



SOME PRINCIPLES OF ASSURING THE QUALITY OF COMPETENCY-BASED PROFESSIONAL TRAINING OF BACHELORS IN AGRICULTURAL ENGINEERING

Olexander Domin

Candidate of Pedagogical Sciences (Ph.D), Associate Professor of Transport Technologies and Facilities of Agriculture, National University of Bioresources and Nature Management of Ukraine
<https://orcid.org/0000-0002-3907-0992>. e-mail: demin31@gmail.com

Abstract

Relevance: the need to comply with pedagogical principles in ensuring quality control of competency-oriented professional training of Bachelors in agricultural engineering.

Aim: research of peculiarities of observance of pedagogical principles in the process of competence-oriented quality control of professional training of future Bachelors of the specialty "Agroengineering".

Methods: theoretical (analysis, synthesis, comparison, generalization; modeling); empirical (praximetric (study and analysis of pedagogical experience, educational standards, curricula, work programmes for future Bachelors of the specialty "Agroengineering" and the results of their activities); questionnaire-diagnostic (testing, conversation, discussion).

Results: The analysis of observance of pedagogical principles in the course of ensuring quality control of professional agroengineering preparation is carried out. It has been found that, for a long time, both in domestic higher education, in general, and, in the process of professional training of agricultural engineers, in particular, the quality of this training was determined by the full formation of graduates' knowledge, skills and abilities in accordance with the qualification rules within separate disciplines. Due to insufficient study of the competence orientation of professional training, we have conducted a study of the peculiarities of the adherence to the pedagogical principles of quality control of professional competencies as a basis of professional excellence on the example of Bachelors in the specialty "Agroengineering" as a basic engineering training for domestic agriculture.

Conclusions: it is theoretically proved that the competence orientation of professional training of Bachelors in agricultural engineering (while ensuring quality control) contributes its specifics to the process of compliance with pedagogical principles. To comply with these mentioned principles of control, it is advisable to carry out the following additional measures: 1) diagnosis of students' initial professional training before studying the profiling disciplines; 2) the division of professional knowledge and skills in each discipline into blocks that are part of the content of the particular competence; 3) systematic control over the formation of these blocks; 4) combining all blocks of knowledge and skills of different disciplines within the relevant competencies.

Keywords: *quality control of professional training, Bachelor in agroengineering, formation of professional competencies, agriculture, pedagogical principles.*

Introduction. The focus on competence in higher educational institutions of Ukraine is becoming increasingly important in connection with the gradual change of the paradigm of domestic education from knowledge to competence. This trend highlights the problem of complete use of professional competencies

as a basis for quality control of training of future professionals. Taken into account the radical changes and the relentless development of domestic agriculture, in our opinion, this problem becomes especially relevant when checking the quality of training of future Bachelors majoring in speciality 208 "Agro-

engineering". The agricultural sector has recently been considered strategic for Ukraine, as it provides more than 40% of its gold and foreign exchange reserves. The efficiency of the industry mainly depends on the quality of professional training of agricultural specialists, in particular, Bachelors in agricultural engineering. Therefore, the quality of formation of their professional competencies in higher educational institution of the agricultural profile is of significant national importance.

Materials. Quality control of the results of professional training is a necessary and very important part of the management of students' educational activities. This is confirmed in the works of many famous scientists of the past and present (A. Alekseyuk, J. Bolyubash, V. Zhupavsky, M. Zgupovsky, G. Yelnikova, L. Kolodkina, K. Kondratiev, V. Koptyug, V. Kremen, O. Kuznetsov, A. Makapenko, D. Medouz, N. Nichkalo, C. Nikolaenko, A. Pokopenko, V. Palamapchuk, V. Radkevich, G. Romanova, G. Tsekmistepov and others). In particular, profound scientific works of P. Luzan, V. Manko, O. Koshuk, V. Duganets are devoted to the quality control of professional training of agricultural engineers.

