How to educate in a changing world? Towards competence-based tertiary agricultural education

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We live in turbulent times, our world is changing at accelerating speed. Information is everywhere, but wisdom appears in short supply when trying to address key interrelated challenges of our time such as; runaway climate change, the loss of biodiversity, the depletion of natural resources, the on-going homogenization of culture, and rising inequity. Living in such times has implications for education and learning. (Wals and Corcoran, 2012)

Source: Jimma University College of Agriculture and Veterinary Medicine (JUCAVM), https://plus.google.com/107229457994018982305/photos?hl=en

Introduction

Borrowing from one of the latest books on education and learning in the context of sustainable development – *Learning for Sustainability in Times of Accelerating Change* (Wals & Corcoran, 2012) – it can be observed that the speed of change, physically, socially and culturally, is accelerating. Continued globalization and digitalization are not only affecting how we think, what we know, who to believe, how we act, they also affect the role of education in society. Higher education, for instance, and the science it produces, is no longer the sole authority of truth, if ever it was. Rather, science oftentimes represents just another point of view or an opinion in the public debate of controversial and ambiguous issues such as; the causes and impacts of climate change, the role of GMOs in food security, the use of biofuels, etc. Scientists can be found on different ends of the ongoing debates, although more might be found at one end than on the other. It is

not easy to decide who is right, who is wrong, or who is more right than others, or what the best way to move forward might be.

What do we educate for in such a world when things change so fast and knowledge becomes obsolete before you know it? How do we prepare today's graduate for the world of tomorrow? And more specifically, what are the implications for tertiary agricultural education (TAE) around the world? We will respond to these questions by offering a brief review of some trends in TAE within Europe and zooming in on a world-wide response by shifting from traditional transmissive (based on the transfer of static knowledge from a sending teacher to a receiving learner) to emerging transformative (based on the development of more dynamic competencies in real-world settings based on authentic tasks and issues that require knowledge-in-action) forms of education which we will refer to as 'competence-based' (Mulder, 2012).[1]

Firstly, we need to observe that compared to ten years ago, TAE is more in demand today because of an increased interest in quality-of-life issues, including amongst young people. Issues such as climate change and related worldwide weather-related disasters, the end of peak oil and the search for alternatives, feeding the world and related food-security issues and emerging transitions towards a bio-based economy, circular economies, urban agriculture and sustainable consumption and production, have led to a more prominent place for TAE in the world of higher education. At the same time, agricultural universities started changing their identity by positioning themselves as *life science universities*, which aspire to contribute to a better world and improved quality of life. For example, Wageningen University does this by, among other things, publishing weekly front-page 'infomercials' in one of the Netherlands' most prominent newspapers, showing how the university is dedicated to helping to solve societal problems regarding food security, the environment, landscape, health, community development in the South, etc. The enrolment figures of Wageningen University have increased almost 10 years in a row after a low point in the late 1990s. Draconian measures were taken during the years

[1] See, for a review of the literature on the concept of competence and of the current understanding of professional competence as situated expertise, Mulder (in press). Conceptions of professional competence. Billett, S., Harteis, C., and Gruber, H. (Editors). *International Handbook on Research into Professional and Practice-Based Learning.* Frankfurt, Germany: Springer.

1999-2003; complete programmes and about 25 chair groups were eliminated. But, this resulted in new and creative solutions for the tensions that were felt throughout the university, which is a good example of “innovation under pressure”.

Innovation and development strategies in TAE in selected EU member states

Clearly the new dynamic in our interlinked world and the new demands and needs that arise from the challenges of creating and supporting developments that are more sustainable than the ones currently employed, requires a number of new competencies. These include; interdisciplinary problem-solving, addressing multiple stakeholder interests, participatory approaches in innovation, interactive methods in conflict resolution, responsive actions regarding community needs, critical media literacy, and social responsibility in entrepreneurship, to name a few, along with those that still connect to specific content areas (e.g. animal science, plant science, environmental science and agro-technology).

