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THE SYSTEM OF FORMATION AND DIAGNOSIS OF LEVELS OF INNOVATION AND ENTREPRENEURSHIP COMPETENCE OF THE FUTURE MANAGERS OF EDUCATION IN THE CONDITIONS OF THE KNOWLEDGE ECONOMY

Abstract. The article is devoted to the problem of formation and diagnostics of the levels of innovation and entrepreneurship competence of the future managers of education in the conditions of the knowledge economy. The purpose of the research is theoretical substantiation and experimental verification of the system of formation and diagnostics of innovation and entrepreneurship competence of the future managers of education in a higher education institution in the conditions of the knowledge economy. The authors define the innovation and entrepreneurship competence of education managers as mastering a certain level of developed knowledge, skills, values, attitudes, experience and qualities. The research is a system that includes an assessment technology outlining the assessment matrix containing a description of the levels, criteria and indicators of innovation and entrepreneurship competence of the future education managers. Necessary condition for solving the problem of preparing the education managers for their future professional activity presupposes the formation of motivational-value, cognitive, activity, personality and evaluative-reflective components being the components of their innovation and entrepreneurship competence. The results of practical application of innovation and entrepreneurial competence showed that a large proportion of students try their hand at starting and registering their own business. Raising the level of registered enterprises by students in 2008—2018 by more than 30 times is evidence not only of the introduction of digital technologies in education, but also of the growing availability of information technology and the Internet. The share of students who plan to start their own business after graduation reaches 50%, but a little more than 10% achieve the planned goals. Only 2.5% of students plan to join the family business, this share may increase to 4.5% in the future. The application of the system has provided a positive dynamic of the formation of innovation and entrepreneurship competence in the prospective education managers in all its structural components. The results of the implementation of this system have confirmed its effectiveness and expediency for application in the educational process of higher education institutions.

Keywords: knowledge economy, education manager, educational institution, student, innovation and entrepreneurial competencies, higher education seeker.

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СИСТЕМА ФОРМУВАННЯ І ДІАГНОСТИКИ РІВНІВ ІННОВАЦІЙНО-ПІДПРИЄМНИЦЬКОЇ КОМПЕТЕНТНОСТІ МАЙБУТНІХ МЕНЕДЖЕРІВ ОСВІТИ В УМОВАХ ЕКОНОМІКИ ЗНАНЬ

Анотація. Присвячено проблемі формування й діагностики рівнів інноваційно-підприємницької компетентності майбутніх менеджерів освіти в умовах економіки знань. Мета дослідження — теоретичне обґрунтування та експериментальна перевірка системи формування й діагностики рівнів інноваційно-підприємницької компетентності майбутніх менеджерів освіти у закладі вищої освіти в умовах економіки знань. Визначено інноваційно-підприємницьку компетентність менеджера освіти як інтегровану особистісно-професійну, соціально значущу якісну характеристику майбутнього фахівця, який володіє певним рівнем сформованих знань, умінь, цінностей, ставлень, досвіду, якостей. Дослідження являє собою систему, яка включає матрицю оцінювання, що містить характеристику рівнів, критеріїв і показників інноваційно-підприємницької компетентності майбутніх менеджерів освіти та технологію оцінювання. Необхідною умовою розв'язання проблеми підготовки майбутніх менеджерів освіти до управлінської діяльності є формування мотиваційно-ціннісного, когнітивного, діяльнісного, особистісного та оцінно-рефлексивного компонентів, як необхідних складових їхньої інноваційно-підприємницької компетентності. Результати практичного застосування інноваційно-підприємницької компетентності показали, що велика частка студентів пробує власні сили у відкритті та реєстрації власного бізнесу. Підняття рівня зареєстрованих підприємств студентами за 2008—2018 рр. у понад 30 разів є свідченням не тільки запровадження цифрових технологій у навчання, а й зростаюча доступність інформаційних технологій та Інтернету. Частка студентів, що планують відкриття власної справи після завершення навчання, сягає 50 %, однак досягають запланованих цілей трохи більше 10 %. Усього 2,5 % студентів планують долучитися до родинного бізнесу, у перспективі ця частка може зрости до 4,5 %. Застосування системи забезпечило позитивну динаміку формування інноваційно-підприємницької компетентності майбутніх менеджерів освіти у всіх її структурних компонентах. Результати впровадження системи підтверджують її ефективність і доцільність застосування в освітньому процесі закладів вищої освіти.

