

# COMPETENCE DEVELOPMENT IN HIGHER AGRICULTURAL EDUCATION

## **Draft. Published as:**

Mulder, M. (2010). Competence development in higher agricultural education. M. Slavík & B. Jordánová (Eds). *Teacher training for vocational education in contemporary Europe*. Prague: Czech University of Life Sciences, pp. 25-38. ISBN 978-80-213-2119-9.

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## **Abstract**

Many institutes of higher agricultural education have been implementing a competence-based education philosophy. What are the opinions regarding competence-based higher education? How can this teaching philosophy applied in practice? Examples are be given. These innovations have consequences for teacher professionalism. A description is given of the program on teacher professional development in green education which started in 2010.

## **Key words**

Competence development, competence based education, higher agricultural education, life sciences education, skills training, teacher professional development

## **1. INTRODUCTION**

The challenge of current higher agricultural education is to address the 1. interests of the present generation of students, 2. offering quality study programs which address the needs in science and society and which comply to national and international regulations, and 3. which open and inspiring opportunities for the graduates in terms of further study, employment and personal and career development. This is an extremely complex challenge because interests are sometimes latent and differ, needs are heterogeneous, divergent or even opposite, and opportunities vary with the economy. One thing is obvious however, which is that higher agricultural education needs to deliver graduates who are professionals in their field of study, research and the application of knowledge.

Regarding the alignment of student interests, quality study programs and graduate opportunities, it became fashionable during the last decades to think in terms of competence. The labour market demands competent graduates, education needs to provide the right competencies, students receive competence assessments, and the

education programs are competence-based. There is a genuine innovative element in the competence development education philosophy in higher education, which comprises of the integrated development and application of knowledge, skills and attitudes. The implementation of competence-based education has important implications for teachers, teacher education and teacher professional development.

## **2. COMPETENCE – THE IRRESISTIBLE ADVANCE OF A CONCEPT**

However, many colleagues get confused, if not upset, when the policies, practices and definitions of competence, competency and competencies are concerned (Biemans et al 2004). It is a difficult issue, but an essential thing to discuss in competence theory. The original notion of a competent person is probably as old as mankind and not controversial. However, after the start of the professional use of the concept of competence in various fields of society, many dimensions evolved by which the concept varies, many contexts became apparent in which it is conceptualized, and different functions emerged it fulfils. Nevertheless, the advance of the concept was irresistible, and its profusion immense.

To try to order the different meanings of the concept of competence the following levels of use of the concept can be distinguished. 1. *Competences as behavioristic functionalism*. This meaning entails the detailed breakdown of competencies in list of trainable behaviors, for instance as was used in the 70s and 80s of the last century. Experience showed this approach was difficult to maintain in education as it was too fragmented, and actual behavior of teachers did not really change when they were trained in very many isolated skills. 2. *Competence as integrated occupationalism*. This means that competence is seen as the integrated capability of persons to achieve results. This approach is very popular amongst educational policy experts who want to warrant that the outcomes of education live up to the standards defined in national competency-based qualification frameworks. The approach is called integrated because there is combined attention for the development of knowledge, skills and attitudes, often based on occupational profiles. 3. *Competence as situated professionalism*. This means that competence only gets meaning in a specific context, in which professionals interact with each other. It is closely related to the theories and practices of professional development which showed that personal epistemologies have a stronger influence on professional behavior than isolated skills training. It also touches upon the notion that competence is heavily influenced by what important stakeholders expect of the professional in terms of wishful professional action. Professional associations but also local players have a strong influence on the desired competence fields and the extent to which the professionals need to be proficient in these fields.

Agricultural education, or rather, education in the life-sciences, has to deal with over 100 occupations in the labour market (International Standard Classification of Occupations, 1988). In a previous publication we have given an overview of general competencies which have become important for higher agricultural education (Mulder & Eernstman, 2006). Many competence profiles of professionals exist, but the competence profiles and development issues of entrepreneurs, which are so characteristic in the agri-food sector, tend to be overlooked (Lans et al, 2004; Mulder et al, 2007). The same holds for open innovation specialists who are working in the field of manufacturing of food, detergents of life style products (Du Chatenier, 2009).

