

UNIVERSITY DOCTORAL THESIS (PhD)

**AN ANALYSIS OF THE COMPETENCES IN FIRST DEGREE
COURSES IN AGRICULTURAL SCIENCES**

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1. THE BACKGROUND AND AIMS OF THE DOCTORAL THESIS

In Hungary the changes which have taken place over the last two decades have had effects on social and economic life. The decrease in natural resources, the political changes occurring in Central and Eastern Europe, the emergence of a new consumer and service society, have all significantly increased the role of human resources in all areas of economic life. Higher education institutions have also had to create new objectives, in order to satisfy the changing social and economic demands.

The Bologna Declaration, signed in 1999, transformed the system of courses in higher education in many European countries, including Hungary. From the 2006/2007 academic year, all Hungarian higher education institutions introduced the unified European system of courses established during the Bologna process, providing a basic, masters and doctoral course in all fields of study which gives a pre-determined qualification and specialisation. To achieve success in this process, higher education must maintain close links with actors in the labour market in order to ensure that well-prepared candidates with degree-level qualifications can enter the market, ensuring that an appropriate supply can meet the current demand.

Social and economic development is based on human knowledge. In economic competition human resources, in the form of human capital, enjoy a pre-eminent role, as a basic precondition of economic growth. In the economic sphere there is a great need for employees with a strong basic knowledge, a clear specialist competence, good preparation, language skills and a readiness to undertake further training. The activities of educational institutions, particularly higher educational institutions are crucial in determining students' chances for future employment. When they employ graduates, businesses and other economic actors undertake a real evaluation of their specialist knowledge and suitability for employment. Graduating students' chances for future employment can be improved in part by a systematic reconsideration of the creation of workplaces and partly by an increase in the quality of education – in our case higher education.

The course structure offered by higher education institutes must be prepared on the basis of the course demands and the outcome demands. These de-

mands, in addition to specialist knowledge, also determine what requirements graduates should fulfil, and what competencies they should achieve in each field, in order to become successful members of the workforce. In the labour market the quality of human resources is determined by the qualification, the language skills, the experience and practice in the specialist field, and also by the existing and potential competencies. It is necessary to study and harmonise the course requirements and outcomes with the expectations of the labour market expressed as workforce competences. A continuously developing economy needs specialists who have knowledge which can be developed and improved. All of this determines the concept of life-long learning.

The aim of my thesis was to analyse the effects of the Bologna process on higher education; in the wider sense the appearance of new elements in higher education, and in a narrower sense the form of the courses established as a result of the Bologna agreements, specifically the first degree courses in agricultural sciences: the environmental management agricultural engineer course and the environmental protection engineer course. In my work I would like to directly contribute to the development of organised links between the specialised courses and the labour market by considering and comparing the demands of employers and the content of the specialised courses so that higher education activities can serve the demands of employers and increase the chances of new graduates to find work.

In my research I would like to find proof for my hypothesis that the actors in the labour market were not sufficiently informed about the changes relating to the introduction of the Bologna process in higher education, and the new conceptions relating to developments in higher education institutions. I believe that in the field of studies related to my area of research, the syllabus of the two first degree courses, even though their accreditation process was completed in agreement with employers, should be re-examined, both in their general and their specialised syllabus elements. It is possible that the expectations related to the work carried out by graduates in the courses examined can be met by a continuous process of course revision; the appropriacy of the course content can be achieved by satisfying the expectations established in work descriptions; the lack, or insufficiency, of indi-

vidual elements of the course requirements can be resolved by continuous development and by communication between the parties involved. All of this can help graduates on the environmental management agricultural engineer and environmental protection engineer BSc courses develop their specialist knowledge and acquire the competencies required in their fields of work.

2. RESEARCH METHODOLOGY

In the course of my research I attempted to measure how much agreement there was between the competencies required of the graduates in the two disciplines by the higher education institutions and by the labour market. I measured the expectations of the representatives of the business sector as regards students graduating from the courses.

My research programme is made up of several parts (*Figure 1*).

In my research I employed primary and secondary methods. During the preliminary, primary phase I carried out my own investigations, which included data collection in the form of questionnaires and an examination of workplace job descriptions. For the secondary phase of the research I used the data produced by the HEFOP 3.3.1 project, co-ordinated by the Faculty of Agricultural Sciences of the University of Debrecen, and carried out the analyses based on the validation. I carried out the analysis of the data I collected with the help of the Statistical Package for the Social Sciences (SPSS) software programme. I conducted a non-parameter test between the two basic types of statistical hypotheses. I also used a Khi-square test, in order to decide on the ‘reality’ of the relationship between two variables.

During the primary phase of the research, relating to the environmental management agricultural engineer and environmental protection engineer courses, I sent a questionnaire containing 49 questions to employers who had in recent years employed graduates with traditional qualifications as environmental management agricultural engineers and environmental protection engineers, and also to employers whose activities are connected to the agricultural field and can thus be considered potential employers of BSc graduates. My aim was to build

up a picture of the expectations in the business sector relating to graduate environmental management agricultural engineers and environmental protection engineers. To this end I also sought out companies involved in general agricultural activities. With the help of the questionnaire I wanted to find out, for example, the respondents' knowledge of the content of the first degree courses; what level of knowledge and competences did they expect from graduates? Had they been involved in the syllabus development of the degree programme? Parallel with the questionnaire, I attempted to collect and evaluate individual work description documents. During the process of this so-called employer monitoring, I initiated the research process described above with 62 employers, of whom 42% responded. The employers included in the survey were primarily environmental protection specialists, specialist advisory and service firms, directorates of national parks, waste disposal and sewage treatment plants, specialist nature protection authorities, firms extracting and processing natural resources and civil organisations. On the basis of the specialist and general requirements I established those workplace tasks which the employee could carry out with the help of the specialist qualification and the competences acquired. In this stage of the research I measured the tasks and competences expected of employees in the economic sector, and then reformed the course task- and competence profile with the help of the higher level specialist courses for waste management technicians, and medicinal herb and spice producer and processor technicians. Considering the process of the courses and the differing methods of study experienced, in order to guarantee lifelong learning there is a decisive role for the creation of a modularised system which, independently of the education system – be it formal or informal -, can provide an opportunity for the individual to enlarge his/her specialist knowledge. The content of the modules can be adjusted according to this principle, since the candidate must solve workplace tasks in order to secure a job, and so needs to have the appropriate competences to be successful. The modules containing the required outcomes constitute a new degree course, helping the conception of life long learning, as well as the achievement of a system in which the courses are integrated with each other. During the process of modularisation the whole competence profile of the specialist courses must be compared, the common and distinct profiles must be examined, and competences considered to

be identical must be taken into account. In order to do this I examined the overlap between the further education specialist courses and the BSc courses, and prepared the competence profiles for the courses, before breaking them down into modules. The task profiles were evaluated by educational and labour market experts with the help of validation tables. All modules and all task competences were subjected to evaluation, on an ordinal three-point scale – independently of whether the evaluator performs the given task or not – with the following criteria: importance of the task, frequency with which the task is carried out, and complexity of the task.

