well as reducing technological challenges, while enabling the institutions to participate actively so that they drive and own the process in terms of form, content, structure and orientation.

Activities related to OER have been constantly embedded in AVU policies, objectives and activities. The AVU participated in major international OER initiatives such as the Massachusetts Institute of Technology OpenCourseWare (MIT-OCW) and the World Summit of Information Society in 2005. The AVU implemented activities on behalf of the Open University UK initiative called Teacher Education in Sub-Saharan Africa (TESSA). As well, the AVU began implementing an OER portal project, which was later relocated to the South African Institute for Distance Education (SAIDE) and became an initiative known as OER Africa in 2008. Throughout all of these activities, the AVU has developed solid partnerships with OER and OCW bodies on all continents, including global players such as MERLOT, MIT, the OpenCourseWare Consortium and UNESCO.

Open Educational Practices were implemented in the design, development and delivery of the teacher education programme developed as part of the AVU Multinational Project. For instance, materials developed using OER and the 219 textbooks produced were released as OER under the Creative Commons licence.

The effective management, review and sustainability of these materials required the AVU to build an interactive portal that would support its strategy. The AVU started developing the OER repository called OER@AVU in 2010. The main objective of this repository was to serve as a platform for the 219 textbooks, as well as to serve as a platform for educators to use, modify and contribute to the AVU collection, thereby making their educational resources available to others. The educators could discuss and comment on the OER and collaborate in the development of additional OERs. The portal was also expected to host future AVU collections in areas such as business studies, computer sciences, and agriculture and environmental studies.

OER@AVU was launched in January 2011 and publicised using various media, including traditional media, strategic partners' networks and social media. It exceeded expectations, attracting visitors from 187 countries and with 393,000 textbooks viewed as of October 2011; winning an Education-Portal.com global award as Best Emerging OCW initiative; and sharing its resources. In this way, the AVU has gained global recognition of its Open Educational Practices and it has increased awareness of the quality resources developed in Africa. These resources can be used globally.

The developments outlined above led to a review of the AVU's OER strategy. The AVU now aims to:

- increase access to quality and relevant education through the innovative use of ICTs;
- develop and share quality OER that are relevant to the AVU network;
- create, maintain and improve an African-based OER library;
- facilitate the adoption of OER practices in the AVU network; and
- build effective partnership that will add value to the this strategy.

One immediate consequence of this revised strategy is the use of OER as a means to increase access to education in Africa through the delivery of accredited and non-accredited programmes. The target of the Consortium Program Model was to enhance existing formal accredited programmes. The OER were instrumental in developing and delivering cross-border educational programmes relevant to the local context. Unexpectedly, the AVU discovered that its OER collection was being used by institutions and individuals in Africa and around the globe, and that world-leading OER repositories were adding AVU textbooks to their collections. This has encouraged the AVU to consider including the accreditation of self-learners in the Consortium Program Model.

The issue of accrediting self-learning through OER has been explored through the OER university concept (Day and et al. 2011). In the case of the AVU, it focused on the mandate of the AVU and on lessons learned. The AVU will explore having self-learners sit examinations at consortium universities that have granted senate approval for their programmes.

It is anticipated that the inclusion of the accreditation of self-learners will contribute in increasing access to quality education in Sub-Saharan Africa where tertiary education enrolment was 6 per cent in 2008 (UNESCO 2010). In addition, most countries in this region are unable to enrol all high school graduates because of barriers such as limited seat capacity.