### **3. THE ACCEPTATION OF THE COMPETENCE DEVELOPMENT PHILOSOPHY IN HIGHER EDUCATION**

Although the megatrend of making education competence or outcome based, an important question is to what extent educational management is convinced of the value added or even the necessity of this educational philosophy? To answer this question we need to differentiate between professional and academic education. It is obvious that professional education is more prone to conceptualize education as a system which prepares students for certain jobs. That is less obvious in academic education, for example in the hard sciences such as physics, mathematics and chemistry. The dominant philosophy in those sciences seems to be to introduce students in the discipline, and in many cases to prepare them for an academic career. It is surprising, however, that research in higher education in the Netherlands showed that the competence development philosophy (although not necessarily phrased that way) is also embraced by a majority of university professors in the hard sciences (Mulder et al, 2009). So that can be called promising.

### **4. COMPETENCE-BASED VOCATIONAL-PROFESSIONAL EDUCATION**

But how can competence-based education be implemented in HAE? For vocational education this is clear (Mulder et al, 2007; Weigel et al, 2007). In various countries a competence-oriented qualification structure is developed and implemented in vocational education. This is at least the case in the Netherlands where each program has its own qualification dossier, and these consist of many specifications such as core tasks, working processes, and competence specifications.

To determine the level to which the competence-oriented education philosophy is implemented, Wesselink (2010) developed a so-called matrix of competence-based vocational education. At present the matrix is available in English, German, French, Spanish, Portuguese, and Chinese. Further research is going on to improve the matrix. But is clear already that study programs can be positioned with this matrix, and program teams can formulate their development policy regarding the respective programs.

### **5. COMPETENCE-BASED UNIVERSITY EDUCATION**

As said, implementing a competence development education philosophy in university is different. Not the same principles apply as the link between the educational programs and the labour market are more opaque. What is more, university programs have a stronger knowledge component. Principles of competence-based university education as a variety of the matrix of competence-based vocational education have not been formulated yet, but could read as follows.

1. The (core) competencies which are essential to include in the program are defined;
2. The (core) competencies are being positioned by educational level (e.g. Bachelor, Master and PhD);
3. The (core) competencies are being addressed in the educational outcomes of the program;
4. The courses of the programs are mapped using the overview of the (core) competencies (to see which competencies are addressed in which courses);
5. Competence-based learning lines are designed defining the preferred sequence of courses;
6. Certain competencies can be lifted to

educational outcomes which need to be addressed by separate courses (this is often the case with skills training); 7. Certain authentic learning tasks, situations or periods are included (in or as courses) to stimulate the development of certain competencies; 8. Formative competence assessment of achievement (as feedback for improvement of student learning) is applied; 9. Summative assessment (for grading purposes) of outcome mastery is applied; In learning and assessment processes, knowledge, skills and attitudes are integrated; 11. Self-responsibility and self-reflection/reflection is encouraged in students; 12. Professors fulfill their roles as expert teachers and learning coaches in balance (if the student numbers allow for that); 13. Students are prepared for lifelong learning after graduation; 14. Assessment of student characteristics is made available to improve the choice for specializations and careers; 15. Employability competence is a special attention point in the programs.

## **6. IMPLEMENTATION OF COMPETENCE-BASED EDUCATION IN HIGHER AGRICULTURAL EDUCATION**

As will be clear from these principles, the implementation of competence-based education in Higher Agricultural Education is a complex innovation. How can this teaching philosophy be applied in practice? Making university programs competence-based is not new (Grant, 1979). To date there is a European Qualifications Framework (European Commission, 2008) in which the concept of competence is integrated. Some of the implementation of competence-based education will be given from the context of Wageningen University.

The first example is about mapping study programs against the background of core competencies and competence lists. The first step was an orientation towards the notion of competence-based education, and next key competencies were defined, inspired by work of the three technical universities (Meijers, Van Overveld and Perrenet, 2005) in which eight competence areas are distinguished, related to the domain of study, the methods being used, and the context in which one is operating. Study programs were analyzed to detect the presence of competencies in the courses within the programs. Program teams went through this process which resulted in maps of courses by competencies. Global maps of this kind were instrumental in arranging learning lines for competence development. Finally Special program elements were re-programmed to better comply with the competence development education philosophy. The compulsory course Academic Consultancy Training and the (optional) Pilot projects on assessment are good examples of this. Next to that, the development process was quite effective for program visitation and accreditation.

## **7. ACADEMIC CONSULTANCY TRAINING**

Academic Consultancy Training (ACT) is a 9 European Credits (ECs) course with an extensive practical training format. In the course student teams of about 4 to 7 persons choose a real project on an authentic problem. These student teams operate as interdisciplinary consultancy teams. Students have to apply for a place and in their application letter students have to explain the value added of their disciplinary knowledge for the project. Process coaches as well as subject matter experts assist the students. The projects teams have to deliver a design of a solution for given problems for a client organization. Designs may be varied, and include new technologies, policy papers, business plans, communication plans or draft research plans. The intention is that teams produce an interdisciplinary synthesis of the problem analysis and translate this into the project results as an advice for future actions of the client organization.

