Changing educational framework in the transition to new educational standards at Russian universities of life science and their impact on the teaching of statistics

Galina Kamyshova
Saratov State Agrarian University, Saratov, Russia
e-mail: gkamichova@mail.ru

Presented by
Lyman McDonald
Western EcoSystems Technology, Inc.
Laramie, Wyoming, USA
e-mail: lmcdonald@west-inc.com

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Abstract

The reform of higher education in Russia involves changing the key approaches to the formation of educational standards. These changes suggest transition of educational standards, strictly regulating professional curricula to develop National Qualifications Framework and Professional Qualifications Framework. This process, in turn, puts forward new requirements both to the formation of specialties curriculum in general and to the teaching of individual subjects. This paper analyzes the status and development of learning outcomes and competences (level cycle descriptors) of statistical disciplines for life science specialties, in particular in food sciences and agro-ecology, according to the new requirements and standards.

Keywords: learning outcomes, statistical disciplines, descriptors, Qualifications Framework.

Introduction

The questions of developing the conditions and mechanisms that will ensure long-term competitiveness of trained professionals in the world community are at the top of agenda for universities within the period of introduction of global economy into a post-industrial phase and development of social and economic breakthrough in the modern post-industrial society. These conditions necessitated the need for higher education reform in Russia. The previous approach, strictly regulated the knowledge and skills of specialists and is no longer appropriate. That approach in turn strictly regimented the set of disciplines in curriculum.

Development of National Qualifications Framework and on this base Branch Qualifications Frameworks (BQF) was caused by the need to implement strategies for long life learning in view of technological and economic changes in industries, as well as the need to eliminate barriers between industries and institutions that prevent the efficient use of knowledge and competence of industry staff due to the lack of qualifications transparency. Under the National Qualifications Framework of the Russian Federation, we understand the basis of the national qualifications system of the Russian Federation, which is a generalized description of the basic skill levels and how to achieve them in the territory of Russia. In this Branch Qualifications Framework (BQF) - part of the national qualifications system of the Russian Federation, is: General description of the established indicators qualification levels within the industry, recognized by leading organizations in the industry; Hierarchically ordered by qualification levels classification of employment, formed in terms of NRC and other relevant indicators for the industry.

Changing the educational paradigm affects teaching of individual subjects. One of these disciplines is statistics.

Problem

Teaching of statistical disciplines at the Russian universities for non-specialists, that is, non-statisticians, has its own characteristics and problems. In the past decades, the state sought to show successes and achievements by means of statistics while remaining silent on and "masking" the difficulties and shortcomings. On the one hand, social and economic changes in Russia had an impact on the need for information and on experts' need to know modern methods of analysis. On the other hand, economic globalization and internationalization of education make new demands of statistics, as to the universal information language that allows professionals to communicate in

different countries and in different fields of activity. Thus, definition of necessary quantity of statistical courses and their contents in educational programs of specialties becomes the main objective. These courses must meet the changing educational paradigms. Training and competence of future experts in statistical methods should be the focal point.

Results

As it was noted earlier, the reform of higher education in Russia involves changing the key approaches to the development of educational standards. These changes allow educational standards and requirements of professional training programs to be developed in accordance with National Qualification Frameworks and Professional Qualifications Frameworks. This process, in turn, puts forward new requirements both to the formation of specialties curriculum in general and to the teaching of specific subjects.

Let's consider the effect of change in the educational paradigm for teaching statistics, in particular for training experts in food science. We proposed inclusion of statistical disciplines into curricula. Remember, though, that statistics is taught as a part of general course of mathematics in 360 - 600 hours of instruction. Thus, the elements of statistical methods such as: probability theory, random processes, statistical estimation and hypothesis testing, and experimental data processing were taught. Some universities added extra courses on "Basics of scientific research", which gave the elements of applied statistical analysis techniques in disciplines such as Agronomy, Ecology, Food science, etc. However, these courses usually had a small number of training hours and were courses chosen by students, not courses required by the curriculum.

What changes entail orientation of programs on the system of classification? Branch qualification systems substantially connect requirements of employers, public and professional organizations with workers` labor competencies and learning outcomes. They determine the principal approaches to certification of educational programs graduates and staff, as well as educational modules accreditation within the branch qualification system. They promote processes of life long education and professional training using the mechanisms of credit units. Branch Qualification Frameworks contain simple and clear indications of education priority areas, professional training, basic knowledge, skills and competencies necessary for successful work and successful employment in the branch. Branch Qualification Frameworks must allow change according to changing technologies, changing trends in the national labor market, regional and local labor markets. We provide as an example extract from Branch Qualification Frameworks for area of Energy (level 5).

