

UDC 378.147:004.77

Olena G. Glazunova

Doctor of Pedagogical Sciences, Associate Professor, Dean of the Faculty of Information Technology
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
ORCID 0000-0002-0136-4936
o-glazunova@nubip.edu.ua

Tetiana V. Voloshyna

Senior Lecturer, Department of Information and Distance Technology
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
ORCID 0000-0001-6020-5233
t-voloshina@nubip.edu.ua

Yevhenii M. Starychenko

Senior Lecturer of the Information Systems Department
National University of Life and Environmental Sciences of Ukraine, Kyiv, Ukraine
ORCID ID 0000-0001-8608-5268
starychenko.e@gmail.com

FORMATION OF SELF-EDUCATIONAL COMPETENCE OF FUTURE IT SPECIALISTS

Abstract. The article deals with theoretical and practical aspects of self-educational competence formation of IT students. It determines the concept and structure of self-educational competence, analyzes the information resources and services that are used to develop it. The article offers the system of ICT-tools for the formation of self-educational competence of future IT specialists: the resources of the University educational portal, the online academy, massive open professionally-oriented online courses, computer-aided code verification systems, practical programming courses, cloud platforms for the development of software systems, the environment for implementing collective projects. It defines the system of indicators of self-educational competence according to such components, as: motivational-value-based, organizational-technological, practice-activity, reflexive-analytic, and determines the following levels of formation of self-educational competence of future IT specialists, which will reflect the qualitative and quantitative characteristics of the concept under study: high, middle, and low. The article presents the results of experimental research on formation of self-educational competence of future IT specialists using the developed system of ICT tools, in particular, positive effect of using the ICT tools in the learning process on the level of self-educational competence of future IT specialists. Theoretical and methodological aspects of the future IT specialists' self-educational competence formation by means of using resources and services of the information and educational environment of the higher educational institution are substantiated.

Keywords: self-educational competence; IT specialist; information and communication technologies; educational portal; cloud platforms.

1. INTRODUCTION

The modern stage of development of higher education is connected with the transition to the practical realization of a new educational paradigm aimed at creating an integral system of continuous education, at expanding the sphere of students' self-education in the conditions of involvement in the process of knowledge of information and communication technologies that enable the formation and development of self-educational competence, skills of self-organization and self-education of future specialists. The concept of lifelong learning becomes particularly relevant.

Statement of the problem. The current competitive job market requires professionals who have developed professional and personal skills which are necessary for continuous

development and improvement of future information technologies specialists. The problem of formation and development of students' self-educational competence while studying at the university is relevant, in particular, for future IT specialists as their future professional growth will depend on the ability to organize the process of their own self-development, on their interest and understanding of the need for continuous improvement of their level of theoretical knowledge and practical skills, improvement and development of personal skills.

Consequently, there is a need to analyze and substantiate the concept of self-educational competence of future IT specialists, to determine the levels of its achievement and indicators for assessing the corresponding level. Considerable attention should also be paid to the problem of creating such an educational environment that will promote the development of self-educational competence among IT students. It is necessary to identify the basic information and communication technologies for creating such an educational environment, to develop a methodology for using the resources and services of the educational environment for the formation and development of self-educational competence of future IT specialists.

Analysis of recent research and publications. The problem of self-educational competence formation was studied by L. Bilousova [1], N. Bukhlova [2], N. Voropay [3], R. Gurevich [4], L. Yevsyukova [5], S. Kasiyants [6, 7], I. Mosya [8], Santa Striguna [15, 25], Alida Samusevica [25].

The organization of self-educational activities under the conditions of informatization of society and the use of information technologies as a means of self-education is considered in scientific researches of: L. Bilousova [9], N. Voropay [3], O. Kiselyova [9], O. Kopul [10], O. Fedorenko [11], O. Chebotareva [12], O. Shcholok [13], et al.

The purpose of the article is to substantiate theoretical and methodological aspects of the future IT specialists' self-educational competence formation by means of using resources and services of the information and educational environment of the higher educational institution.

2. THEORETICAL BACKGROUND OF THE RESEARCH

2.1. The notion of self-educational competence

The studies of Ukrainian and foreign scholars testify that there exist different approaches to the definition of "self-educational competence". N. Dovmantovich regards self-educational competence as a system of abilities and aptitudes that provide an opportunity for an individual to successfully solve life objectives, to successfully carry out individual's vital activity and life-creation in all its manifestations [14].

