PhD Competences in Food Studies

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Abstract

In European Higher Education, learning outcomes and competences have been used sometimes with different meanings and sometimes with the same meaning. But both terms have been more commonly used to refer to knowledge, understanding and abilities a student must demonstrate at the end of a learning experience. Their use is a consequence of the paradigm shift of the Bologna Process to a learner centered education environment. The definition of standards of competences (or learning outcomes) for the PhD degree is thus a need for the quality assurance of this degree. In this work, subject-specific and generic competences for the PhD in Food Science and Technology and their alignment with the European Qualifications Framework (EQF) level descriptors for quality assurance purposes have been identified.

Keywords: Third cycle studies; Skills; Generic competences; Specific competences; European Qualifications Framework

1 Introduction

In the last few years, international trends in education have shown a shift from the traditional "teacher-centered" approach to a more "student-centered" approach. While traditionally the focus was on what the teacher did, in recent years the focus has been on what students have learnt and can demonstrate at the end of a module or programme. To this aim, all modules and programmes in third level institutions throughout the European Higher Education Area should be (re)written in terms of learning outcomes (Kennedy, Hyland, & Ryan, 2006). In European Higher Education, learning outcomes and competences have been used sometimes with different meanings and sometimes with the same meaning, but both terms have been more commonly used to refer to written statements of what the successful student/learner is expected to be able to do at the end of the module/course unit or qualification (Adam, 2004). These competences or outcomes are usually expressed as knowledge, skills or attitudes (Kennedy et al., 2006). In this work, the term "competence" represents a combination of attributes in terms of knowledge and its application, skills, responsibilities and attitudes.

The most common form of doctorate programme is still based largely on a supervised research project over three to five years during which

the candidate is registered at a higher education institution. All doctoral candidates are required to make an original contribution to knowledge by conducting an independent research project. More recently, there has been a greater emphasis on personal and professional development in PhD programs, which has led to increasingly structured programs that include both research and transferable skills training. Acquisition of these skills, together with evaluation of the candidate's discipline specific research skills, is generally monitored or assessed through annual progress reviews. Whether or not the structured elements are formally assessed, examination of the research degree itself focuses on the quality of the candidate´s thesis or equivalent and his/her defence of it at the viva voce. Individual institutions specify entry requirements for doctoral degrees, this usually being a master's degree. Related to the funding structures used by some research councils, most of the doctoral degrees are structured around a 1+3 model, with candidates completing a taught master's programme before embarking on doctoral studies. Some candidates are able to enter doctoral programs on the basis of their prior professional knowledge and experience (QAA, 2011).

Doctoral training must remain clearly distinct from the first and second cycles of higher education in the Bologna Process. Quality assurance of doctoral training should be embedded in the regular research assessment of research degree awarding institutions (LERU, 2007). The definition of standards of competences for the PhD is thus needed for the quality assurance of this degree. The main key characteristics of outcome-based education have been listed by Harden (2002):

- The development of clearly defined and published learning outcomes that must be achieved before the end of the programme;

- The design of a curriculum, learning strategies and learning opportunities to ensure the achievement of the learning outcome;

- An assessment process matched to the learning outcomes and the assessment of individual students to ensure that they achieve the outcomes.

When writing learning outcomes, it is important to write them in such a way that they are capable of being assessed. Clearly, it is necessary to have some form of assessment tool or technique in order to determine the extent to which learning outcomes have been achieved.

The definition of competences of the PhD degree must take into account the future needs of the society. Universities often believe that academia is still the most valuable calling for their PhD graduates, but this is not true anymore as has been concluded in several studies carried out recently by Fiske (2011) and Cyranoski, Gilbert, Ledford, Nayar, and Yahia (2011). In fact, few PhD graduates in science (under 6% in Germany) eventually go into full-time academic positions in Europe as the number of academic positions have stagnated or declined in most European countries. Moreover, many doctoral programmes do not adequately serve students as they are over specialized, with curricula fragmented and increasingly irrelevant to the world beyond academia (food industry, consultancy, governmental organizations, non-profit organizations, research centres, consumer associations . . .). Expertise, of course, is essential to the advancement of knowledge and to society but in too many cases, specialization has led to research areas so narrow that they are of interest only to other people working in the same fields, subfields or sub-subfields. Additionally many researchers struggle to talk to colleagues in the same department, and communication across departments and disciplines may be very difficult (Taylor, 2011).