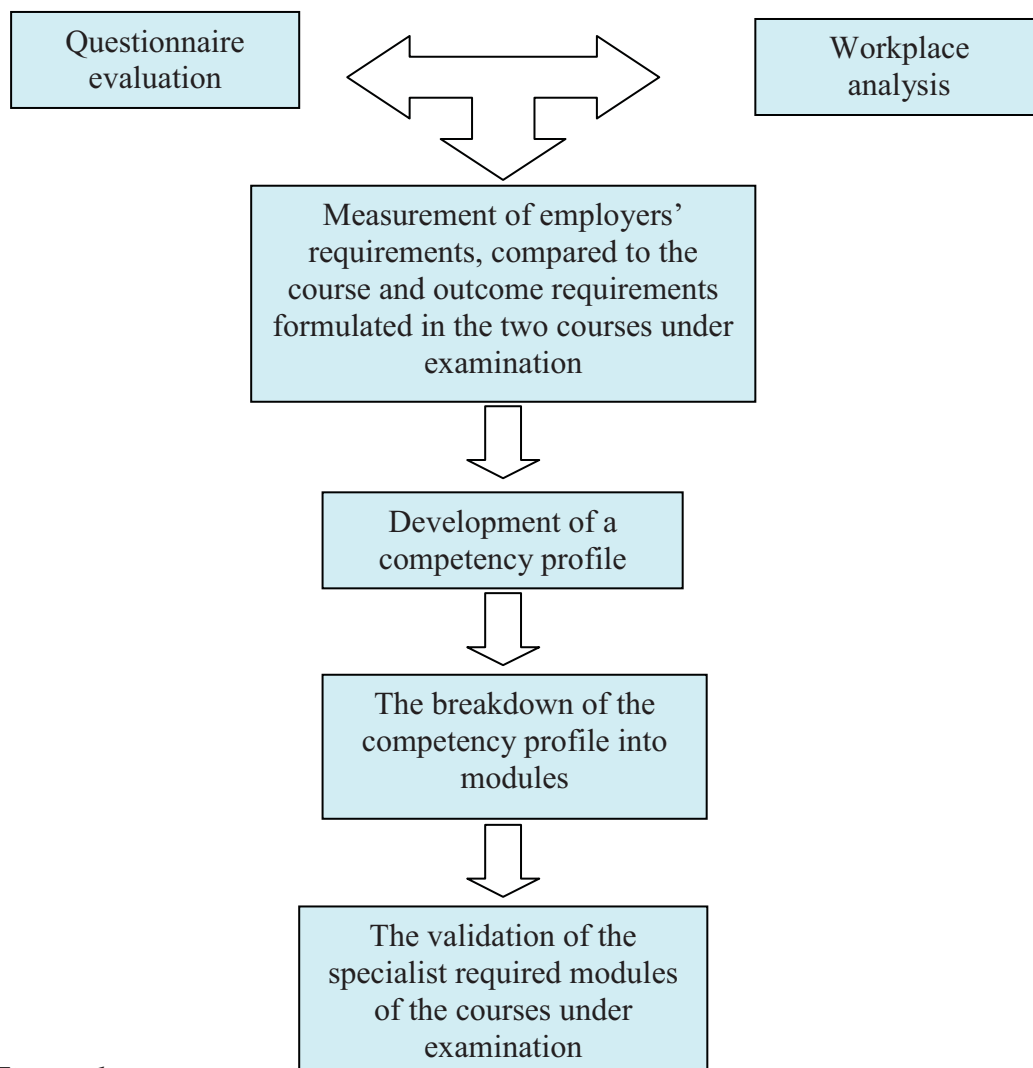


Figure 1

The research programme

Source: own research.

3. THE PRINCIPAL FINDINGS OF THE EVALUATION

Courses and evaluation based on competences are becoming more common in higher education in Hungary, thanks primarily to the new higher education course system developed during the Bologna process. Nowadays we cannot consider the expectations established during the accreditation process – competences fixed 3 or 4 years previously – as permanent and stable, given the changes in the labour market, the economy, technology and innovation. It has become necessary to review the expectations related to the competences. The significance of the course and output requirements for the BSc course and their harmonisation with the expectations of the workplace can be considered as a basic requirement, in order to guarantee workplaces for graduates in these disciplines. The competence-based course, in addition to guaranteeing the opportunity to continue life long education, must continuously monitor developments in economic life and the changing expectations of employers in the face of these changes. Emphasis must be placed on the adaptation of the syllabus to achieve the competences required.

3.1. Establishing the requirements of the labour market on the basis of a questionnaire

According to my hypothesis it is necessary to inform actors in the labour market more widely concerning the changes related to the introduction of the Bologna process into higher education, and create a wider understanding of the concepts related to the development of higher education institutions.

The 49-item questionnaire was completed by 89 respondents. Most of them were organisations in the service sector (23.6 %), administrative authorities (22.5 %) and in the production sector (20.2 %). In addition there were also respondents from non-governmental organisations and authorities. I examined whether the respondents had heard of the two BSc courses which had been developed during the Bologna process. I established that the business sector respondents I contacted had heard of both courses. This result is not surprising since during the

process of preparing the accreditation documents for the courses employers were able to find out about the syllabus and offer their support to the higher education institutes involved.

I examined the questionnaires returned by employers in terms of how, given their current state of knowledge, they evaluated the value of the labour market value of the courses. With this question I intended to measure the labour market chances of those graduating from the two courses (*Figure 2*).

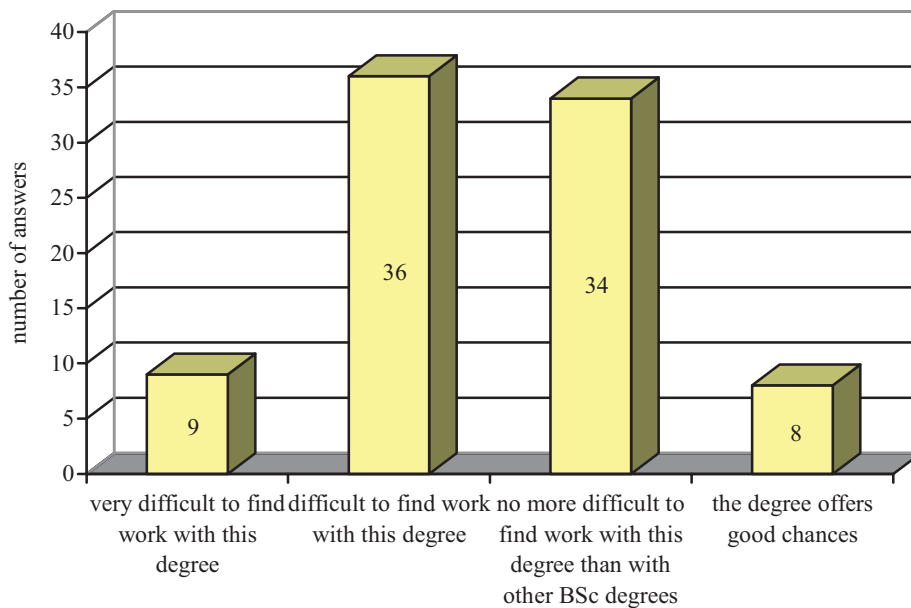


Figure 2
Respondents' answers concerning the labour market value of graduates from the two BSc courses under examination

Source: By questionnaires (2008) own research.

Altogether, I have received 87 answers from 89 respondents. On the basis of the results shown, I established that the respondents could not decide whether graduates from the two degree courses would find it difficult to find work, or, given the conditions of the labour market, BSc graduates from the two courses would find themselves in a similar position to other BSc graduates. The results show that it is of fundamental importance for higher education institutions to in-

tegrate the creation and continuous development of the courses designed in the Bologna process into the labour market sphere.

It is interesting to examine the employers' answers to see whether they would support current BSc graduates in their employment if they wished to continue their studies at the Masters level, or whether they are satisfied with the BSc, and also to see whether they would support employees who wanted to turn a further education college qualification into a BSc degree. Following the concept of life long education, those respondents supporting employees converting a BSc into a Masters' degree and turning a further education college qualification into a BSc were more likely to answer that it was difficult to find work with this degree or that it was no more difficult to find work with this degree than with other BSc degrees. Respondents who believed that BSc graduates from the two courses had good chances in the workplace were also supportive of further study and the MSc degree.

On the basis of my results it is clear that there is a greater need to integrate the various actors in the labour market into the development of the course systems in higher education institutions, in order to increase the graduates' chances to find work.