Santa Striguna considers self-educational competence as an integrative quality of the personality's activity, which is characterized by the personality's ability to perform a systematic, independently organized cognitive action, directed towards further education in general-culture and professional aspects, and it is formed, organized and controlled by the cognitive action of the individual himself/herself [15].

A. Nasimov believes that self-educational competence is a quality to personalities, characterizing their ability to carry out systematic organized cognitive activity, directed at the continuation of their formation in common cultural and professional aspect [16].

N. Kovalenko considers person's self-educational competence as a complex integrated personality trait that provides readiness to meet the individual and social needs of their realization on the basis of mastering the knowledge, skills and abilities, methods of activity and acquired experience to productively carry out an independent systematic targeted development of the social experience of mankind. It is the willingness and ability of the individual to acquire an independent, systematic, purposeful knowledge of reality, the

development of social experience of mankind, self-realization, self-development, the integrated quality of the individual, which is based on the skills of self-education and determines the readiness of the individual to self-education, self-learning, self-improvement, self-realization throughout life recognizing personal and public needs. This is the willingness and ability of the individual to carry out self-development, self-creation [17].

According to Yu. Pryshupa [18] self-educational competence is the ability and willingness of the subject to perform an effective self-cognitive creative activity based on mastering flexible knowledge, generalized skills and abilities.

S. Kasiyants in the dissertation study [7] defined the concept of “self-educational competence of future economists” as a qualitative characteristic of the personality of students-economists, which is a set of professional skills and knowledge, the ability to independently organize cognitive-search activity, awareness of the need for professional-and-personal self-development, aimed at improving the theoretical basis of knowledge and practical skills in the economic field with a view to flexible response to socio-economic reform in the society and increase of his/her own level of competitiveness in the Ukrainian and foreign labor markets.

Thus, on the basis of the analysis carried out, we propose to consider the self-educational competence of future IT specialists as a confirmed person's ability to carry out self-educational activities on improving the theoretical knowledge and practical skills in order to respond flexibly to the rapid changes in the modern information society and to independently solve professionally-oriented problems in the field of information technology with the aim of increasing their own level of competitiveness in the labor market.

2.2. The structure and levels of self-educational competence

The formation and development of the self-educational competence component structure is based on the research data. The process of formation of self-educational competence is possible if the individual possesses target orientations, skills of learning activities and skills of working with various sources of information [7].

A. Nasimov considers the structure of self-educational competence as holistic integrative construct, including its motivational, reflexive, emotional-volitional and cognitive components [16].

N. Dovmatovich [14], taking into account the provisions of the educational-professional program of training and educational qualification of the medical profile specialists, the specifics of the activities of these specialists, as well as on the basis of the analysis and generalization of scientific research, distinguished the following structural components of the students' self-educational competence: motivational-value-based, cognitive-reflexive, organizational-activity.

I. Mosya [8], in the dissertation, specifies the structure of self-educational competence of a future skilled worker as a synthesis of such interdependent and mutually related components, as: motivation-and-value, practical-activity-based, organizational and personal-reflexive.

According to O. Chebotareva [19], the structure of students' self-educational competence is a coherent integrative mechanism (construct), which includes reflexive, procedural-informational, organizational, motivational-value-based components.

S. Kasiyants in the dissertation study [7] identifies four components in the structure of self-educational competence of future economists, namely: motivational-stimulating, social-informational, planning-organizational and reflexive-corrective.

Based on the analysis carried with the aim of forming self-educational competence of future IT specialists, we take as basis such components of self-educational competence, as: motivational-value-based, organizational-technological, practice-activity and reflexive-

analytic. Characteristics of the components of self-educational competence of future IT specialists are presented in Table 1.

The process of self-educational competence development of future IT specialists is accompanied by the highly necessary motivational-value-based component. The motivational-value-based component is responsible for the future IT specialists' understanding of the vital value of self-education, the availability of value orientations for personal and professional self-development, the arousal of interest in the chosen IT profession, awareness of the goals of education, the professional orientation of learning activities, the formation of the need for systematic educational and cognitive activities, development of internal needs in self-education, self-motivation skills, awareness by the future IT specialist of the choice of a profession and the trend of self-education. This component serves as a stimulus for student's self-education, characterized by the development of the motivation of future IT specialists to continuous self-improvement and self-development.