The outcomes of the course are about defining the goals of the project, making a project plan, developing a work breakdown structure, client-consulting communication in which project goals and the project plan are refined or revised, presenting and defending results, learning to work in an interdisciplinary project team including delivering (intermediate) project results as agreed, reflecting on experience, the performance of the team members and self-reflection of self-performance, both in writing and an assessment interview, and team member assessment and giving feedback.

Team have to produce the following deliverables: an oral presentation in English, to the client organization, fellow students and coaches involved in the ACT; the project plan and product; a performance portfolio which consists of the application letter, an expectations paper, completed reflection forms, a mid-term reflection paper and a final reflection paper. Coaches and team members give feedback on the portfolios. Examination is based on 1. the midterm reflection paper which is graded by a specialized trainer as 'pass' or 'fail'; 2. the project plan; 3. the final oral presentations; 4. the project results (the 'design'); 5. the equality of the contributions and performance of the project team members; 6. the contributions to the project process of the team members.

## **8. MODULAR SKILLS TRAINING**

Modular skills training (MOS) is linked to the ACT course. Students get 3 credits with which they can choose skills training courses of 1,5 credits each. The essence of MOS is that students acquire skills which they need as MSc-graduates on the labour market. The selection of the modules is supported by study advisors who analyze the education history and mastery of the competencies of the students, and give advise regarding the competence development plan of the students. Giving the scheduling constraints students are advised to speak about their intentions with their study advisors early in their MSc program and to get agreement about their choice of modules.

There are three levels of MOS modules: 1. modules at the level of BSc graduation; they can be perceived as refresher courses for MSc-students; 2. modules at the level of MSc graduation; 3. modules for additional development of skills which are helpful for career development. The list of skills courses is as follows:

*Category 1:* Skills Assessment; 2. Computer Literacy; Information Literacy; Basic presentation skills; *Category 2:* Advanced Presentation Skills; Negotiation Skills; Intercultural Communication Skills; Argumentation Skills; Observation Techniques; Professional Ethics; Introduction Philosophy of Science; Scientific Writing Skills; Project Planning and Organization; Interviewing Techniques; Questionnaire Construction; *Category 3:* Intuitive Intelligence; Career Development Planning; Train the trainer; Entrepreneurial skills; Consultancy skills; Management skills.

For all MOS modules specific descriptions are given in the Study Handbook.

Most MOS modules can be taken during the period in which the Academic Consultancy Training is scheduled. This results in peak pressure in the teaching load and staff capacity needed, but this also holds for the ACT course, since most of the teaching and learning takes place in small groups (although some MOS modules are taught for larger groups).

It is required that students should master all skills listed under category 1. From the

2<sup>nd</sup> category they can choose relevant modules which may be necessary for doing their thesis and internship. Students can choose modules from category 3 based on their personal preferences and professional ambitions.

## **9. COMPETENCE ASSESSMENT, STUDY CHOICE AND CAREER DEVELOPMENT**

Another example of the implementation of the competence-based education philosophy is the introduction of competence assessment for supporting study choice and awareness raising of the issue of career development. This initiative is recently pilot-tested (Gulikers et al, 2010).

The pilots were implemented in a course which was offered to third-year BSc-students animal sciences (BDW) and business and consumer studies (BBC). In total twenty five students from both studies were invited to voluntarily participate in both pilots. A private human resources (HR) company and an external professional career coach were included in the preparation and implementation of the course. The company delivered an online assessment tool. The assessment addressed three basis questions: 1. who am I? (this was measured by a self-assessment on eighteen competencies; 2. what do I want?:(this was also measured by a self-assessment, in this case of motives and work cultures; 3. how do I perform? (measured by a 360 degrees competence assessment, completed by the student and at least three other persons). Six roles were identified to share with the students: researcher, consultant, policy maker, teacher/trainer, entrepreneur, and expert.

The course contained three steps: 1. the assessment; 2. the individual feedback conversation; 3. training sessions. There were three training sessions, each of which dealt with component of models for career decision making (see Hirschi & Läge, 2007; Van Esbroeck, Tibos and Zaman, 2005): 1 self-exploration; 2. then environment exploration; 3. identifying concrete choices and possibilities. The training sessions were conducted in plenary sessions. Individual, small group, plenary activities and home work were included.

