

Alternative learning technologies for developing capacity in Animal Breeding and Genetics in middle and low income countries

J.M.K. Ojango¹, J.E.O. Rege², I. Dror¹, D.R. Kugonza³, M.G.G. Chagunda⁴, R. Mrode^{1,4}, J. Philipsson⁵ and A.M. Okeyo¹

¹ *International Livestock research Institute (ILRI), Box 30709-00100, Nairobi, Kenya*
j.ojango@cgiar.org (Corresponding author)

² *Emerge-Africa, Box 1450-00502, Nairobi, Kenya*

³ *Makerere University, Box 7062, Kampala, Uganda*

⁴ *Scotland's rural college (SRUC), Edinburgh, UK*

⁵ *Swedish University of Agricultural Sciences (SLU)*

Summary

In today's world where scientific progress and development of new knowledge is increasing rapidly, middle and low income countries must be able to train and retain versatile researchers in the field of animal breeding and genetics able to analyze, adapt and use technologies, and possess strong social skills. A modernized blended learning approach with flexible organizational structures that allow the integration of face to face with virtual learning environments using various e-learning technologies needs to be adopted. However, electronic learning tools addressing situations and needs for animal genetic resource management in middle and low income countries are few, and several challenges hinder wide adoption of e-learning. This paper presents some experiences with e-learning tools in middle and low income countries, outlines opportunities for enhanced adoption of e-learning and identifies some gaps and questions that still need to be addressed to facilitate e-learning.

Keywords: e-learning, animal breeding and genetics, middle and low income countries, challenges and opportunities

Introduction

Sustaining socio-economic growth in middle and low income countries in the backdrop of on-going and recent economic challenges for nations which depend mostly on agriculture to spur their development critically depends on a dynamic human capital: *knowledgeable, flexible, innovative, passionate and able to adapt technologies to local realities* (Adipala *et al.* 2009). However, a limited critical mass in terms of expertise, and opportunities for continuous training impedes the rate of achievable development in the livestock sectors of these countries. Initiatives that focus at building, strengthening and scaling up capacities are paramount for the countries to significantly contribute to the Sustainable Development Goals (SDG) of ending poverty, ending hunger and achieving food security, and, promoting sustainable economic growth, employment and decent work for all.

Scientific progress and development of *new knowledge* is increasing rapidly in the field

of Animal Breeding and Genetic (ABG). Possibilities for continuing education and refresher training courses in ABG (not just for students, but also for professionals working in the field) are more critical to middle and low income countries, where access to the internet and scientific journals though increasingly expanding is still limited (Ojango *et al.* 2011). To increase availability and access to information on ground breaking technologies in ABG to a greater number of people, conditions that enable advanced learning without having to be physically present are needed. Innovative and flexible learning programmes that are responsive to the situation and needs of both the existing and the perceived future industry need to be developed and adopted (Dror, 2016).

On-site traditional workshops have for a long time been the main method of providing training on advances in technologies for ABG. This method is however restricted by cost inefficiencies in time, space and learner access (Dror, 2016). The next generation of learners are a more digital oriented group with wider and broader networks and workspace setting. A modernized blended learning approach with flexible organizational structures that allow the integration of face to face with virtual learning environments using various e-learning technologies presents a golden opportunity to help bridge the knowledge and information gaps in ABG that would support the sustainable use of Animal Genetic Resources (AnGR) in medium and low income countries.

E-learning for Animal Breeding and Genetics in middle and low income countries

Learning environments for ABG must of necessity adapt and change in line with evolving information communication technologies (ICT) and e-learning technologies (Singh *et al.* 2002). E-learning provides a means of raising the number of people with access to training in ABG, and if strategically used, can stimulate knowledge sharing and networks needed for improving AnGR utilization within and across these regions. Through on-line courses, learners in low income countries are exposed to practical high impact practices that are adaptable to different environments, and thus stimulate creativity in adoption of the latest research in the field of ABG. Electronic learning tools addressing situations and needs for AnGR management in middle and low income countries are however few. Where the goal is to make all the e-learning materials available online, websites such as the Animal Genetics Training Resource (AGTR) are developed to present learning tools for AnGR in middle and low income countries (see Example).

To enable learners who are already engaged in professional activities expand their knowledge without jeopardizing their work schedules, alternative forms of delivery of content are required. Delivery of learning content could be in the form of short-courses and modular in-service training options for graduate students, with in-built mechanisms to provide evidence of course completion. E-learning courses packaged in flexible and highly illustrated modules could catalyze development of revised curricula for joint graduate programs with cooperation and mobility between institutions and within and across regions for learning in ABG. An example of this is the free on-line course on *animal breeding and genetics* implemented by ILRI/ACGG in

collaboration with Wageningen University & Research: <https://youtu.be/xgdfBs9GLzk>.

Critical to the success of on-line modules is their flexibility in integrating opportunities for developing critical thinking through group discussions, debates and team activities in virtual learning tools. Flexibility is also required at management levels to revise policies and procedures in higher education institutions. To achieve this, the management approach advocated for e-learning is one that adapts a business model to identify the “market” needs, conceptualize the types of products to meet the “customer” (learner) needs, and produce the “product” (learning tools) of good quality quickly (Hogan and Kedrayate, 2008). This could lead to new alliances with industry players in the livestock sector and expand the employment opportunities for graduates.