Organizational-technological component is responsible for the formation of the ability to determine the purpose of self-education, to plan, to independently manage the educational and cognitive activity. This component assumes: an IT student can independently determine the content, sources of knowledge, the timing of the scheduled activities, anticipate the course and results, build his/her own self-learning trajectory, taking into account personal needs and abilities, define forms, methods and services, regulate and control time, etc. This component performs the organizational and informational function of self-improvement and self-development.

The practice-and-activity component envisages the selection of corresponding kinds and techniques of self-educational activities (search, selection of required information, effective use of services and resources for work), mastering by the student of the "ability to study throughout life". A student possessing it is characterized by the ability to schedule and plan work time and time of educational activities, organize future professional activities, choose the best ways of achieving goals, plan and develop projects, determine the sequence and duration of activities, plan self-employment. It combines the knowledge and actions necessary for the successful implementation of the self-educational activity of the future IT specialist. In the structure of the process of self-educational competence formation, the practice-activity component performs a technological and instrumental function.

The reflexive-analytical component is one of the main constituent parts of self-educating advance of the future IT specialist; it is associated with cognitive autonomy, volitional and ideological qualities, initiative, responsibility, scientific thinking, and inspiration of an individual.

This component implies the ability of the future IT specialist to carry out self-control and reflection (the ability to outline, analyze and compare their own actions with a specific situation, perform the content-theoretical actions of self-examination, self-control, form an adequate self-assessment of their achievements in the formulation of complex tasks, compare the achieved results with the stated objectives and tasks, to correct and develop new further tasks).

Table 1

Characteristic of the components of self-educational competence of future IT specialists

Components of self-educational competence	Indicators of self-educational competence	Signs of their manifestation	Levels of self-educational competence	Assessment criteria
Motivational-value-based	purposefulness; understanding of the need for self-education; value attitude to personal and professional self-improvement	a conscious attitude of the future IT specialist to the importance of the self-educational process for solving professional problems; the presence of interest in obtaining new theoretical knowledge and practical skills; the presence of a stable interest in professional growth in the IT sector	low	personal criterion (self-evaluation; survey)
			middle	
			high	
Organizational-technological	planning self-educational activities; ability to organize and manage the process of self-improvement	the ability to develop personal ways of self-development; the ability to effectively distribute and use resources for the organization of self-educational process; the ability to be guided by the process of self-education	low	pragmatic criterion (testing; competence-based task)
			middle	
			high	
Practice-activity	orientation in the modern information space; solving professional tasks	the ability to - search, analyze, select necessary professional information; - to apply new technologies in solving professional tasks; - to organize information exchange in the team	low	knowledge-based, pragmatic criteria (group project)
			middle	
			high	
Reflective-analytic	self-monitoring self-educational activity; identification of shortcomings in the process of self-education; adjusting your own trajectory of learning	the ability - to analyze the results of self-education; - to apply the acquired knowledge and skills in professional activity; - to develop perspective directions of further professional self-development	low	reflexive criterion (reflection; peer assessment; expert evaluation)

T. Yavorska [26] in her work defines the following levels of self-educational competence formation: low (lack or non-recurrence of motivation, which occurs only under the influence of external factors, the system of scientific knowledge is not formed, knowledge is superficial), intermediate (motivational-value attitude to independent work, non-systemic non-recurrent motivation), sufficient (having knowledge of fundamental and professionally-oriented disciplines, knowledge of methods for organizing activities using information and communication ability to develop software products needed to increase their self-education, ability to organize and plan their activities), high (formed need and assurance in the importance of independent learning activities, high intellectual activity, enthusiasm for science, the desire to participate in the search and creative educational process).

In her thesis Yu. Pryshupa [18] distinguishes the following levels of self-educational competence: reproductive (non-structured desire to change the learning situation, the ability to independently identify and solve educational tasks, the desire to constantly search for the necessary information, the ability to work with sources of information), productive (focus on knowledge and self-educational activity, the desire to learn independently, set self-educational goals and to execute them qualitatively), creative (focus on learning and self-educational activity, curiosity, desire for more profound knowledge, formation of intrinsic motivation of self-educational activity, formation of cognitive needs being the feeling of inner need for self-education).