According to the results of the review of theoretical scientific achievements, we have determined that there are different interpretations of the concepts of "quality of specialist training" and "quality of specialist". Thus, A. Suslov (2005, p. 58) mentions that the "quality of a specialist" means "a set of his/her properties that allow to do qualified professional work timely in accordance with the requirements of the specialty, take an active civil position, constantly improve skills and, if necessary, change the profession on time".

P. Kanivets (2004, p.231) defines the concept of "specialist quality" as "a set of essential properties and characteristics, the level of which is formed in the process of educational activities and must meet the requirements of consumers".

T. Medvedovska (2013) formulates this definition, similarly, but more meaningfully. She characterizes the quality of specialist training as "a set of properties, qualities, abilities, skills and characteristics of the specialist, the level of which is formed in the course of educational activities in higher educational institution and must meet the requirements of consumers (society, labor market, employers, the individual).

The article aims to study the peculiarities of observance of pedagogical principles in the process of competence-oriented quality control of professional training of future Bachelors of the specialty "Agroengineering".

Methods: theoretical (analysis, synthesis, comparison, generalization; modeling); empirical (praximetric (study and analysis of pedagogical

experience, educational standards, curricula, work programs for future Bachelors of the specialty "Agroengineering" and the results of their activities); questionnaire-diagnostic (testing, conversation, discussion).

Results and discussion. The need for reform in the field of quality control in higher education in Ukraine has long been overdue. Some higher educational institutions have even set up special departments to check the quality of training of their specialists independently. And only on September 6, 2014, the Law of Ukraine "On Higher Education" came into force, which provided for the establishment of the National Agency for Quality Assurance in Higher Education (NAQAHE).

P. Luzan, V. Manko and G. Podpryatov substantiated the multifaceted control of professional training of graduates of agricultural higher educational institutions quite successfully and fully. Preferring the training of specialists in agricultural mechanization, scientists emphasize that "control measures allow teachers to obtain data on the results of their work, make adjustments to teaching methods timely, and introduce students to the awareness of the requirements for the level and quality of knowledge, skills and abilities" (Podpryatov, Manko and Luzan, 2003, p. 312). Let's consider these aspects through the prism of focus on special competencies as the main components of professional training of agricultural engineers.

In the scientific and pedagogical literature and various documents, in particular, in educational standards, the words "special" and "vocational" competencies are often used as a synonym for the term "professional". Quality control of professional training of future Bachelors in agricultural engineering should be carried out in accordance with general and special competencies, formulated in the standard of education for Education Degree "Bachelor" in specialty 208 "Agroengineering". 14 special (professional) competencies have been formulated.

To study the question of full use of professional competencies as a basis for specialist training, we consider it sufficient to view the quality control of training on the example of formation of the first special competence CC (component of competence)-1: the ability to use knowledge of the structure and technical characteristics of agricultural machinery for modeling agricultural processes, in professional activities (Ministry of Education and Science of Ukraine, 2018, p.7).

According to the structural and semantic model of providing special competencies with the relevant disciplines of the curriculum (*Fig. 1*), three disciplines "Tractors and cars", "Agricultural machinery", "Operation of machinery and equipment" should provide the formation of competence CC-1. According

to the program of the discipline "Agricultural Machinery", for the formation of this competence, students must study 12 groups of machines, starting with the first group – "Tillage machines" and ending with the twelfth one – "Machines for harvesting and post-harvest processing of vegetables, fruits and berries" (Voitiuk, 2004, pp. 477). Students from two other disciplines need to master the same amount of study material.

In order to ensure quality control of the fragment of professional training of future Bachelors in agricultural engineering, we specify our chosen competence CC-1. Taken into account that the strategic crop – winter wheat takes 60% of all grain crops in the domestic crop sector, we consider it appropriate to specify our chosen competence for sowing this important crop. Then the special competence of CC-1 will have the following formulation: *the ability to use knowledge of the structure and technical characteristics of agricultural machinery to model the technological process of sowing winter wheat in professional activities.*

Now, let's consider the teaching material from each discipline, on the basis of which the mentioned competence should be formed.