## Challenges

A few challenges were experienced with the development and delivery of the teacher education programme:

- As most of the participating institutions did not have an ICT policy at their institutions, it was difficult to draft suitable ICT and curriculum policies.
- Several challenges were encountered during the curriculum design process. For example, there was a scarcity of ICT-integration educational experts in Africa. Although it was generally easy to agree on commonalities in the curricula of the anglophone universities, differences between the anglophone and francophone education systems resulted in a separate process for the francophone group in designing their curricula. However, the groups later merged in subsequent processes.
- Four primary challenges were encountered with the content development process. First, academics who were to undertake the writing process lacked ICT skills. Second, there was a lack of ICT-integration experts within Africa. Third, the translation of modules required expertise both in the subject matter and in two languages. Firms with such expertise were not found and it was challenging to source academics with such skills. Fourth, in many cases, the authors and peer reviewers had competing responsibilities in their universities that would not allow them to meet most deadlines. Thus, considerable delays were encountered during the writing process.
- In order to use the Moodle LMS effectively, academics who were accustomed to face-to-face delivery methods needed extensive training in eLearning.
- Due to inflexible internal processes, university authorities delayed the approval of the teacher education programmes.
- Regulations in some participating countries caused delays in using equipment at eLearning centres. For example, delays were encountered during the granting of VSAT licences (for satellite Internet services) and the passage of equipment through customs.
- Employing three languages during the development and delivery of OER was challenging and costly. However, the use of several languages meant that a greater number of people could use the material.

## Lessons Learned and Recommendations

This final section provides a summary of the key steps in the formation of the Consortium Program Model that may assist others who want to set up or review similar initiatives. However, it is important to note that the AVU model was implemented in a specific context. Therefore, these recommendations may need to be adapted to different situations.

The key steps in the formation of the Consortium Program Model are as follows.

- Harmonising the educational policies and adoption of policy guidelines to inform the implementation of the programme. All stakeholders must be involved in the process.

- Forming an advisory committee to oversee the implementation of the programme. The members should be drawn from the top management of the universities and the relevant faculties.
- Developing a quality assurance framework.
- Agreeing on an accreditation scheme.
- Agreeing to assign intellectual property rights to one institution or consortium and to releasing the resources under a Creative Commons copyright licence.
- Agreeing on a common structure for the curriculum and designing a curriculum that takes into account the needs of the institution and countries involved.
- Developing the content in a collaborative manner.
- Producing material in several file formats and making them available online and in compact disc (CD), DVD and print formats.
- Securing agreement on OER practices and releasing the content as OERs.
- Enabling participating universities to deliver programmes as their own programmes or jointly with the AVU and other partners.
- Supporting participating universities in terms of ICT and eLearning infrastructure, technical advice, and capacity enhancement of staff members.
- Forming a dedicated Program Coordination Unit which is responsible for the daily implementation.

The Consortium Program Model was implemented in a specific context that overcame political, geographic, cultural and linguistic barriers. As the model had never been implemented before in Sub-Saharan Africa, it required thorough planning, monitoring and adjustments. Below are some of the lessons learned during the development and implementation of the model.

- Managing academics from different countries under “one roof” can be difficult, thus one needs to be well prepared to engage with teams from different countries (who have different cultures and languages), and consider different educational policies and practices.
- Collaboration is key to the success of the Consortium Program Model. Institutions involved in such development projects must feel that they are improving their own programmes, that their input is important, that decisions are made upon agreed principles, and that the outcome will address their needs.
- It was essential to harmonise policies, to contextualise the curricula and to agree on a common modular structure and common objectives acceptable to all countries.
- It was vital to keep the participants motivated and committed.
- Without acceptable quality mechanisms, the process would not have been fully implemented or the expected outputs would not have been achieved.
- Publishing the materials as OER was done carefully, progressively and systematically. The focus of material development and production was

primarily on creating high-quality materials relevant to the context of each country, and to have participating institutions accredit the programme as their own programmes.

- The purpose of using OER in authoring and publishing the content was to improve the content and share the resources with other African countries and universities.

The Consortium Program Model is scalable: it can be expanded to include additional countries and universities, as well as other subject matter. The AVU is preparing a second phase of the Multinational Project that will strengthen the gains made during the first phase of the project and expand its benefits to more countries. The objectives of the second phase include reviewing and improving the AVU OER collection, developing and delivering a consortium programme in computer science, and releasing the computer science content as OERs. Thus, the AVU plans to develop additional high-quality educational resources that will meet the needs of educators and learners in Sub-Saharan Africa, but also those in the 180-plus countries that access the AVU OER repository.

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