Employers were involved in and consulted on the nature of the syllabus for the environmental management agricultural engineers and environmental protection engineers during the accreditation period. My hypothesis is that the teaching of these subjects is justified, although of course continuous development is necessary both for the general and the specialist programme.

I examined the answers on the questionnaires to see what opinions were held concerning elements of the courses which did not teach specialist knowledge, and how important they considered the teaching of individual subjects. Of the courses studied, accounting and finance, marketing, general and specialist law, and company economics all featured in the syllabuses of both basic courses. I established that the employers expect potential employees with a BSc degree to be familiar with the subjects taught. I analysed the employers' opinions regarding each of the different specialist courses. Those on the environmental management

agricultural engineer course can choose between three groups of subjects on the syllabus: environmental, settlement management, and waste management. The employers questioned agreed that those starting their careers must be familiar with the subjects offered on the course. I carried out a similar analysis with the most important specialist subjects offered to the environmental protection engineers. On the basis of the answers given I established that the specialist subjects on the course were important for enabling environmental protection engineers starting their careers to find a job. The results are primarily due to the fact that during the course accreditation process the course directors reached agreement with the labour market representatives. At the same time I must point out that my evaluation is in some respects hypothetical. Students graduating with a new degree from the two courses could not meet with employers, who were thus not familiar with their abilities, skills, specialist knowledge and experience. The first students on the course started their studies in the 2006/2007 academic year, I made my analysis in 2007, 2008. However the answers can be considered as guidelines for the future considering the long years of experience with the traditional course system.

My hypothesis is that the employment-related expectations of the environmental management agricultural engineer and environmental protection engineer courses can be met by a continuous review of the courses and by agreement with employers.

One of the bases of satisfying employment-related expectations is if the graduate already has practical work experience (*Figure 3*).

On the basis of figure 3, the employers (62 respondents, 69%) are happy if their employees have practical experience in a work-related field. However 24% (12 respondents) believe that candidates can be employed without practical experience, and can acquire experience on the job.

I examined whether the candidate's job chances are reduced if he/she has practical experience in a field of work unrelated to the course. 93% (83 respondents) of respondents (89) felt that these candidates were suitable. 55% (49 respondents from 89) however believed that to compensate for the lack of practical

experience the candidate must have the necessary skills and abilities for that area of work. These can all help to build the direction of the employee’s future development and his/her later success.

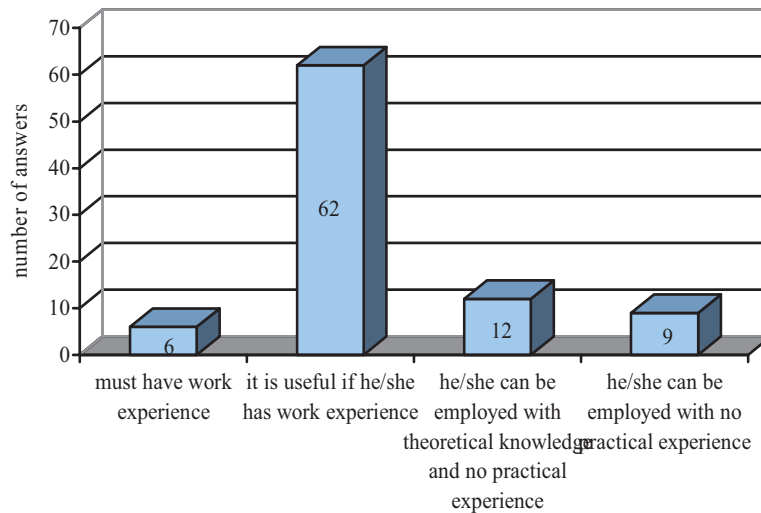


Figure 3

Expectations of employers concerning the specialist practical experience of those beginning their careers.

Source: By questionnaires (2008) own research.

I also sought to answer the question of whether employers are ready to work together with higher education institutions on the theoretical course, the practical course, or on both courses. The co-operation would extend to supporting the specialist skills appropriate to the field of work. For the theoretical course 20% (18 respondents from 89) indicated they would not be willing to co-operate with higher education institutes in this respect. For the practical course the number was 18% (16 respondents from 89).

According to my results, actors in the labour market would be willing to co-operate on the theoretical course in all three stages of the course (further education diploma, first degree and Master’s degree). As regards co-operation on the practical course, I analysed in what form employers would wish to co-operate with higher education institutions (*Figure 4*). 4 of respondents didn’t answer this question.

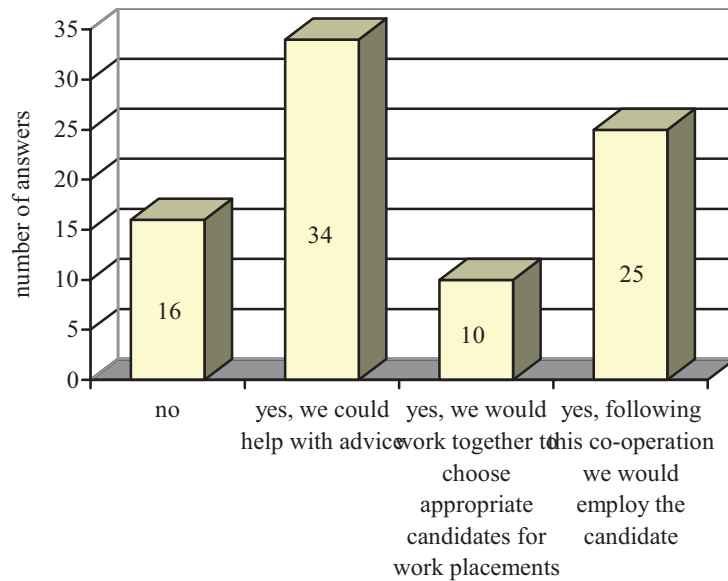


Figure 4

Do employers wish to co-operate with higher education institutions on the practical course? If so, in what form?

Source: By questionnaires (2008) own research.

The results obtained could be decisive for the seventh, practical semester of the BSc first degree course.

In summary it is clear that the employers believe it is important to employ graduates with practical experience. In order to achieve this it would be helpful to harmonise the expectations of employers with the theoretical and practical programmes of the courses at each course stage.

According to my hypothesis the business sector considers the specialist knowledge of environmental management agricultural engineers and environmental protection engineers to be appropriate, although in continual need of development

For the questionnaire I designed a framework for the evaluation of the specialist knowledge and competences of students graduating from these courses based on the specialist literature, including certain abilities and skills based on employers' judgement of how important they are in a given working environment. I established that knowledge of languages (61 respondents, 68%), computer skills (77 respondents, 86%) and knowledge of grant application procedures (59 respondents, 66%) were of exceptional importance. In terms of the skills expected of starting graduates

the most important were the ability to solve problems independently (51 respondents, 57%), and the readiness to work in teams (53 respondents, 59%).

Employers completing the questionnaire established what was expected of graduates with a BSc degree on the basis of the environmental management agricultural engineers and environmental protection engineers graduating from the traditional course system. They were not completely confident about expressing their opinions about the job chances of graduates from the two BSc courses. This may be due to their limited experience of the courses. They emphasised the importance in business life of the subjects taught on the course, and the abilities and skills I had described. However in view of changing requirements, all of this must be continually reviewed; firstly the expected competencies must be emphasised, and the range of subjects taught must be adapted to them.

3.2. Competence profiles and validation

Having determined competence profiles of the two BSc courses, I prepared the modular structure for the two basic BSc courses. I have linked the modular structure of the BSc courses to the modular structure of the OKJ (National Qualifications Programmes) prepared for the waste management and the specialist further education medicinal herb and spice producer and processor post-secondary courses to ensure the possibility of transfer between the two courses and their mutually supporting structure. Following this, in the interests of continuously harmonising the expectations relating to the competences and the expectations of the labour market, and also of ensuring that graduating students can find work, the task profiles of the specialist module requirements were evaluated by educational and labour experts according to the importance, frequency and complexity of the tasks performed by graduates.