Agricultural machines: technical characteristics, purpose, structure, work process, technical adjustments, technological adjustments of grain seed drills on the basis of the basic model C3-3,6A and its modifications.

Tractors and cars: types of agricultural tractors, tractor controls, tractor work equipment, the

phenomenon of wheel slippage, rated traction, gearbox and the basic values of working and transport speeds.

Operation of machines and equipment: Kinematics of machine units: characteristics of the working area; kinematic characteristics of machine units; technology of turns; basic modes of movement; stroke ratio; justification of the width of the fold. Substantiation of the rational composition of machine units: the main requirements for the selection and assembly of machine units; calculation of parameters and modes of operation of aggregates; assembly of aggregates in kind; control and management of operational modes of aggregates. Mechanization of pre-sowing tillage, sowing of winter wheat: agrotechnical requirements for pre-sowing tillage and sowing; composition and preparation of machine-tractor units for pre-sowing tillage; preparation of seeds, its transportation to the field and refueling of sowing units; composition and preparation of sowing (planting) aggregates for work; organization of work of machine-tractor units.

In order to ensure proper control and assessment of knowledge and skills from this material, first of all, it is necessary to follow the relevant pedagogical principles.

1. *The principle of objectivity of assessment of knowledge and skills* is designed to promote the impartial application of control criteria and uniform standards of assessment without influencing the likes and dislikes of the teacher, behavior, health and other personal characteristics of students.

Due to the fact that the vast majority of students majoring in "Agroengineering" is from rural areas (there are, periodically, such typical situations in the educational process). Before entering the higher educational institution, a student from the mechanization family constantly helped his father to perform technological mechanized operations – plowing, cultivation, sowing, harvesting grain and other crops. In higher educational institution, at the classes on technical disciplines, in particular, in the study of agricultural machinery, such student begins to understand that he knows these machines, and he orients better than the teacher in some practical matters. The student becomes uninterested at the class, he stops listening to the teacher and begins to distract other students. Teachers do not like this situation very much, and they start to make remarks to such students, expel them from classes and underestimate their grades objectively. We believe that in such a situation the teacher had to use the previous practical training of the student for the benefit of the educational process. It is desirable to do this after identifying the quality of previously acquired knowledge and skills of the student, in a personal conversation with him. If the student really has practical knowledge and skills in a group of agricultural machinery, it is desirable to use this knowledge, giving him the floor during a lesson

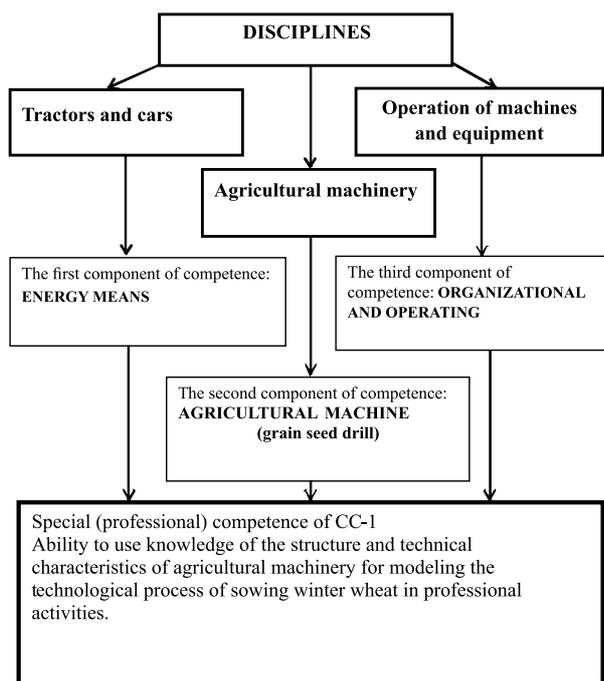


Fig. 1. Structural model of formation of professional competence CC-1

near the object of technology, to provide an opportunity to participate in the competition, in preparing a report at the student scientific conference, reporting work of the scientific student circle, at the annual "Festival of Student Science". Additional points are awarded for successful participation in all these activities, and the student can deservedly claim the highest score due to his previous training.