Ключові слова: економіка знань, менеджер освіти, заклад освіти, студент, інноваційно-підприємницькі компетентності, здобувач вищої освіти.

Формул: 4; рис: 1; табл: 3; бібл. 22.

Introduction. The development of the information society has directly and indirectly led to a new world order in which knowledge becomes the most important product of people's activity. This system-forming principle of building a knowledge-based society — the society 5.0 (Super smart society) — is universal for all system levels: from higher to lower [1].

The need for training the education managers in Ukraine is extremely important, because it is impossible to achieve high quality of a modern school functioning without managers possessing a sufficient level of professional competence and skills to successfully solve management problems. In such conditions, the concept of knowledge economy, which emphasizes the role of entrepreneurship in achieving high results of innovative training of future education managers, needs to be introduced in detail.

The importance of quality management of educational institutions is pointed out in the World Bank research. According to the forecasts of education development for 2018 [2], among the factors that negatively affect the educational process at schools, poor school management is one of the most significant.

The UNESCO World Report «*Leading Better Learning: School Leadership and Quality in the Education 2030 Agenda*» [3] states that, in connection with the globalization of social changes and the new vision of the education system, improving *School Leadership* is becoming a new challenge for many countries, especially for developing ones, where school leaders, whose role is traditionally administrative, must become true educational leaders. It is believed that the manager must be internally ready to play a leadership role. The degree of such readiness is determined by the compliance of the qualities of head-managers to certain professional standards. For example, for the member states of the European Union, such standard model of managerial competence of leaders, developed by the European Commission [4] is reflected in the project «*Rethinking Education: Investing in Skills for Better Socio-Economic Outcomes*» being a Communication from the Commission presenting the challenges and the priorities for national and EU policies in the field of education, where great importance is attributed to vocational education and training.

Thus, the system of vocational education and training of the prospective education managers should be based on the main global educational trends and the requirements for the level of competence of the personality in the XXI century. However, in the absence of a professional standard for heads of educational institutions in Ukraine, the training of managers needs thorough scientific substantiation and improvement.

Analysis of research and problem statement. The study of professional competence of education managers as a component of management of educational institutions is outlined in the works of such scientists as Zhyhir [5], Deshchynskyĭ [6], Vasylychenko and Hryshyna [7], Vdovychenko [8], Yelnikova [9], Kalagurka, Balanovska et al. [10], Pylaieva and Kochyna [11], Azhyppo and Korolova [12], Myshchysyn and Kalahurka [13], Myshchysyn [14] and many others. However, the presence of a significant number of scientific papers does not provide sufficient grounds for analyzing the components of professional competence of education managers in the context of modern requirements. This has stimulated the development of further research. For example, Zhyhir believes that professional competence covers the following competences: general cultural, communicative, psychological and pedagogical, managerial and strategic [5]. It should be added that scientists have not specified such important components as innovation and entrepreneurship, which are important elements of the knowledge economy.

We share the views of the experts of the Ukrainian-Canadian project «*Decentralization of Vocational Training Management in Ukraine*», which distinguish the following types of competencies: the key ones, necessary to obtain new knowledge and to adapt acquired knowledge to new requirements and situations, the personality adaptation for changing conditions in the labor market (intellectual, social and interpersonal, entrepreneurial); cross-cutting competencies, aimed at interacting with various elements of the labor environment, including the ability to organize and improve work and the ability to work in compliance with the requirements of labor protection and the environment; professional competencies relating to a specific technology of labor [6]. All three types of competencies, in our opinion, form the professional competence of the prospective education managers, contributing to their professional success and self-improvement.

During the study, a set of general scientific and special methods of cognition was used, namely:

- content analysis in order to establish a critical vision of the development of training of education managers in the knowledge economy;
- logical generalization to determine the main components of the competency model;
- quantitative and qualitative comparisons to study the mutual influence of the quality of education of students-managers and their innovation and entrepreneurial competence;
- taxonomic and index analysis to create an index of functional normality of professional competence of the student.