The results indicate that the assessment, feedback and further training activities have added value in terms of competence awareness, awareness of personal weaknesses, development of specific ideas for the remainder of the study, understanding of the professional roles and of finding out the personal preferences regarding the professional roles. Pilot 2 was improved based on experiences in Pilot 1 and included three measurement moments: 1. the beginning of the course, 2. after the assessment and feedback sessions with study advisers; 3. at the end of the course, thus after the training sessions. There appeared to be significant improvement of competence, weaknesses and strengths awareness, role understanding and role preferences improved significantly as a result of the assessment and feedback sessions. Strengths awareness, general awareness of things students never thought about before, specific idea generation for personal development, and development of specific ideas for planning the remainder of the study increased (further) as a result of the training sessions.

## **10. IMPLICATIONS FOR PROFESSIONAL DEVELOPMENT OF TEACHING STAFF**

All developments in education ask for professional development of teaching staff. This also holds for the introduction of competence-based education. Various principles for competence-based education have implications for teaching staff. They need:

1. to determine the vocational core problems and take them as the organizing unit for (re)designing the curriculum at the level of the educational institute; 2. assess student competence before, during and after the learning process; 3. introduce learning activities which place in a range of authentic situations; 4. integrate knowledge, skills and attitudes in learning and assessment processes; 5. scaffold and fade in self-responsibility and self-reflection/reflection in students along the program; 6. fulfill their roles as experts and coaches equally; and stimulate the development of an attitude of lifelong learning in the students.

Teachers are being trained in these principles, but this is not an easy thing. Professional development is optional, educational institutions have the financing of in-service training programs in their lump sum budget, and although not intended, in various cases the budgets are being used for financing other priority areas. Also, much of the in-service training and professional development takes place on an individual basis, whereas a school-based approach is needed which is overarched by a strategic development plan of the educational institution and supported by targeted human resource management.

For green secondary agricultural-vocational education, which takes place in junior (VMBO) and senior secondary education (MBO) institutes, there is one teacher training institute, which is Stoas University for Professional Education. In principle, teacher education provided by Stoas prepares students for a starting qualification as secondary education teacher. This is done within the framework of the Dutch Law on Professions in Education (Wet Bio). This law has specified seven competence areas for which the student teachers are prepared. Stoas and ECS are going to conduct a project in which competence clusters which are unique for green vocational education are generated.

## **11. THE RESEARCH PROGRAM ON PROFESSIONAL DEVELOPMENT OF TEACHERS IN GREEN EDUCATION**

This project is part of a wider research program which is running during the years 2010 and 2011 on professional development of teaching staff. Nine projects have been proposed on the following topics.

1. What are the success and failure factors of professional development of teachers in green education? 2. Which specific guidelines are there for the pedagogical content knowledge for green education themes? 3. Is there a need for a green standard for professionalism of teaching staff in Universities for Professional Agricultural Education (HAS)? 4. Is there a need for the development of a HAS minor in Education? 5. Does the development of an academic training school in the triangle School-Stoas-ECS have added value for the training and professional development of teaching staff? 6. Which priorities are there concerning the professional development of teachers and trainers who work in the field of practical training (such as PTC<sup>+</sup> and IPC)? 7. What is the added value of teacher participation in extra-curricular regional learning arrangements for their professional development, entrepreneurship and creativity? 8. What possibilities are there to augment the number of PhD research trajectories conducted by teaching staff in green Education in cooperation with the lectorships in Professional Agricultural Education? 9. Which knowledge about green themes which is generated in green knowledge institutes can be brought to non-green Education (elementary and secondary) and what are effective ways of doing that?

A Group Decision Room with representatives of green education and the green education service sector has been held in which priorities for conducting these

projects were formulated. In a later stage we hope to be able to report about the projects which have been prioritized, which are in order of priority by education representatives, projects 3, 1, 9, 7, 6, 4, 2, 8, 5. We hope to present the first outcomes of this research program in the course of 2011.

## 12. CONCLUSION

In this contribution we have stated that the introduction of competence-based higher education is a major innovation in education. It has important consequences for teaching staff and management in education. Teachers need to be prepared for this innovation, but they also have to work on its development and implementation from their own perspective. Practical examples from Higher Agricultural Education are given on the integration of the competence development education philosophy in the curriculum, cooperative authentic interdisciplinary consultancy courses, modular skills training and formative career assessments. These innovations have consequences for teaching staff and management involved. Their competence development is also at stake, and to enable this, a competence management philosophy is also needed in general management of educational institutions. Since as the simple saying goes: Verba docent, exempla trahunt, or: example is better than precept.

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