3.2.1. The formation of task and characteristic profiles

Competence profiles cover both task and characteristic profiles. According to the definition established by the National Specialist and Adult Education Institute the task profile covers those tasks linked to the individual employee which can be car-

ried out without particular difficulty by those just entering the workplace following their attainment of a specialist qualification. While formulating the specialist requirements of the basic BSc courses I took into consideration the waste management technician, and the medicinal and herb producer and processor technician further education courses, as sub-modules of the agricultural technician specialist course, and thus designed the task profiles of the BSc courses. During the formulation of the task profile I examined the labour market situation relevant to the course, the level of the course, the duration of the course, and its division into different modules. The profile of characteristics describes the expected specialist knowledge, the suitability of the prospective employee to carry out workplace tasks and the personal characteristics which include the specialist knowledge, abilities, skills, attitudes and social and individual competences. Personal competences are also related to physical, physiological and psychological characteristics. Social competences are made up of co-operation, communication and conflict management skills. The methodological competences include thinking, problem-solving, method of working and working style skills.

The development of a modular system creates a system of output requirements which are independent of the way the course is taught. To evaluate the course requirement modules of the two specialised BSc courses I studied the specialist modules in the task and characteristic profiles of the two further education specialist courses.

I designated the further education specialist courses according to the code numbers used by the OKJ. In the case of the BSc courses I supplemented the codes used by the OKJ with individual codes, KG and TV, of the two courses, and by HG and GY of the two further education specialist courses. Considering the meaning of the codes, for example the specialist requirement module corresponding to the TVKG 30-08 requirement module consists of the task and characteristic profiles which both an environmental protection engineer and an environmental management agricultural engineer BSc graduate would find helpful in their search for work. This is indicated by the code: TVKG. The numerical code

individually acquired in the case of this requirement module does not refer to either of the further education specialist courses.

The waste management technician further education course is made up of five requirement modules (*Figure 5*):

- 2288-06: familiarity with basic tasks;
- 2293-06: waste management -;
- 2294-06: management of community waste -;
- 2295-06: management of agricultural waste -;
- 2296-06: management of industrial waste.

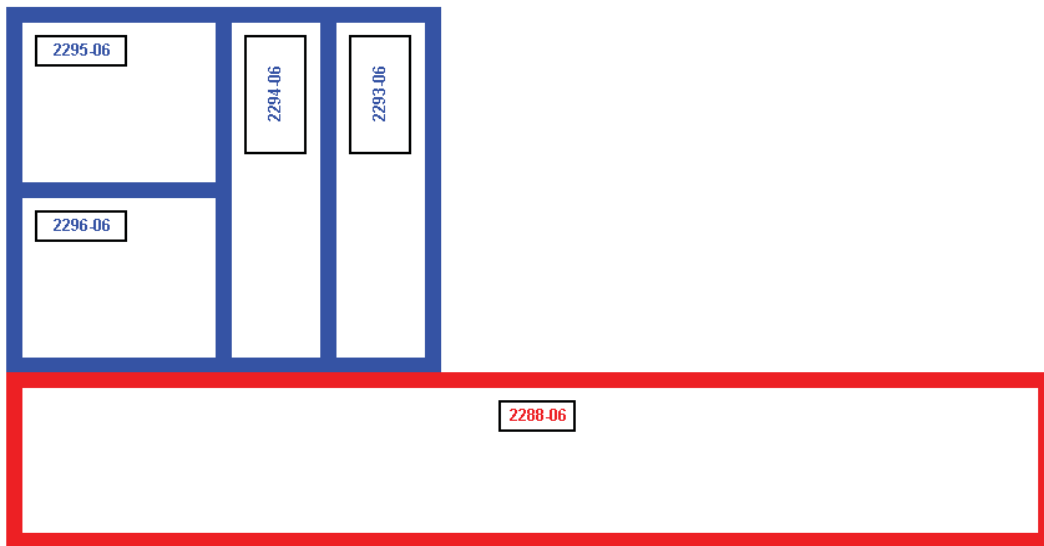


Figure 5

Modular Structure for the Waste Management Technician Course

Source: own research.

The herb and spice producer and processor further education course is made up of three requirement modules (*Figure 6*):

- 2288-06: familiarity with basic tasks;
- 2291-06: herb and spice production;
- 2292-06: herb and spice processing.

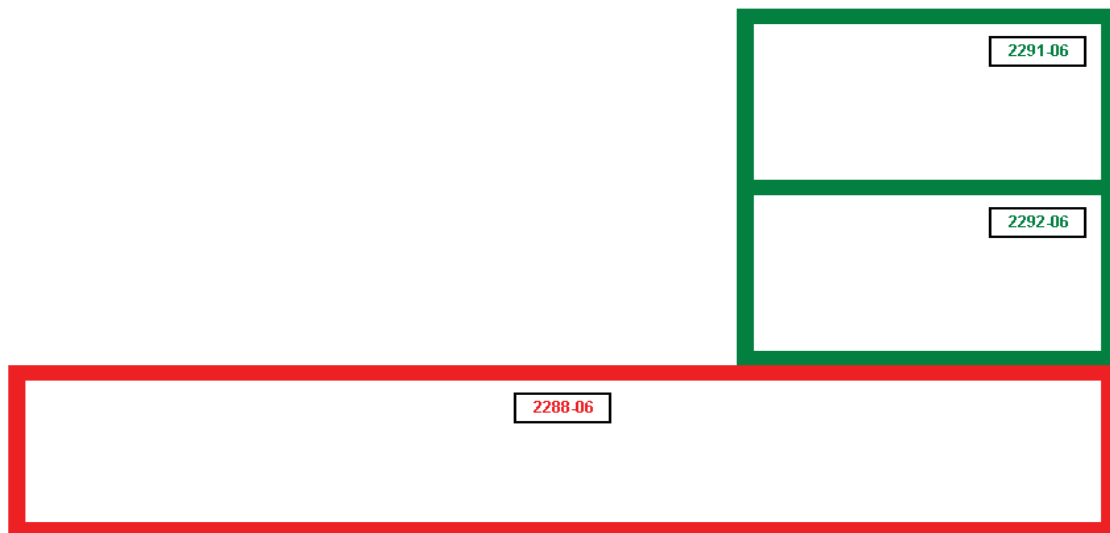


Figure 6

Modular Structure of the Herb and Spice Production and Processing Course

Source: own research.

According to the structure of the two further education specialised courses, the common ‘familiarity with basic tasks’ module is used as a starting point for the specialist modules of the two courses. I prepared the modular structure of the environmental management agricultural engineer BSc course on the basis of the waste management technician further education course modular system. This includes the ‘familiarity with basic tasks module’, the waste management technician, the food industry waste management, community waste management and waste management modules common to the environmental management agricultural engineer course. The task module for environmental management is built up on the tasks listed above. On the basis of the ‘familiarity with basic tasks’ module I developed the environmental protection and environmental management module which is common to both the environmental management agricultural engineer and the environmental protection engineer BSc courses.

The environmental management agricultural engineer course is made up of six requirement modules (*Figure 7*):

- DE OKJ 2288-06: familiarity with basic tasks (contains 30 work task competence profiles);

- DEHG-KG OKJ 2293-06: waste management – (contains 59 work task competence profiles);
- DEHG-KG OKJ 2294-06: communal waste management – (contains 6 work task competence profiles);
- DEHG-KG 2295-2296-06: environmental management agricultural engineer agricultural and food industry waste management – (contains 9 work task competence profiles);
- DETV-KG 30-08: environmental protection – environmental management – (contains 35 work task competence profiles);
- DEKG 32-08: environmental management tasks (contains 75 work task competence profiles).