Unsolved aspects of the problem. Despite the significant achievements of scientists in the field of research of the problem of professional competence of education managers, including innovation and entrepreneurship, this problem needs further scientific substantiation and practical verification.

The purpose of the article is to substantiate the system of formation and assessment of the levels of professional innovation and entrepreneurship competence in the prospective education managers.

Research results. The formation and development of certain competencies in different specialists is understood by scientists as the formation of knowledge, skills and abilities, as well as the development of abilities and values in the process of formal or informal learning. Thus, the formation of professional competence in the prospective education managers can be represented as the formation of abilities, personality qualities, mental resources of the personality and the acquisition of cognitive components and experience in the educational process of higher educational establishment.

Competent education manager, in our opinion, first of all, must possess certain individual and psychological qualities (independence, discipline, communicativeness, need for self-development, creativity), and secondly — must demonstrate the formation of key, basic and special competencies.

To structure pertinent competencies, a model of competence of the prospective education manager is proposed, developed by the authors based on the study of scientific sources [4; 6—8; 10; 12; 13] (*Table 1*). The model of professional competence of the prospective education manager includes key, basic and special competences.

Table 1

Competence model of the head of the educational institution

Type of competence	Components of competence
Key competence	communicative; informational; social and legal; cultural and value; ability to control oneself; clear one's own goals; self-improvement
Basic competence	general pedagogical; topical and pedagogical; psychological; innovation
Special competence	education management; economics of education; entrepreneurship; educational and juvenile jurisprudence

Such a type of special competence as entrepreneurship was introduced only in 2018. It provides an opportunity to use existing experience, knowledge and skills in organizing personal work and/or doing business and/or work of a group of people (team), guided by national and international standards and relationship ethics.

We believe that necessary condition for solving the problem of preparing the prospective education managers for educational management is 1) motivational-value, 2) cognitive, 3) activity, 4) personality and 5) evaluation-reflexive components, being necessary components of their professional competence, each of which includes knowledge, skills, values, views (attitudes) and qualities.

The authors of this research have developed the structure of the components of professional competence of the prospective education manager (which is presented in *Table 2*) based on the fact that professional competence is established by the standard of higher education professional, social and personal requirement for the future head of an educational institution, necessary for his/her effective management.

Table 2

The structure of the education manager's components of professional competence

Knowledge	Knowledge of management functions; knowledge of management decisions; knowledge of organizational strategies; knowledge of people management; knowledge of financial management; knowledge of change management; knowledge of education quality management; knowledge of project management
Skills	Performing management functions; developing procedures, methods, strategies; assessing the conditions, impact, consequences of decisions; analyzing the relationships between the strategies of organizations; implementing strategies, projects of the organization; managing personnel, projects; overcoming resistance to change; designing organizational structure, communications; distributing powers; effectively organizing team work; analyzing; introducing innovations; solving management tasks; making balanced decisions; building and using the system for managing the quality of education
Values	Humanistic, democratic values (respect for diversity, the right to choose, community formation, multiculturalism); professional honesty, integrity, fairness, responsibility, optimism; anthropocentrism; a sense of responsibility for the proposed decisions and actions; respect and awareness of the importance of other people; value attitude to the profession.
Views, attitudes	Behaving in accordance with the declared values; being consistent; declaring one's own views for discussion; seeking to understand the views of others; being active in life; firmly stands one's own ground; seeking to establish feedback; being ready to take responsibility for one's own values.
Quality	Ability to anticipate; authority; entrepreneurship; business acumen; initiative; independence; ability to work intensively; ability to generate useful ideas; ability to take risks within reasonable limits; emotional and stress resistance; leadership.

In our opinion, any of the worked-out components of professional competence can be broken down into these five components [10; 14; 15]. The content of competencies should be clear to all lectures, students, and most importantly — this content should reflect all areas of the prospective managers of education and clearly differ from other activities [16—21].