Expanding the PhD experience and preparing holders of scientific doctorates to be successful in a range of careers should be the main goal of academia. PhD graduates must have qualities attractive not only in academia but also outside, in both manufacturing and service-oriented enterprises, in small innovative companies, in the civil services and public administration, among others (LERU, 2007). Focused seminars in areas as communication, business basic and public policy would go a long way towards strengthening the capabilities of PhD students and improving

their career prospects (Fiske, 2011). This needs the creation of new models for PhD programmes that have to be developed urgently.

The aim of this work, in the framework of the ISEKI_Food 3 European project (www.iseki-food.eu), was to develop a list of competences for a third cycle level related to Food Studies. To this aim, a study on the tuning of PhD studies has been carried out through the identification of subject and generic competences, their alignment with the European Qualifications Framework level descriptors, access arrangements, supervision and assessment procedures.

2 Methodology

In the first phase of the study, the ISEKI_Food 3 project coordinators reviewed the various studies, reports and sources of information on doctoral competences in Food Studies, both at the European and national levels. This work involved the participation of 94 institutions (mainly higher education institutions) from 30 European countries. During the course of several meetings, the Steering Committee, together with the coordinators, took the opportunity to seek clarifications and engage in discussion on the preliminary results.

After the review process and feedback received from the different meetings, the work was finally organized by taking into account seven groups of outcomes. These outcomes dealt with both the research activities and with the transferable skills (generic competences). In the last step, a final report was prepared and made available from the web pages of the project (www.iseki-food.eu/deliverables_iseki_food3).

3 Results

3.1 PhD competences of Food Studies

The subject-specific competences comprised research techniques, environment and management and are listed in Table 1. The generic competences comprised personal effectiveness, communication skills, networking and team working and career management and are listed in Table 2.

In food studies, the PhD student must develop subject-specific competences directly related with the topic of the studies, the core competences of the degree, that are characteristic of the student's capability of working at the frontiers of science. The competences related to research environment are essential to the student's coexistence in the research groups with which he/she is involved in order to avoid conflicts and the management of research competences assures the student's autonomy in future research activities. The generic skills listed in Table 3 strengthen the integration in the research environment and the autonomy in future research development.

As there is always the danger of being over-ambitious when writing competences, in this document a desirable level of achievement (low, medium, high) of each outcome has been established (Tables 1 and 2).

Most of the competences described can be achieved and/or evaluated by measuring different items such as:

- Productivity of the PhD student in terms of number of publications of publishable quality which would satisfy peer review;

- Oral presentations given in scientific conferences, workshops and commercial trades in both national and international events to promote the use of different languages;

- Structured courses outside the lab, including classes in management, communication and other transferable skills;

- Promoting and evaluating the participation of the PhD student in teaching activities;

- Favouring the exchange and collaboration with other labs (i.e. in other countries);

- Promoting highly interdisciplinary projects;

- Promoting supervisors from a range of disciplines;

- Promoting opportunity for PhD students to supervise Bachelor's or Master's theses;

- Promoting opportunities for PhD students to integrate project application in experienced teams;

- Favouring the evaluation of the progress in his/her research (together with a mentor, a professor).

3.2 Alignment of PhD competences with the European Qualifications Frameworks level descriptors

The EQF is a common European reference framework which links countries' qualifications systems together, acting as a translation device to make qualifications more readable and understandable across different countries and systems in Europe. The qualifications framework includes descriptors for each level of qualifications (European Commission, 2008).

In 2005, the qualifications framework for the European Higher Education Area defined six descriptors for the third cycle (PhD; see Table 3) (Ministry of Science, Technology and Innovation, 2005). In 2008, the European Parliament officially recommended the establishment of the European Qualifications Framework for lifelong learning (LLL) in the EU. This framework presents three descriptors for the 8th level (PhD; see Table 4). (European Commission, 2008).