How does TAE deal with these new demands? The results of a European review of competence needs and pertaining varieties of educational practices in life-science education provide some lessons (Mulder and Eernstman, 2006). Strategies of various institutes of TAE in Europe to develop new competencies were studied. Several universities (Austria – Universität für Bodenkultur Wien (BOKU); Czech Republic - Czech University of Life Sciences (CUL); Denmark – Royal Veterinary and Agricultural University (KVL); France - Institut supérieur d'agriculture Rhone-Alpes; Germany – Universität Hohenheim and Technische Universität München (TUM); Hungary – Corvenus; Ireland – University College Dublin; Poland – Warsaw Agricultural University (SGGW) and Agricultural University of Poznań; Romania – Agricultural Science University Bucharest; Spain – la Politécnica de Madrid; UK – Newcastle University) were either visited or contacted. A topic list was used during the interviews with the institutes. It is beyond the scope of this article to provide more details about the study and its limitations.

The most important findings regarding the expectations of the public and the educational innovations, as experienced by the interviewees, were synthesized. The most important

focus points were selected, and information gaps were determined regarding competencies needed to respond to the observed demands and related pedagogical/didactical solutions. This led to a refined study description and a new questionnaire. Comparison between the various universities was not the main purpose of this study. The intention was to get a picture of challenges regarding public expectations with which TAE institutes were confronted, and how they responded in terms of competencies stressed and didactic/pedagogical strategies used for developing the competences needed. The results from the literature review and the interviews are presented below. The requirements are mentioned first, followed by the pertinent competencies.

Requirements as defined by the public	**Competencies considered relevant**
Dealing with the complexity of the contemporary society	o Knowing the different sides to an issue and being able to deal with these conflicting points of views.
Decreasing the gap between science and society	o Being able to get scientific information across to the society. o Students should understand a problem in such a way that they are able to explain it in 'layman's language'. o Students should understand the problem as a whole and not just focus on the details, i.e. have a holistic view of issues and problems.
Preparing students for the increased competition	o Communications skills, e.g. being able to present oneself, etc. o Personal development in order to be a 'more complete person' when leaving the university.
Responding to internationalization	o Being able to communicate in different languages. o Being able to establish contacts abroad. o Being able to communicate with people from different cultures. o Being able to participate in discussions on natural resource management in a global context.
Shifting from generalization to adaptive niche specialization	o Being innovative/ creative. o Being able to combine activities. o Having an 'antenna' for changes occurring outside of their niche.

	o Having both practical and theoretical agricultural knowledge and experience.
Human resources development (extension - consultancy)	o Have practical agricultural knowledge and experience. o Being able to speak on farmer's level. o Being able to convey information to the group one is targeting (e.g. through presentations/ exhibitions).
Responding to the wishes of the capricious consumer	o Having analytical capacities in order to judge situations (graduates should be able to decide what is important and what is not). o Being able to see and understand the connections between things. o Being flexible in order to be able to act upon these trends. o Being able to solve problems creatively.
Decreasing the gap between the consumer and the agricultural sector	o Being able to communicate agriculture in a positive way to the public. o Being able to transfer information to the consumers. o In order to effectively transfer information, students should understand a problem in such a way that they are able to explain it in 'layman's language' - this means that they should understand the problem as a whole and not just focus on the details, i.e. have a holistic view of issues and problems. o Being able to talk to different target groups (farmers, consumers, etc). o Being able to convey information to the group one is targeting (e.g. presentations/ exhibitions).
Dealing with the consumer paradox	o Students should be able to understand the different sides of agricultural issues, conflicting interests of different stakeholders (from environmental impact to producers' motives, economics, marketing), in order to understand the consumer's motives. o As it is impossible to comply with the wishes of all groups within a society, students should decide for themselves which production process they want to support (the intensive one, and cheap products; or the more extensive one, leading to sustainable but more expensive products.) To do so, students should be aware of all the opportunities and be able to make consistent decisions.
Sustainable production/quality orientation	o Having knowledge on organic production. o Knowing that agriculture is more than just production by understanding the consumer part of agriculture. o Being aware of the definition of

	'quality'. o Being aware of environmental, health and social issues.
Considerations about GMOs	o Have an overview of the risks and opportunities, so that they can come to a personal view upon the theme. This is something that they should have with regard to all issues related to agriculture and science; GMOs are therefore a good field to practice in. o Being able to think critically.