It is interesting that the share of students who plan to organize their own business in the sphere of professional self-realization is almost 60%, at the same time, in fact, only about 10% actually succeed. Moreover, more than 4% plan their self-realization in the family business, the actual figure is 2.5%.

Activity in business registration has also increased. Thus, if in 2008 1.1% of enterprises were registered by students on average, then in 2018 this figure was 34.6% according to the plan. That is, the widespread introduction of information technology, the spread of the Internet has made it possible to increase activity in this area.

The most dynamic is the class of students who, in the process of learning, open their own start-ups and organize business, i.e. realize the most innovative projects. In general, the share of such students varies significantly depending on the country: from 35% in Malaysia to 1.3% in Japan (*Fig.*).

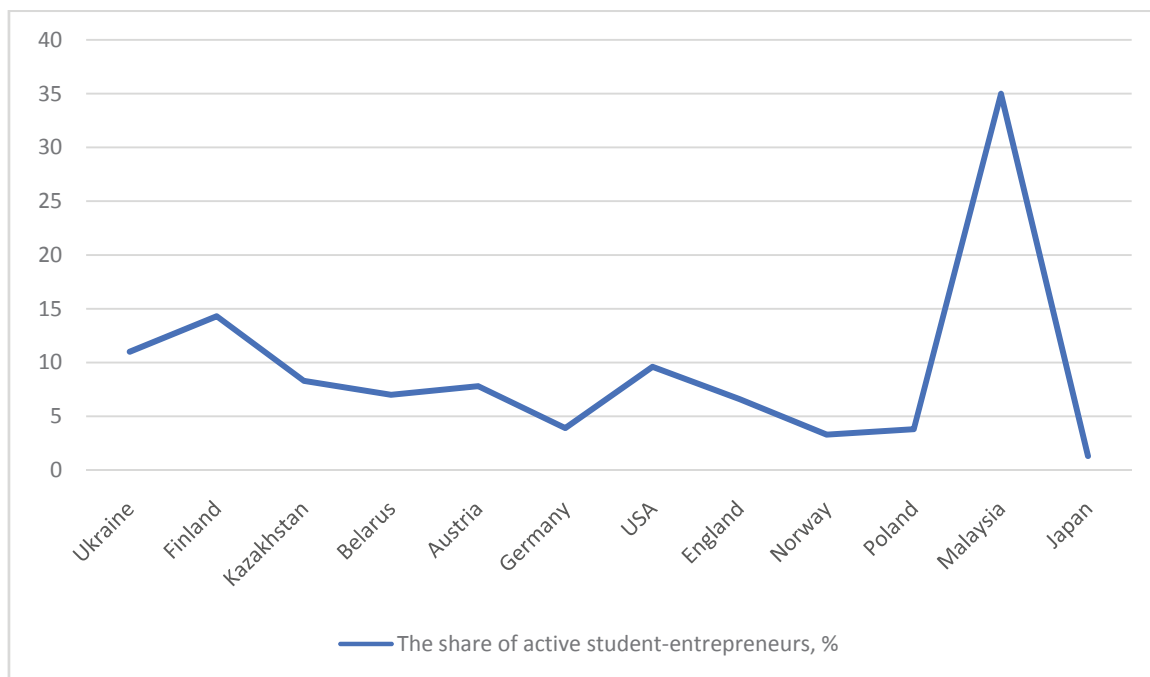


Fig. The share of active student-entrepreneurs, %

Note. [22].

Thus, professional competence is a latent variable, the indicators of which are the levels of formation of its components. Let N be the total number of components of the professional competence of the prospective education manager, K_j is the formation (on the M-point scale) of the j -th component of competence. So, the professional competence can be calculated on the logit scale by the formula (1):

$$S = \frac{1}{2 \times M \times N} \ln \ln \left(\sum_{j=1}^N K_j \right). \tag{1}$$

Thus, the calculation of the index of structural normality of professional competence of the prospective specialist is carried out by the formula (2):

$$\alpha = \frac{1 \cdot N_n + 0,5 \cdot N_w + 0 \cdot N_d}{N} = \frac{N_n + 0,5 \cdot N_w}{N}. \tag{2}$$

Where N_n , N_w и N_d – the appropriate number of components of professional competence of the prospective education manager, which are in the normal range (N_n), warning range (N_w) and danger range (N_d). The formation of the components of professional competence in the prospective education managers is in the normal range, if K_j is not less than 70% of M (scale); in warning range — from 40 to 70%; in danger range — less than 40%.