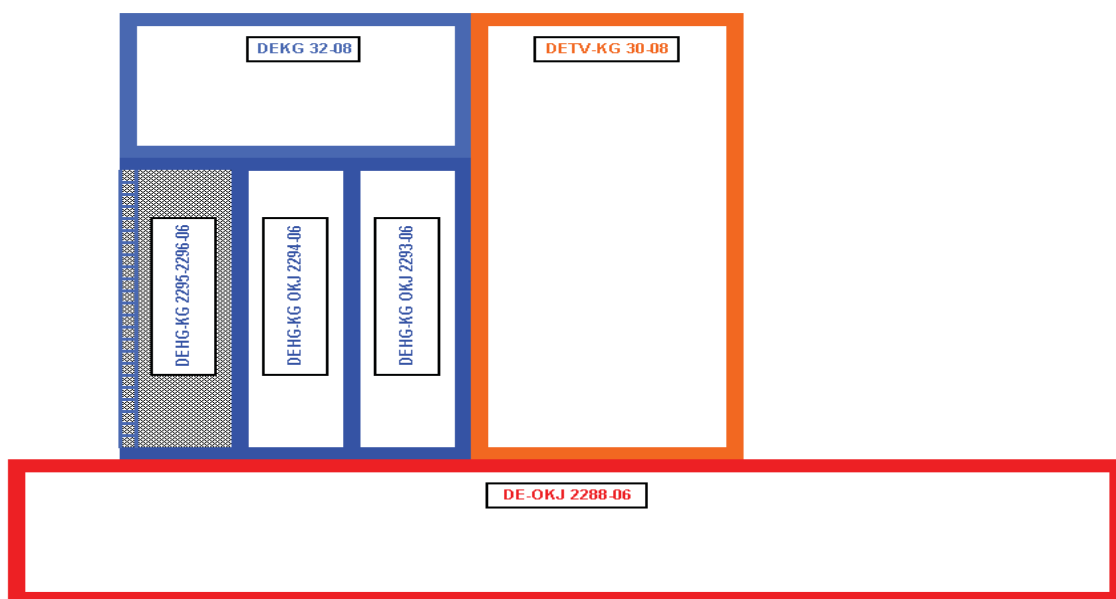


Figure 7

Modular Structure of the Environmental Management Agricultural Engineer Course

Source: own research.

The modular structure of the environmental protection engineer course is based on the descriptions of the environmental management agricultural engineer BSc course. It includes the ‘familiarity with basic tasks’ module common to the

waste management technician course, the medicinal herb and spice producer and processor technician course and the environmental management agricultural engineer course, on which is built the environmental protection – environmental management tasks module common to the environmental management agricultural engineer BSc course, and the medicinal herb and spice producer and processor tasks module and the environmental protection tasks module common to the medicinal herb and spice producer and developer course.

The Environmental Protection Engineer course is made up of four requirement modules (*Figure 8*):

- DE OKJ 2288-06: familiarity with basic tasks (contains 30 work task competence profiles);
- DEGY-TV 2291-2292-06: environmental protection engineer medicinal herb and spice producer and processor – (contains 35 work task competence profiles);
- DETV-KG 30-08: environmental protection and environmental management – (contains 35 work task competence profiles);
- DETV 31-08: environmental protection tasks (contains 89 work task competence profiles).

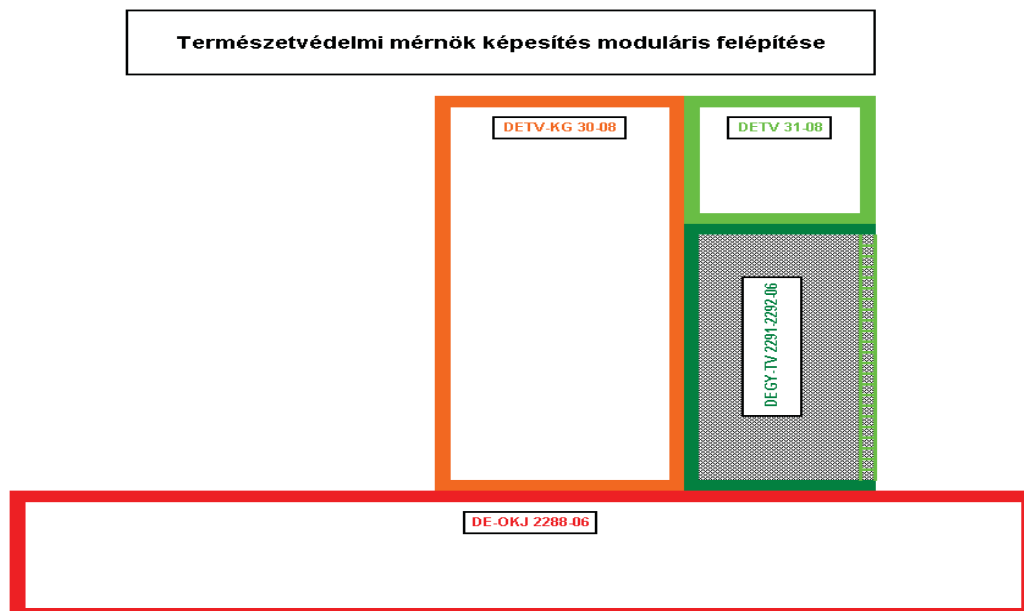


Figure 8

Modular Structure of the Environmental Protection Engineer Course

Source: own research.

In Figure 9 I show the combined modular structure of the waste management technician, environmental protection agricultural engineer, the medicinal herb and spice producer and processor and the environmental protection engineer courses, which exemplifies very well the way the two further education courses and the two BSc courses are integrated and how it is possible to move from one course to the other.

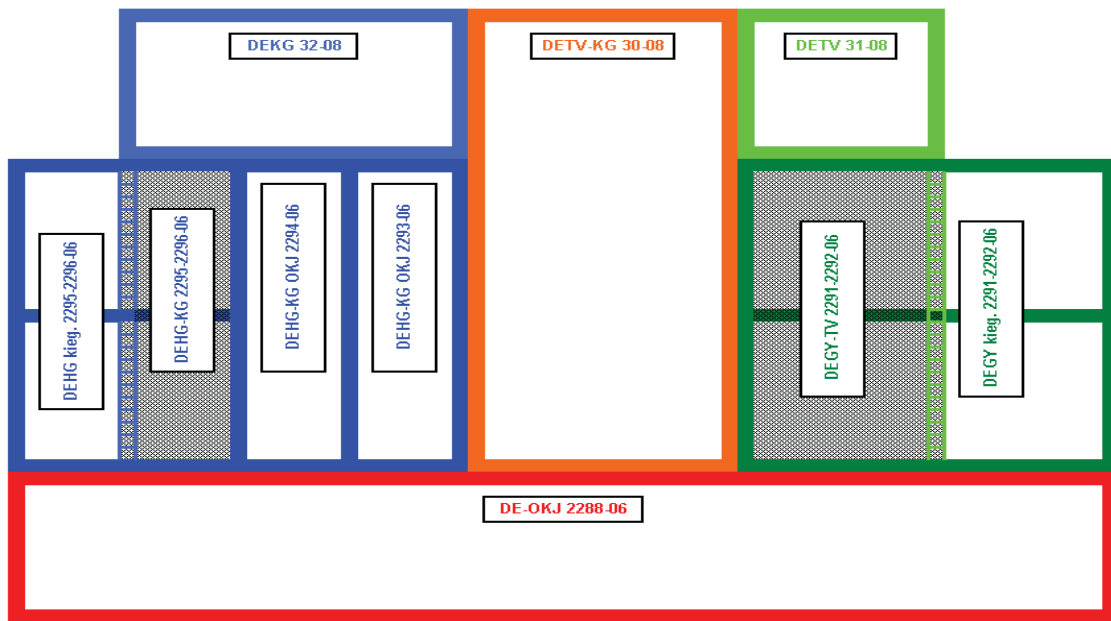


Figure 9

The combined modular structure of the Waste Management Technician, Environmental Protection Agricultural Engineer, the Medicinal Herb and Spice Producer and Processor and the Environmental Protection Engineer courses

Source: own research.