Challenges and opportunities for e-learning in Medium to low income Countries

Lecturers and trainers play a critical role in the effective delivery of e-learning as it is the lecturer and not the technology that facilitates the students learning experience. In most medium and low income countries, the number of competent trainers is low as most professionals move on to higher paying positions in administration that take them away from formal teaching. Motivation of trainers to remain committed as both a learner in use of IT tools, development of facilitation skills for moderating on-line discussions, and a trainer developing and modifying course content and coaching students on the same needs to be re-evaluated (Mapuva and Muyengwa, 2009).

Sustaining learner interest in the field of ABG, given the transformative and fast changing nature of the underlying sciences, such as genomics, information and computational sciences calls for adoption of a more blended approach to learning. This would entail curricula with face to face sessions, exposure visits and electronically delivered content to be completed within a specified time-line that offers some flexibility. The Learning Management System adopted (Dror, 2016) would track the progress and performance of the learners, enabling controlled access to learning materials in a manner that users could only access different courses/lessons once prerequisite courses have been completed.

Main functions of a Learning Management System

- ❖ User Management: Collecting user information, registering users, assigning users to groups
- ❖ Reporting on user progress and performance
- ❖ Content management: hosting the learning content
- ❖ Tracking/ blocking: granting access to content upon completion of prerequisites

(Adopted from Dror, 2016)

Learners in areas with poor infrastructural development would be faced with the challenge of intermittent access to internet due to electricity and band width availability. For these clients to benefit from the new platforms, offline modules of the e-learning materials with self-contained browsers to play the content would need to be availed. In such instances, progress and assessment data would be saved on any portable electronic device from where it could be submitted for evaluation when internet is accessible.

In instances where regular computer access is a challenge, the learning process could be facilitated through the use of smartphones. Development of an Android app with different

modules of the course content would greatly complement the learning process. Travelling, waiting for an appointment, in the middle of a city or in the field, a mobile app presents a great opportunity to work on learning materials either on or off-line. Such an app has been developed through the ILRI capacity development program in collaboration with partners in the Humid tropics program of the CGIAR (Dror, 2016). Users are able to use the app for all the learning activities, and their progress and results are synced or emailed once the device connects to the internet. Because not all mobile devices have sufficient storage for users to download all the courses, users are able to temporarily “un-load” media files in order to free up space on their devices.

When availing and assessing knowledge remotely, use of unorthodox means and taking short-cuts in the process of answering quizzes is a vice that needs to be addressed from the outset. An on-line proctoring provider would serve to monitor each person as they take a quiz by using technology on the test-taker’s computer (camera, microphone, etc.) to observe the person, the room they are taking the test in, and their computer screen.

Some gaps and questions in adoption of e-learning for Animal Breeding and Genetics in low income countries.

The future for training in ABG will encompass e-learning. Critical questions and gaps in information still require to be addressed at three levels; Organizational level, teacher/ lecturer level and at the level of the learners. Some issues at each level are expressed below:

1. *Organizational level:* Universities in medium and low income countries are inexperienced in incorporating e-learning into their organizational structures. How could a multi-institutional approach leverage and facilitate conducive change in policies and regulations for the adoption of e-learning for ABG?
2. *Teacher/ lecturer level:* E-learning demands that lecturers adapt from being the main knowledge source to being a knowledge navigator using the internet as a teaching tool. What mechanisms would need to be put in place to enhance the learning experiences and facilitate the process of continuously updating learning materials to cover new areas? How would this be measured when deciding on merits for trainers in the middle and low income countries?
3. *Learner level:* In order to facilitate interactions among learners, provision of a moderated space or “chat-room” has been advocated. How could this be implemented in a way that supports engagement of experienced and knowledgeable persons in different areas of ABG? How could graduate student programs be integrated in use of the “space” for moderation and mentoring of next generation geneticists that also facilitates innovations in ABG?

List of References

- Adipala E, Ochola WO, Ekaya W, Osiru M, Dhlamini N (2009) Capacity Development for Agricultural Transformation: Making Postgraduate Level Training Relevant to Africa’s Agricultural and Rural Sector Development. . *Glob. Consort. High. Educ. Res. Agric. Conf.*
- Dror I (2016) The story of Humidtropics Capacity Development 2014-2016. (Nairobi, Kenya)

Hogan R, Kedrayate A (2008) E-Learning: A Survival Strategy for Developing Countries. In 'Elev. Annu. Conf. Sir Arthur Lewis Inst. Soc. Econ. Stud. Turmoil Turbul. Small Dev. States Going Beyond Surviv.', 1–17.

Mapuva J, Muyengwa L (2009) Conquering the Barriers to Learning in Higher Education Through e-Learning. *International Journal of Teaching and Learning in Higher Education* **21**, 221–227.

Ojango JMK, Malmfors B, Mwai O, Philipsson J (2011) 'Training the Trainers-An Innovative and Successful Model for Capacity Building in Animal Genetic Resource Utilization in Sub-Saharan Africa and Asia.' (Nairobi, Kenya)

Singh G, Donoghue JO, Worton H (2002) A Study Into The Effects Of eLearning On Higher Education. *Journal of University Teaching and Learning Practice* **133**, 547–553.