Any quality assurance system related to the third cycle must use these descriptors as guidelines for the evaluation of the achievements of the respective programs being evaluated.

Every descriptor of both frameworks has some correspondence(s) with the PhD competences for food studies here defined (see Table 5). However, some competences for food studies define topics that do not find correspondence with the descriptors, particularly:

1.1.8: demonstrate ability to work well across disciplines.

1.3.2, 1.3.3, 1.3.4, 1.3.5: manage a team of people, apply effective project management through the setting of research goals, intermediate milestones and prioritization of activities, recognise principles of project and time management, ap-

ply for funding or attract other companies to work in a research project.

2.1.1, 2.1.2, 2.1.3, 2.1.4: demonstrate flexibility and open-mindedness, when working with different environments and people, show ability to handle difficulties in research or other professional activities in an appropriate way, show ability to react quickly and effectively to unpredictable/unforeseen situations, show ability to adapt to different cultures and socio-economic environments.

2.3.1, 2.3.2, 2.3.3, 2.3.4: develop and maintain co-operative networks and working relationships with supervisors, colleagues and peers within the institution and the wider research community, understand one's behaviour and impact on others when working in and contributing to the success of formal and informal teams, listen, give and receive feedback and respond perceptively to others, develop capacity to engage in multidisciplinary works.

2.4.1, 2.4.2: appreciate the need for and show commitment to continued professional development, demonstrate an insight into the transferable nature of research skills to other work environments and the range of career opportunities within and outside academia.

These competences are almost exclusively on research management, personal effectiveness, networking and team working and career management. The derivation of the definitions of competences from the descriptors was expected, since the descriptors defined the level of every PhD study of every subject and thus are more general and define the common denominator to all knowledge areas and the minimum to distinguish the various levels of qualifications. Subject specific competences are, by definition, more specific to the particular PhD it is referred to.

4 Conclusion

The results of the present work can be used in the future for Quality Assurance standards of European PhD Food Studies, not only as a pillar to set the basis of the future PhD programs, but also to modify and to improve present PhD studies.

Table 1: Specific competences for PhD food studies[1]

1.1.Research skills and techniques		
To be able to:		**Level (*)**
1.1.1	demonstrate original, independent and creative thinking	High
1.1.2	demonstrate ability to perform original and independent research within a scientific discipline or interdisciplinary collaboration	High
1.1.3	demonstrate ability to 'work in depth at the frontiers of knowledge' and across disciplinary boundaries	Medium
1.1.4	formulate and apply solutions to research problems and effectively interpret research results	High
1.1.5	demonstrate an understanding of relevant research methodologies and techniques and their appropriate application within one's research field	High
1.1.6	analyse critically and evaluate one's findings and those of others	High
1.1.7	recognise and integrate ideas and resources from a wide pool of sources	High
1.1.8	demonstrate ability to work well across disciplines	High
1.2. Research environment		
To be able to:		**Level(*)**
1.2.1	show a broad understanding of the context in which research takes place: understand the relevance of research in society and the potential impact of research on individuals, groups and society	Low-Medium
1.2.2	demonstrate awareness of issues relating to the rights of other researchers and of research subjects e.g. confidentiality, attribution, copyright, ethics, malpractice, avoidance of plagiarism, ownership of data and the requirements of the Data Protection Act.	Medium-High
1.2.3	understand relevant health and safety issues and demonstrate responsible working practices	High
1.2.4	understand the processes for funding, evaluation of research and grant application procedures	Medium
1.2.5	understand different cultural environments, including the business world, and the contribution that knowledge transfer can make to society	Low
1.3. Research management		
To be able to:		**Level(*)**
1.3.1	develop new research projects	Medium
1.3.2	manage a team of people	Medium
1.3.3	apply effective project management through the setting of research goals, intermediate milestones and prioritisation of activities	Medium
1.3.4	recognise principles of project and time management	High
1.3.5	apply for funding or attract other companies to work in a research project	Low-Medium

(*) minimum desired level
[1] proposed by ISEKI3 FOOD network

Table 2: Generic competences (key transferable skills) for PhD food studies[1]