II. *The principle of systematic control* provides a system of regularity of control and assessment of the quality of students' knowledge. At each lecture, it is desirable to conduct an oral quality control of students' mastery of the main issues of the previous lecture. This survey provides benefits, in particular:

1) students remember the educational information from the previous lecture and logically connect it with the next lecture material;

2) students are stimulated to watching the previous lecture to prepare for the survey;

3) although from 5 to 12 students take part in such a survey, and the rest of the course students carefully follow the answers, carefully preparing for the answers themselves, as a result of which all students of the course effectively repeat the educational information from the previous lecture (this effect is achieved if audience is no more than 50 students);

4) stimulates students to be active in the desire to answer, as high scores for answers add points to the final attestation at the end of the semester.

The next stage of the survey is a written test control (preferably not more than 7 minutes), which should be carried out at the beginning of the laboratory lesson. The purpose of control is to check the quality of formation of students' initial skills on the basis of lecture material, which will be used in laboratory or practical classes. This type of control is thoroughly described in our joint work with I. Kolosko (Domin and Kolosok, 2015, p. 417, 466).

III. *The principle of individual approach* should ensure the removal of unnecessary psychological stress and anxiety of students during the control and assessment of knowledge. Adherence to this principle is significantly facilitated by conducting lectures on the technology of problem conversation. Thus, students receive new knowledge and abilities as a result of the active decision of a consecutive chain of problem situations that is a guarantee of their reliable fixing in consciousness. Based on our observations of lectures, practical and laboratory classes and control activities in the process of professional training of future Bachelors in agricultural engineering, we can conclude: if, at the lessons, the mastery of new knowledge and skills takes place by using problem methods and technologies that activate the cognitive activity of students, then the quality control of this knowledge and skills usually takes place in an

atmosphere of friendliness, and fair assessment encourages each student to further active systematic learning activities. At the same time, it is necessary to take into account the clear and understandable formulation of the teacher's control questions from the study material.

IV. *The principle of comprehensiveness and totality* provides a high degree of mastery of control measures of the content of knowledge and skills that directly reflect the quality of professional training. That is, to ensure compliance with this principle, it is necessary to cover the whole set of knowledge and skills in each of three disciplines by control measures simultaneously. It ensures the formation of the competence of the CC-1. However, there is another problem: blocks of knowledge and skills in each of the three disciplines are formed in students majoring in speciality "Agroengineering" in different periods.

We believe that this problem can be solved during the production and technological practice by moving the discipline "Operation of machinery and equipment" in the curriculum to the 6th semester and introducing control and diagnostic training in the internship program – to check the quality of formation of all special competencies of future graduates .

Conclusions. Based on the analysis of examples of compliance with basic pedagogical principles in the process of monitoring the professional training of future Bachelors in agricultural engineering, we determined that the competence orientation of this training contributes its specificity to the process of compliance with the principles. In this regard, we believe that in order to fully comply with each of these principles, it is appropriate to take appropriate additional measures. To comply with the principle of objectivity in the assessment of knowledge and skills, it is desirable to pre-diagnose the state of initial professional training of students before studying the relevant disciplines. To fully use the principle of comprehensiveness and totality, it is advisable to divide the professional knowledge and skills in each discipline into blocks that are part of the content of the particular competence. Then, we can combine all these blocks of knowledge and skills from different disciplines within the relevant competencies. In order to comply with the principle of systematic control, it is expedient to systematically carry out a step-by-step control of the formation of these blocks of students' knowledge and skills. To take into account the peculiarities of compliance with the principle of individual approach, we consider it appropriate to provide control over the formation of professional competencies in an atmosphere of friendliness in the form of a problem conversation. Thus, problematic questions should be formulated in the context of concrete production situations of engineering activity in agriculture.