3.2.2. Preparing the validation

Work task competence profiles of the the two BSc courses were evaluated by educational and labour market experts with the help of validation table (Table 1).

There were 27 returned and processed evaluation sheets relating to the environmental management agricultural engineer course, and 31 for the environmental protection engineer course. During the validation process, the respondent evaluates the gradu-

ate’s work-related task on an ordinal scale of importance from 1 to 5. The frequency scale varies from *never*, through *very rarely*, *monthly*, *weekly*, *daily*, to *continuously*. The third evaluation point refers to the complexity of the task, ranging from *simple*, through *difficult*, to *complex*. I entered the completed tables into the SPSS system and prepared tables to display the results obtained.

Importance of the work task		Frequency with which the task is carried out					Complexity of the task																	
Name of work task profile	Null	Not important				Very Important	Never	Very rarely	Monthly	Weekly	Daily	Continuously	Simple					Difficult, complicated						
		1	2	3	4								5	0	1	2	3	4	5	0	1	2	3	4
1	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5	0	1	2	3	4	5

Table 1

Validation table for educational and labour market experts

Source: own research.

I examined to what extent the environmental management agricultural engineer and the environmental protection engineer BSc courses fulfilled the expectations of social and economic life.

The environmental management agricultural engineer course can be divided into six modules. I give a detailed demonstration of the evaluation of the task competences of the requirement modules in the thesis. Here I will introduce the evaluation of the task competences of the environmental management tasks modules.

The basic tasks for the environmental management required module include 75 task competences. Looking at the task competences, it is noticeable that 82% of the experts believe that establishing the internal and external value qualities of crops to be a less important task and 81% believe the same about conducting measurements of plant yields. Most of the task competencies of the required module include important activities, although the experts found it difficult to judge the importance of many of these activities, such as installation and operation of irrigation systems, and surveying diseases of and damage to plants. From the point of view of tasks consid-

ered important in terms of frequency, those ‘continually carried out’ include supervising the respecting of laws relating to environmental protection (68%), and maintaining links with authorities (63%). Other activities in the required module which were believed to be less frequent were planning nutrition and nutrition programmes and examining plant productivity (Figure 10).

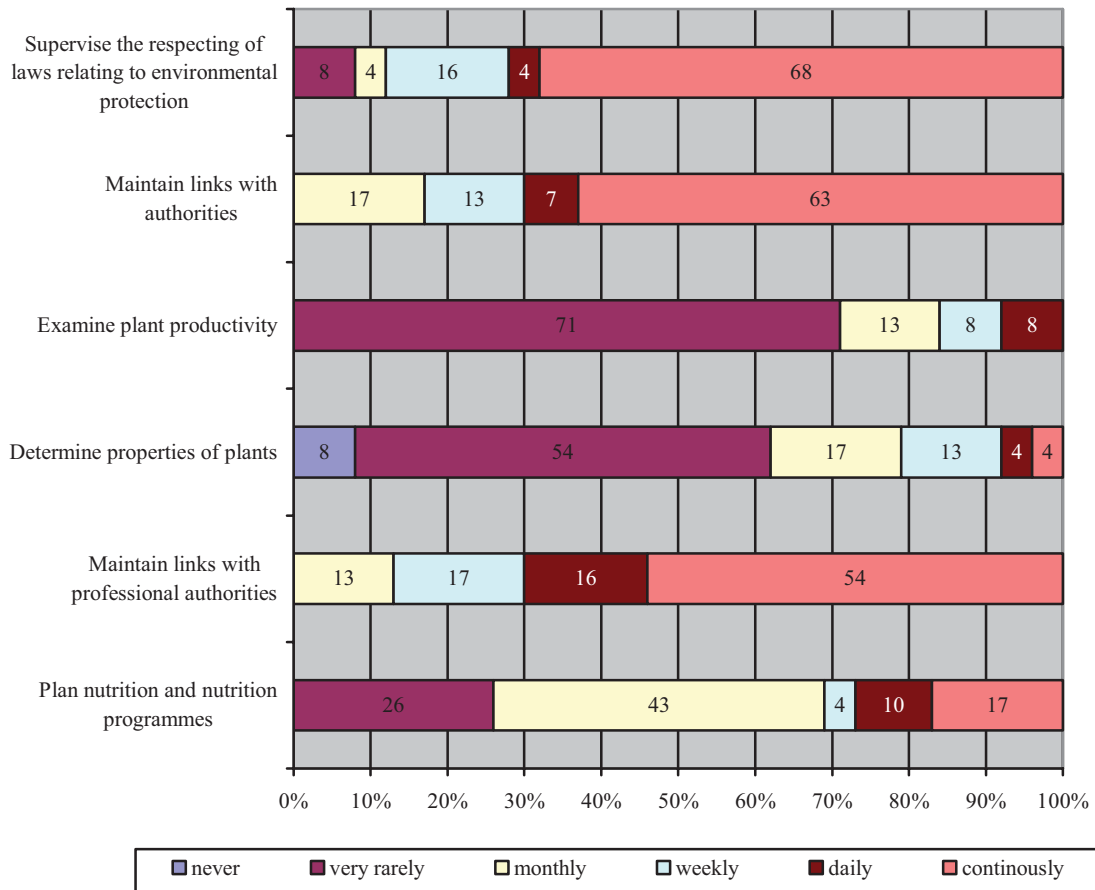


Figure 10.

Evaluation of some work task competence profile of the environmental management module of the environmental management agricultural engineer BSc course from the point of view of importance

Source: Validation, own research.

Examining the complexity of the environmental manager tasks it is clear that the experts evaluated the specialist tasks listed in the required module, such as organising and directing procedures against erosion and deflation and carrying out environmental toxicology tests as difficult and complex. Among the task

competences that were considered important, tasks such as providing information relating to permission to use water sources were considered simple. In many task competences the evaluators could not decide on the complexity of the task; these included planning nutrition and nutrition programmes and establishing irrigation needs and planning irrigation services (11).

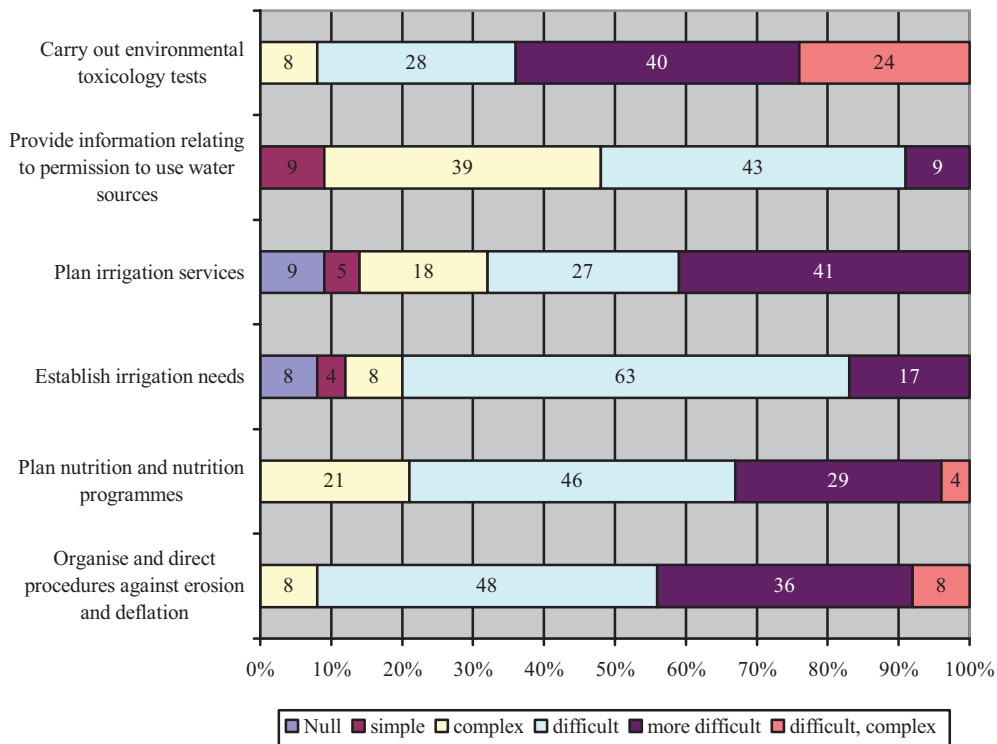


Figure 11.