Towards competence-based education and training (CBET)

The overarching innovation at this moment is competence-based education and training (CBET). In a recent issue of the *Journal of Agricultural Education & Extension* Mulder (2012, p 319) writes: "The main reason for competence-based education is the alignment with needs in society, a sector, a region, a community or a company. CBET intends to give graduates access to the world of work. It also wants to enable them to have added value for the economy, and to ensure them a good livelihood in terms of self-employment, employment in commercial farms, processing companies, non-governmental organisations (NGOs), governmental agencies, or international donor organisations, or as independent entrepreneurs. The CBET movement is a response to education programmes that are obsolete and irrelevant for socio-economic development." A matrix was developed by ECS staff members with these principles and levels of implementation. This matrix is primarily meant for competence-based agricultural vocational education, including higher professional education (see also: Mulder and Gulikers, 2011, 2012; Sturing *et al.* 2011ab). The principles are:

1. The competencies, that are the basis for the study programme, are clearly specified.
2. Vocational core problems are the organizing unit for (re)designing the curriculum (learning and assessment).
3. Competence-development of students is assessed frequently (before, during and after the learning process).
4. Learning activities take place in several authentic situations.

5. In learning and assessment processes, knowledge, skills and attitudes are integrated.
6. Self-responsibility and (self)-reflection of students are stimulated.
7. Teachers both in school and practice fulfil their role as coach and expert in balance.
8. A basis is realized for a lifelong-learning attitude for students.

Case Study: A ten-step re-design of the MSc curriculum on horticulture at the Jimma University College of Agriculture and Veterinary Medicine (JUCAVM) in Ethiopia

1. An informal curriculum evaluation was conducted with key representatives of the horticulture programme (JUCAVM was already teaching a BSc programme on horticulture): Several points for attention and suggestions for improvement were identified and documented.
2. Review of future tasks and competencies by MSc alumni in the current world of work in the sector: stakeholders were identified, such as producers, the export association, research institutes, governmental bodies and NGOs. Various stakeholders were selected for site visits and interviews.
3. Creation of occupational profiles and competence lists.
4. A labour market analysis was incorporated in this study.
5. Expert opinions were collected via interviews and literature study and model practices were identified.
6. An additional desk-study of literature and policy document was done to see what was to take advantage of current theoretical insights and trends in policy and practice within the field of horticulture training and development.
7. A draft curriculum proposal was prepared.
8. An invited curriculum deliberation conference with sector representatives and education quality monitors about the curriculum proposal was organized.
9. As a follow-up, the curriculum was revised and teaching guides were developed.
10. Finally, the programme was implemented and continuously evaluated and updated.

(Based on Mulder, 2012)

Conclusions

The public has various expectations on a multitude of issues in the fields of agri-food production, environment, landscape and the management of natural resources. New competencies are needed for graduates to meet the challenges of a rapidly changing world with diverse societal demands and tightening ecological boundaries. Educational institutes in Europe that were traditionally aimed at providing agricultural education have responded widely to new qualification needs (Mulder and Eernstman, 2006). There are also various ways, building on existing programmes, courses and in practical educational settings, to develop the new competencies needed, such as beta-gamma interaction,

facilitating multiple stakeholder processes, participatory methods, interactive strategies, conflict resolution, responsiveness regarding community needs, and social responsibility.

Traditional educational innovation trajectories (based on needs assessment, curriculum design, instructional design, implementation and evaluation) are not sufficient to reorient TAE towards the direction needed within the prevailing global change dynamics. These trajectories take too long because of their inherent time lag of many years. Clear values regarding the content-related issues together with an appropriate educational philosophy are imperative.

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