Requirements of branch qualifications frameworks

Performance indicators				**Ways to achieve an appropriate level of qualification**	**Recommended job titles**
breadth of authority and responsibility	**complexity**	**research intensity**	**The nature of knowledge and the manipulation of information**		
Planning, job creation and supervision of the staff of the fourth level Planning activities to attract third-party personnel Harmonization of the regulatory decisions of trained personnel with a higher level	Analysis of the state of technological regimes and conditions of the systems to determine the effectiveness of their operation Implementation of local innovation policy measures	non	Doing set of technical documentation Development and verification of the technical and regulatory documentation Information support of the staff of the fourth and third level	Hands-on experience on the fourth level. Professional training in the presence of a master's degree. Skills development. MBA program.	Head of production Deputy Head of department Head of department The shift manager station The main metrological Deputy Head of Division Project Manager Head of the Department of the training unit Deputy Chief Accountant Division

Russian universities of natural sciences faced the problem of development of Branch Qualification Frameworks together with employers. They then developed specialties curricula considering requirements of the Branch Qualification Frameworks.

Collaboration with employers was accomplished as follows. In the first stage, opportunities for employment of graduates with bachelors and masters degrees, for example, "Food of Animal Origin" degree were revealed. Then was made a list of professional activities and functions which are carried out at the enterprises. Using the received data, questionnaires were formed and filled out to reveal the opinion of employers about the importance of functions, as well as the technical knowledge and skills of employees. As a result of these studies part of the functions have been removed, as not essential to employers. For example function "Development of technology for meat production considering the use of new raw materials, food additives, and advanced equipment and customer requirements" is essential to employees. [Are changes OK? Can you give an example of a function?]

Consider an example of requirements for a bachelor's degree in "Food of Animal Origin". These experts are trained for the following types of professional activity: production and technological, organizational and administrative responsibilities. Possible levels of employment are: senior master, engineer of meat and meat products, junior fellow in technology of meat and meat products, researcher, head of laboratory, production foreman.

The functions realized at enterprises	**Knowledge necessary to perform the functions**	**The skills necessary to perform the functions**	**Competencies**
Development of technology for meat production considering the use of new raw materials, food additives, advanced equipment and customer requirements.	Regulatory and technical documents, rules and regulations of technological process and production safety, and methods of raw materials processing. Metrological principles of instrumental measurements specific to particular field of processing of raw materials of animal origin. Working with information from various sources.	Measure the consumption rate of raw and auxiliary materials in production of animal products and aquatic organisms. Measure, examine, and make descriptions of research results. Prepare data for making reports and scientific publications.	Ability to organize incoming quality control of raw and auxiliary materials, semi-finished industrial control, process parameters and quality control of finished products. Ability to use the regulatory and technical documents, procedures, veterinary regulations in manufacturing process. Ability to justify the consumption rate of raw and auxiliary materials in the production process.

Thus, the chain of: functions - knowledge - skills – competence are considered. To insure certain competencies, courses in various disciplines or blocks of disciplines are defined. Then the specialty curriculum as a whole is formed. The analysis of competences for this specialty in "Food of Animal Origin" allowed inclusion of the following statistical disciplines in the curriculum: probability theory and mathematical statistics, basics of statistical research and statistical methods in food science. At the following stage the Branch Qualification Framework and curriculum for the discipline was developed. All links in the chain of: functions - knowledge - skills – competence are coordinated with employers once again.

Conclusions

This work is only the beginning of implementation of modern requirements for statistical training due to changes in the Russian educational paradigm. We carried out a "pilot" work on introduction of statistical disciplines into specialties curricula for food sciences and agro-ecology. First, we need to work together with expert statistical community to assess the wisdom of introduction of the selected statistical disciplines. Second, the work on clear

definition of the content of these statistical disciplines is only begun. It is important to give that set of learning outcomes in the disciplines that will "cover" the expert skill to full extent. And third, the complete set of methodological ensuring for statistical disciplines should be developed. We mean books on statistic for specialists in different areas.

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