List of references

- Подпратов, Г. І., Манько, В. М. та Лузан, П. Г., 2003. *Зміст і процес підготовки фахівців з механізації сільськогосподарства*. Київ: Національний аграрний університет.
- Дьомін, О. А., Колосок, І. О., 2015. *Активізація навчально-пізнавальної діяльності студентів у процесі практичної підготовки з механізації сільськогосподарського виробництва*. Київ: Логос.
- Канивец, П., 2004. *Модели и методы оценки качества подготовки и повышения конкурентоспособности специалистов*. Кандидат наук. Южно-Российский государственный технический университет (Новочеркасский политехнический институт).
- Медведовська, Т., 2013. Оцінювання якості професійної підготовки фахівців у вищих навчальних закладах України: проблеми і перспективи. (Дніпропетровськ, Україна). *Проблеми та перспективи розвитку науки на початку третього тисячоліття у країнах СНД XVIII Міжнародна науково-практична інтернет-конференція*. Переяслав-Хмельницький, 29-30 грудня 2013 р. [online] Доступно: <<http://oldconf.neasmo.org.ua/node/2182>> [Дата звернення 23 Квітень 2020].
- Войтюк, Д.Г., Дубровін, В.О., Іщенко, Т.Д., Гаврилук, Г. Р. та Погорілець, О. М., 2004. *Сільськогосподарські та меліоративні машини: підручник*. Київ: Вища освіта.
- Міністерство науки і освіти України, 2018. *Стандарт вищої освіти. Бакалавр. Галузь знань: 20 Аграрні науки та продовольство. Спеціальність: 208 "Агроінженерія"*. Київ: Міністерство науки і освіти України. [online] Доступно: <https://nubip.edu.ua/sites/default/files/u284/208_agroinzheneriya_2.pdf> [Дата звернення 23 Квітень 2020].
- Суслов, А., 2005. Система оценки качества подготовки специалиста. *Качество. Инновации. Образование*, 3, с. 58-61.

Translated & Transliterated

- Podpriatov, H. I., Manko, V. M. ta Luzan, P. H., 2003. *Zmist i protses pidhotovky fakhivtsiv z mekhanizatsii silskoho hospodarstva [The content and process of training specialists in agricultural mechanization]*. Kyiv: Natsionalnyi ahrarnyi universytet.
- Domin, O. A., Kolosok, I. O., 2015. *Aktyvizatsiia navchalno-piznavalnoi diialnosti studentiv u protsesi praktychnoi pidhotovky z mekhanizatsii silskohospodarskoho vyrobnytstva [Activation of educational and cognitive activity of students in the process of practical training on mechanization of agricultural production]*. Kyiv: Lohos.
- Kanivets, P., 2004. *Modeli i metody otsenki kachestva podgotovki i povyisheniya konkurentosposobnosti spetsialistov [Models and methods for assessing the quality of training and improving the competitiveness of specialists]*. Kandidat nauk. Yuzhno-Rossiyskiy gosudarstvenniy tehniceskii universitet (Novocherkasskiy politehnicheskii institut) [PhD. South Russian State Technical University (Novocherkassk Polytechnic Institute)].
- Medvedovska, T., 2013. *Otsiniuvannia yakosti profesiinoi pidhotovky fakhivtsiv u vyshchyykh navchalnykh zakladakh Ukrainy: problemy i perspektyvy [Assessing the quality of professional training in higher education institutions of Ukraine: problems and prospects]*. (Dnipropetrovsk, Ukraine). [online] *Problemy ta perspektyvy rozvytku nauky na pochatku tretoho tysiacholittia u krainakh SND XVIII Mizhnarodna naukovo-praktychna internet-konferentsiia [Problems and prospects for the development of science at the beginning of the third millennium in the CIS countries XVIII International Scientific and Practical Internet Conference]*. Pereiaslav-Khmelnyskiy, 29-30 hrudnia 2013 r. Dostupno: <<http://oldconf.neasmo.org.ua/node/2182>> [Data zvernennia 23 Kviten 2020].
- Voitiuk, D. H., Dubrovin, V. O., Ishchenko, T. D., Havryliuk, H. R. ta Pohorilets, O. M., 2004. *Silskohospodarski ta melioratyvni mashyny: pidruchnyk [Agricultural and reclamation machines: a textbook]*. Kyiv: Vyshcha osvita [Higher Education].
- Ministerstvo nauky i osvity Ukrainy [Ministry of Science and Education of Ukraine], 2018. *Standart vyshchoi osvity. Bakalavr. Haluz znan: 20 "Ahrarni nauky ta prodovolstvo". Spetsialnist: 208 "Ahroinzheneriia" [Standard of higher education. Bachelor. Field of knowledge: 20 Agricultural sciences and food. Specialty: 208 "Agroengineering"]*. Kyiv: Ministerstvo nauky i osvity Ukrainy [Ministry of Science and Education of Ukraine]. [online] Dostupno: <https://nubip.edu.ua/sites/default/files/u284/208_agroinzheneriya_2.pdf> [Data zvernennia 23 Kviten 2020].
- Suslov, A., 2005. *Sistema otsenki kachestva podgotovki spetsialista [System for assessing the quality of training]*. *Kachestvo. Innovatsii. Obrazovanie* [Quality. Innovation. Education], 3, s. 58-61.