Obviously, the cognitive component of professional competence is to be calculated by the formula (3):

$$\rho = \bigcup_{j=1}^N KSA_j, \tag{3}$$

where KSA_j (knowledge, skills and abilities) is the set of knowledge, skills and abilities associated with the j -th component; \cup is the symbol of the union of the set of KSA .

All components of professional competence of the prospective education managers are necessary since the lack of one of them will reduce the effectiveness of professional activities.

If we denote the state of formation (in logits) of the motivational-value, cognitive, activity, personality and evaluation-reflexive components by respectively C_{mv} , C_{cog} , C_{act} , C_{per} and C_{er} , then the index of functional normality of professional competence of the student is calculated by the formula (4):

$$\beta = \frac{f(C_{mv}) + f(C_{cog}) + f(C_{act}) + f(C_{per}) + f(C_{er})}{5} \tag{4}$$

If $f(C)$ is equal to 1, the formation of the component is in the normal range; if 0.5 — in the warning range; if 0 — in the danger range. Based on the comparison of the values, it is possible to determine the adequacy of the assessment (diagnosis) of professional competence of a particular student: the difference between the values should not exceed 12.5%, otherwise at least one of the values is incorrect.

This method of calculation made it possible to conduct a qualitative analysis of the professional competence of each individual student: if at least one functional component is in the danger range, the state of competence is abnormal; if all components are in the normal range, the condition is normal; otherwise — the state of competence is functionally limited.

The methods used to diagnose the levels of professional competence in the prospective education managers (questionnaires, testing, knowledge assessment, practical and creative tasks, psychological and pedagogical methods) were identified as the most appropriate criteria according to the requirements of objectivity, reliability, validity.

As a result of the experimental work, it has been found that the control groups of students have shown a slight dynamic in the indicators of their professional competence (the number of students with the initial level of indicators decreased by 7.1%, with slightly increasing the number of students with sufficient and optimal level). The dynamics of the levels of professional competence of students of experimental groups has been more pronounced: the number of students with the initial level of professional competence decreased by 29.9%, while the number of students with sufficient level decreased by 8% due to the increasing by 36.9% of the number of students with the optimal level (*Table 3*).

Table 3

Dynamics of levels of formation of professional competence in the prospective education managers, %

Levels of formation of professional competence	Control group	Control group	Experimental group	Experimental group
	The beginning of the experiment	End of experiment	The beginning of the experiment	End of experiment
Initial	41.3	34.2	42.4	12.5
Sufficient	5.2	58.2	55.3	48.3
Optimal	4.5	7.6	2.3	39.2

The comparison of the indicators of the formation of professional competence in the prospective education managers in the experimental and control groups has confirmed the effectiveness of our system of formation and diagnosis of levels of professional competence in the prospective education managers.

Conclusions. The research has enabled to propose a correct definition of the professional innovation and entrepreneurship competence of the prospective manager as a specific ability necessary to effectively perform specific actions in the management of an educational institution, which includes values, motives, special knowledge, skills, ways of thinking and responsibility.

It is established that the most creative students not only plan to open their own business after graduation, gain experience as an employee, but also organize it as students. Some students continue to run family businesses. Thus, the level of application of entrepreneurship competence gives tangible results.

It has been established that the concept of «competence» includes a number of components, systematized into five basic ones, namely: motivational and value; cognitive, activity, personality and evaluative-reflexive. The study contains an evaluation matrix containing a description of the levels and indicators of professional competence of the prospective education managers, as well as the diagnostic methods, which includes the main psychological and pedagogical tools, methods and tasks.

The study has shown that the developed system of formation and diagnosis of levels of professional competence of the future education managers is a holistic one enabling to improve the

quality of their vocational training. The problem of development and implementation of a similar system for other specialists in the field of education deserves further study.

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