2.1. Personal effectiveness		
To be able to:		**Level(*)**
2.1.1	demonstrate flexibility and open-mindedness, when working with different environments and people	high
2.1.2	show ability to handle difficulties in research or other professional activities in an appropriate way	high
2.1.3	show ability to react quickly and effectively to unpredictable/unforeseen situations.	medium
2.1.4	show ability to adapt to different cultures and socio-economic environments (by means of an international experience, mobility)	high
2.2. Communication skills		
To be able to:		**Level(*)**
2.2.1	write (report) fluently and efficiently scientific publications	high
2.2.2	defend own papers in scientific conferences	high
2.2.3	show ability to communicate effectively to a broad framework of audiences (interdisciplinary teams, expert conferences, science for society, workshops)	high
2.2.4	effectively support the learning of others when involved in teaching, mentoring or demonstrating activities	medium
2.2.5	communicate/discuss effectively with researchers from other disciplines	high
2.3. Networking and teamworking		
To be able to:		**Level(*)**
2.3.1	develop and maintain co-operative networks and working relationships with supervisors, colleagues and peers within the institution and the wider research community	medium
2.3.2	understand one's behaviour and impact on others when working in and contributing to the success of formal and informal teams	low
2.3.3	listen, give and receive feedback and respond perceptively to others	medium
2.3.4	develop capacity to engage in multidisciplinary works	medium
2.4. Career management		
To be able to:		**Level(*)**
2.4.1	appreciate the need for and show commitment to continued professional development	medium
2.4.2	demonstrate an insight into the transferable nature of research skills to other work environments and the range of career opportunities within and outside academia	high

(*) minimum desired level
[1] proposed by ISEKI3 FOOD network

Table 3: Third cycle (PhD) descriptors of the European Qualifications Framework for the European Higher Education Area

Completion of the third cycle is awarded to students who have the following qualifications:

1. have demonstrated a systematic understanding of a field of study and mastery of the skills and methods of research associated with that field;

2. have demonstrated the ability to conceive, design, implement and adapt a substantial process of research with scholarly integrity;

3. have made a contribution through original research that extends the frontier of knowledge by developing a substantial body of work, some of which merits national or international refereed publication;

4. are capable of critical analysis, evaluation and synthesis of new and complex ideas;

5. can communicate with their peers, the larger scholarly community and with society in general about their areas of expertise;

6. can be expected to be able to promote, within academic and professional contexts, technological, social or cultural advancement in a knowledge based society.

Table 4: Level 8th (PhD) descriptors of the European Qualifications Framework for Lifelong Learning

1. **knowledge**: knowledge at the most advanced frontier of a field of work or study and at the interface between fields;

2. **skills**: the most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice;

3. **competence**: demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research.

Table 5: Relationship between LLL and EHEA descriptors (grey background) and ISEKI PhD competences

EQFHE	EQFLLL		
	1. knowledge: knowledge at the most advanced frontier of a field of work or study and at the interface between fields;	2. skills: the most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice;	3. competence: demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research.
	1.3.1		1.1.1 - 1.1.2 - 1.2.2 - 1.2.4 - 2.2.4
1.have demonstrated a systematic understanding of a field of study and mastery of the skills and methods of research associated with that field;	1.1.3	1.1.2 - 1.1.5 - 1.2.3	
2. have demonstrated the ability to conceive, design, implement and adapt a substantial process of research with scholarly integrity;	1.1.2	1.1.4 - 1.1.5	
3.have made a contribution through original research that extends the frontier of knowledge by developing a substantial body of work, of which merits national or international refereed publication;			1.1.3 - 2.2.1
4.are capable of critical analysis, evaluation and synthesis of new and complex ideas;		1.1.1 - 1.1.2 - 1.1.6 - 1.1.7	
5.can communicate with their peers, the larger scholarly community and with society in general about their areas of expertise;			2.2.1 - 2.2.2 - 2.2.3 - 2.2.5
6. can be expected to be able to promote, within academic and professional contexts, technological, social or cultural advancement in a knowledge based society.	1.1.5		1.2.1 - 1.2.5 - 1.3.1

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