Принципи забезпечення контролю якості компетентнісно-орієнтованої професійної підготовки бакалаврів із агроінженерії

Олександр Дьомін,

кандидат педагогічних наук, доцент кафедри транспортних технологій та засобів у АПК, Національний університет біоресурсів і природокористування України

Реферат

Актуальність: необхідність дотримання педагогічних принципів при забезпеченні контролю якості компетентнісно-орієнтованої професійної підготовки бакалаврів із агроінженерії.

Мета: дослідження особливостей дотримання педагогічних принципів в процесі компетентнісно-орієнтованого контролю якості професійної підготовки майбутніх бакалаврів спеціальності "Агроінженерія".

Методи: теоретичні (аналіз, синтез, зіставлення, узагальнення; моделювання); емпіричні (праксиметричні (вивчення та аналіз педагогічного досвіду, стандартів освіти, навчальних планів, робочих програм професійної підготовки майбутніх бакалаврів спеціальності "Агроінженерія" та результатів їхньої діяльності); опитувально-діагностичні (тестування, бесіда, дискусія).

Результати. Проведено аналіз дотримання педагогічних принципів в процесі забезпечення контролю якості професійної агроінженерної підготовки. З'ясовано, що досить тривалий час як у вітчизняній вищій освіті взагалі, так і в процесі професійної підготовки інженерних кадрів аграрного профілю зокрема, якість цієї підготовки визначалася повнотою сформованості у випускників знань, умінь і навичок відповідно до кваліфікаційних характеристик за майбутнім фахом у межах окремих дисциплін. Зважаючи на недостатню вивченість компетентнісної орієнтації фахової підготовки, проведено дослідження особливостей дотримання педагогічних принципів контролю якості формування професійних компетентностей як основи досконалості фахівців на прикладі бакалаврів спеціальності "Агроінженерія" як базової інженерної підготовки для вітчизняного сільського господарства.

Висновки: теоретично доведено, що компетентнісна орієнтація професійної підготовки бакалаврів з агроінженерії при забезпеченні контролю її якості вносить у процес дотримання педагогічних принципів свою специфіку. Для дотримання вказаних принципів контролю доцільне проведення таких додаткових заходів: 1) діагностика у студентів стану початкової професійної підготовки перед вивченням профілюючих дисциплін; 2) поділ професійних знань і умінь з кожної дисципліни на блоки, що входять до змісту конкретної компетентності; 3) систематичність проведення контролю формування цих блоків; 4) об'єднання всіх блоків знань і умінь різних дисциплін у рамках відповідних компетентностей.

Ключові слова: *контроль якості професійної підготовки, бакалавр з агроінженерії, формування професійних компетентностей, сільське господарство, педагогічні принципи.*

Received: 26 April 2020

Accept: 29 May 2020