Evaluation of some work task competence profile of the environmental management module of the environmental management agricultural engineer BSc course from the point of view of complexity

Source: Validation, own research.

While examining the environmental protection engineer BSc course I identified four course requirement modules. I analysed the contents of these modules just as I had for the environmental management agricultural engineer BSc course. Among the basic course required modules here I will introduce the environmental protection module.

The required module of the basic course environmental protection module includes 89 task competences. While evaluating the importance of the task competences of the required module the quality experts considered the following activities important, among others: identifying and evaluating fauna (93%), co-operation with hunting authorities and hunting groups (93%), and gathering and analysing ecology data (96%). Identifying rocks and minerals were not necessarily essential activities for newly employed BSc graduates. However they could not decide unambiguously on the importance of or the need for a significant number of the task competences of the required module (Figure 12).

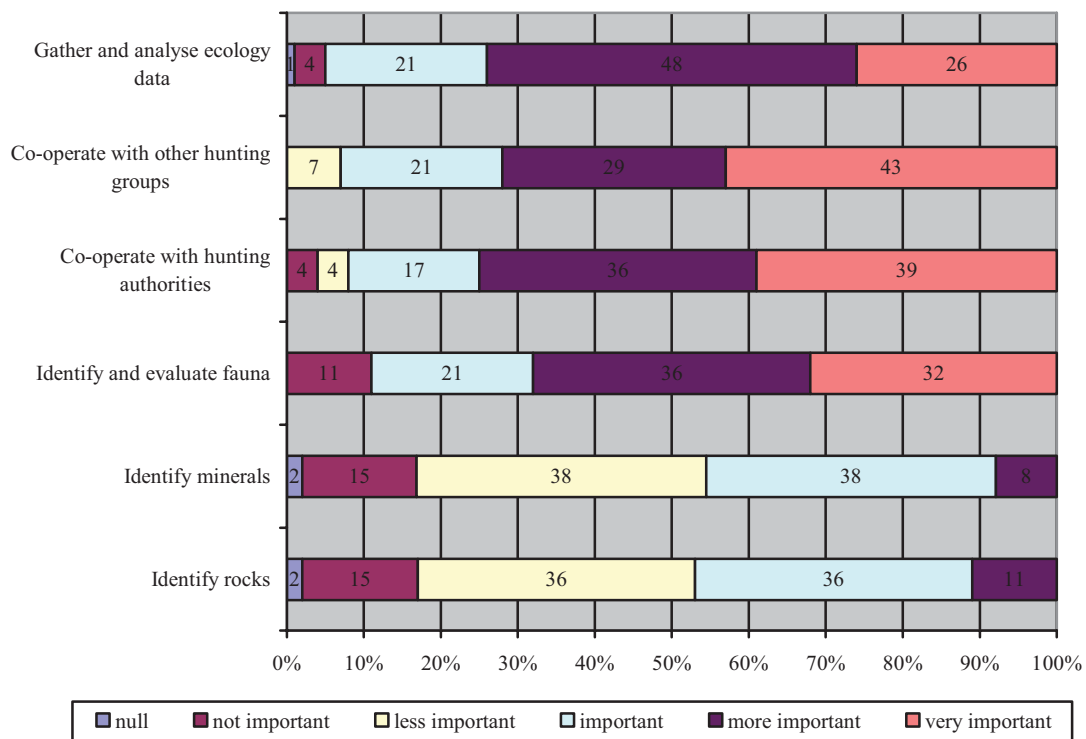


Figure 12.

Evaluation of some work task competence profile of the basic course environmental protection module of the environmental protection engineer BSc course from the point of view of importance

Source: Validation, own research.

Considering the frequency of the environmental protection tasks, those which are carried out continually include co-operation with hunting authorities (according to 54% of experts) and respecting ethical norms when photographing (63%). The majority of

the listed tasks are carried out very rarely or only monthly by environmental protection engineer graduates starting their careers. It is clear that the majority of those task competences listed in the required modules cover mainly difficult, or complex, tasks which must be completed by newly employed graduates. Summarising the evaluation of the task competences only three of the 89 were considered simple: preparing notes and minutes, and updating informational tables (according to 89-93% of experts) for employees with environmental protection degrees.

It is clear from a comparative analysis of all the results that task competences identified in the individual modules during the modularisation of the environmental management agricultural engineer and the environmental protection engineer BSc courses were accepted by both labour market and educational experts, who considered the subjects taught in the course syllabus useful. The BSc courses meet the requirements of economic and social life and the knowledge gained during the courses fits the expectations of the labour market. Institutes of higher education must, in the future, place great emphasis on following the regularly changing demands of the developing and changing economic sphere in relation to higher education, and ensure that, as far as possible, they continually strive to fulfil the expectations placed upon them.

4. NEW SCIENTIFIC RESULTS FROM THE EVALUATION

1. Following the linear course system of the Bologna process, I prepared an integrated modular system made up of 15 modules which can guarantee transference between the specialist agricultural technician waste management technician, and medicinal herb and spice producer and processor technician specialised further education courses which are part of the agricultural technician specialism, and the environmental management and environmental protection sections of the environmental management agricultural engineer and environmental protection engineer BSc courses which are part of the agricultural sciences specialism. The cohesion of the integrated modules produces the abilities and skills which together appear in the specialised work competences of the employee in this sector.

2. I prepared the full task and characteristic profile for the two BSc courses under investigation. The task profile was submitted for validation. For the validation examination I prepared a data input process which made it possible to analyse comparatively the significance, frequency and complexity of the given task competences.
3. The range of subjects taught in the BSc courses under examination was agreed on with employers during the process of creating the courses, and thus the subjects were provided with a firm base, although it is necessary to develop both the general and the specialist subjects continually bearing in mind the demands of the labour market. Using scientific methodology I analysed the expectations of the business sector in relation to graduates from the two basic agricultural science courses. I also compared these expectations with the competence structure of the courses' training and output requirements, which made it possible to harmonise more accurately the expectations and the course competences.
4. Satisfying the workplace expectations – mainly of a practical nature – relating to graduates from the environmental management agricultural engineer and the environmental protection engineer courses, can be achieved by a continuous process of course review. In order to make this a reality the employers questioned indicated their willingness to co-operate with higher education institutions regarding the course programmes. On the basis of the results it is evident that employers in all cases expect newly employed graduates to have practical experience related to their specialisation.
5. My study proved that language skills, familiarity with computers and with grant application procedures are all skills expected from students on the two courses, and are also judged to be important by the labour market. Among the skills required of new graduates are independent problem solving, a readiness to work in teams and a sophisticated, creative, environmentally aware approach.
6. On the basis of the Bologna process I established the optimal time period for BSc course syllabus review, depending on the length of the course and the expectations of the business sector. The length of the specialist elements making up the basic BSc courses, and – following the course – the process of securing a job,

mean that the programme needs to be reviewed every 3-4 years. In all of this it is exceptionally important to harmonise the sustainability of the higher education course system and the human resource demands of the labour market.

5. THE PRACTICAL APPLICABILITY OF THE RESULTS

From the changes in the course programmes of the higher education institutions it is noticeable that individual skills, abilities and developable areas of knowledge have an increasingly important role in the course and outcome requirements. In the labour market the quality of human resources is decided by the qualification, the knowledge of languages, the specialist experience and also by the competences which the employee possesses or can develop. For this reason it is important to strive towards a harmonisation of the expectations established in the course and outcome requirements with the labour market expectations as formulated in the workforce competences. My work convinces me that in order to realise the higher education reforms the above principles must be regarded as essential objectives.

The course system introduced as a result of the Bologna agreements will be able to fulfil the requirements laid down by social and economic life if and when economic actors can be brought into the development process and when the content elements of the course programmes are adapted to important aspects of the labour force, to ensure that graduates possess competences and suitability for employment. All of this requires a course system in which the cohesion of the content of the integrated modules is able to produce the abilities, skills and practical experience which together make up the specialist competences required in the workplace.

The analysis I carried out in order to achieve the goals described above proved the thesis that labour market actors were not sufficiently informed about the changes introduced into higher education institutions as a result of the Bologna process, nor about the concepts related to the development of the education systems in those in-

stitutions. Despite the fact that during the accreditation process employers agreed on the choice of the subjects taught on the courses under examination, now both the general and the specialist subjects are in need of review and rethinking. Considering the future it seems acceptable that the expectations relating to the work experience of graduates on the engineers' courses under examination can be met by a continuous process of review.

In order to sustain a higher education course system appropriate to the Bologna process it is exceptionally important to harmonise and review the human resource demands of the labour market and the specialist competences in a 3-4 year cycle linked to the length of the course. The research results described in my thesis provide new insights for practical and theoretical educational experts and participants and experts in the labour market, insights which can be applied on both a theoretical and practical level. In terms of the practical applicability of my research results, publication of the evaluation of the course and workplace expectations can be useful for students in higher education, while they can be considered career-related documentation for the establishment of personal development paths in the context of life-long learning. For teachers the research can help the optimisation of planned student- and labour market oriented syllabus development tasks. Courses to train employees, in this case involving development of the course contents and expectations, can act as a guideline for higher education institutions, and, for higher education institutions with a similar profile, can act as a methodological guide for the establishment of a quality control system. Employers – in relation to employees graduating from higher education institutions – act as initiators in the creation of individual workplaces, and of the concepts related to the workplace expectations.

My analysis demonstrated that the matching of course content to employers' expectations and the cross-checking of this match can be achieved through continuous development and regular communication between the parties involved.

5. LIST OF THE PUBLICATIONS IN FIELDS RELATED TO THE CANDIDATE'S THESIS TOGETHER WITH FULL DETAILS OF THEIR AUTHORS

Tudományos közlemény idegen nyelvű, hazai, lektorált folyóiratban:

- **Mocsáriné Fricz, J.** – Juhász, Cs. – Kátai, J. – Tamás, J.: 2008. Examination of competences in bachelor courses based on the Bologna process. [In: Tamás J. – Csépi N.I. – Jávor A. (eds.) Natural resources and sustainable development.] Acta Agraria Debreceniensis. Supplement. 51–55. ISSN 1588-8363.
- Juhász, Cs. – **Mocsáriné Fricz, J.** – Tamás, J. – Kátai, J.: 2008. Economic challenges and adequacy of the academic solutions – case study based on competences of agri-environmental engineering BSc. [In: Tamás J. – Csépi N.I. – Jávor A. (eds.) Natural resources and sustainable development.] Acta Agraria Debreceniensis. Supplement. 43–45. ISSN 1588-8363.

Tudományos közlemény magyar nyelvű, lektorált folyóiratban:

- Mocsáriné Fricz, J.: 2009. A gazdasági szereplők elvárásainak vizsgálata a környezetgazdálkodási agrármérnök és a természetvédelmi mérnöki BSc szakokon végzettek kompetenciáiról. Acta Agraria Debreceniensis. 35. 81-87. ISSN 1587-1282.
- **Mocsáriné Fricz, J.** – Juhász, Cs.: 2009. A környezetgazdálkodási agrármérnöki BSc alapképzési szak kompetenciaprofiljának értékelése. Acta Agraria Debreceniensis. (a folyóirat által elfogadott)

Idegen nyelvű lektorált konferencia kiadvány:

- Mocsáriné Fricz, J.: 2008. Comparative study of the BSc engineering courses – Institutional and Financial suitabilities of the academic human resource. [In: Tamás J. – Csépi N.I. – Jávor, A. (eds.) International Symposium on Risk factors for environment and food safety.] Oradea, Romania. 235-240. ISSN 1583-4301.
- **Mocsáriné Fricz, J.** – Juhász, Cs. – Tamás, J.: 2009. Expectation of the society on Bologna process in case of Water Management MSc training. [In: Tamás, J. (ed.) Guidelines for the Development of European Compatible MSc Programmes based on the Bologna process in Egypt. ISBN 978-963-9732-84-41.

- **Mocsáriné Fricz, J.** – Juhász, Cs.: 2009. Forming of competence profile of agro-environmental engineering bachelor course. International Symposia Risk Factors for Environment and Food Safety & Natural Resources and Sustainable Development, Faculty of Environmental Protection. Oradea, Romania. 1433-1437. ISSN 1224-6255. 1139-1150.
- **Mocsáriné Fricz, J.** – Hajdú, Z. – Juhász, Cs. – T. B. Wiwczaroski: 2010. Harmonizing (L2/SP) competencies with labour market needs. ESP World. Issue I. (27), Volume 9. 2010. ISSN 1682-3257. [http://www.esp-world](http://www.esp-world.info) <<http://www.esp-world>> .info

Magyar nyelvű lektorált konferencia kiadvány:

- **Mocsáriné Fricz, J.** – Juhász, Cs.: 2009. Munkaerőpiaci elvárások elemzése a környezetgazdálkodási agrármérnök alapszakon (BSc) végzettekkel szemben. „*Globális kihívások, lokális megoldások*” c. konferencia. Kecskeméti Főiskola Kertészeti Főiskolai Kar, 2009. szeptember 3–4. ISBN 978-963-7294-73-0 (a folyóirat által elfogadott)
- Juhász, Cs. – **Mocsáriné Fricz, J.:** 2009. A kompetencia elvű környezetgazdálkodási agrármérnöki BSc alapképzés elemzése. „*Globális kihívások, lokális megoldások*” c. konferencia. Kecskeméti Főiskola Kertészeti Főiskolai Kar, 2009. szeptember 3–4. ISBN 978-963-7294-73-0 (a folyóirat által elfogadott)

Magyar nyelvű könyvrészlet:

- Juhász, Cs. – **Mocsáriné Fricz, J.:** 2009. A környezetgazdálkodás és a természetvédelem regionális szerepkörének erősítése a DE AMTC képzési programjaiban. [In: Baranyi, B. – Nagy, J. (szerk.) Tanulmányok az agrár- és a regionális tudományok köréből az Észak-alföldi régióban.] MTA Regionális Kutatások Központja, Debrecen. 289-308. ISBN 978-963-9899-10-0.

Ismeretterjesztő publikáció:

- Juhász, Cs. – Szöllösi, N. – **Mocsáriné Fricz, J.:** 2008. A környezeti kompetenciáért. [In: Szujó B. (szerk.) Agrárium. Agrár- és Piacgazdaság.] Grafika Press Nyomdaipari Zrt. Budapest. 18. 6-7. ISSN 1215-8380.