L. Shvachka [27] defined the following levels of the self-educational competence formation: low (the motives of self-educational activities are unstable, impulsive; avoidance of performing educational tasks on your own, distractions, attempts to replace tasks by simpler ones, willingness to do similar exercises, passivity in conditions requiring independent solution of problem situations, low educational and intellectual skills), middle (implementation of reproductive tasks is carried out to obtain the final result; educational-intellectual skills allow to successfully perform the task using the algorithm, certain rules), sufficient (formed need for self-facilitated training and learning activities; gradual transition to self-statement of self-educational activity tasks; objective assessment of results of your activities; constant self-control while performing independent work; the ability to determine the positive aspects of their own self-educational activities), high (the need for self-replenishment of knowledge, persistence, the will to achieve the goals set, the profound possession of educational and intellectual abilities, the desire to achieve the goal, to get deeper into the learning object, the ability to analyze their own achievements, objectively evaluate results, advanced reading techniques, language culture, high communicative qualities).

The factor determining the effectiveness of forming the professional competence of future IT specialists is the level of their self-assessment. Self-assessment is the central component of an individual which significantly affects the attitude of the individual to himself/herself and others. It indicates the level of psychological development of students and the adequate definition of their professional and personal qualities and is closely linked to self-efficacy – the student's ability to realize his/her own abilities to form such a behavior that corresponds to professional tasks. According to the degree of the above-mentioned criteria manifestation and their indicators, we determined the following levels of formation of self-educational competence of future IT specialists, which will reflect the qualitative and quantitative characteristics of the concept under study: high, middle, and low.

Low level is characterized by the absence or partial motivation that occurs only under the influence of external factors. A student is not able to master software products and services independently, not always can reproduce the acquired knowledge; partially performs reproductive actions; has no idea of the role of non-formal education in professional activity; lacks motivation for professional development; has cognitive inertia; demonstrates occasional

interest in learning; displays minimum independent activity, is not able to analyze the reasons for his/her own successes and failures, to plan and modify professional activities. This level is characterized by contextuality, lack of purposefulness of the student's overall activity.

The middle level is characterized by the fact that the student forms a motivational-value attitude to self-education, although the motivation is nonsystematic, episodic. A student has and operates his/her own knowledge, skills and abilities, but cannot ensure their transfer to new objects. Knowledge of the student has signs of lack of completeness and depth, is often based on typical situations and ready-made samples of the work performed; they cannot correctly choose most rational actions out of the whole set. A student is able to master software products only under the guidance of a lecturer, defining purposes, goals and objectives of self-education, its planning and organization is carried out with the help of an educator.

The high level is characterized by the fact that students have formed the need and assurance in the significance of self-education by means of high intellectual activity, enthusiasm for science, and the desire to participate in deepening their own knowledge. This level of development of skills and abilities is the basis for the implementation of the whole system of actions for independent study and is characterized by an independent formulation of the purpose when searching for the necessary learning information, planning the progress of this work and implementing it by means of the most expedient and effective actions. The student has excellent body of knowledge, skills and aptitudes necessary for independent work. Acquired knowledge is characterized by consistency and depth; cognitive skills of formulating conclusions, analysis, synthesis, comparison, abstraction, generalization, observation, results forecasting are formed. Future IT specialists demonstrate cognitive motivation, a constant desire to engage in self-education, have the skills of self-examination, self-prediction and self-correction.

2.3. Analysis of ICT for the development of self-educational competence

Researching the problem of self-educational competence, scientists point out that the most successful tool for this purpose is the use of information and communication technologies. To date, there is a large number of new hardware with enormous learning resources that fundamentally affect the organization of the learning process, expanding its capabilities. New technical, informational, polygraphic, audiovisual means nowadays become an integral part of the educational process, introducing in it the specificity of the indivisibility of methods and tools [11, 3, 22].

On the basis of the scientists' studies analysis, we distinguished ICTs essential for the formation and development of self-educational competence (Table 2).

Table 2

Information and communication technologies essential for the development of self-educational competence

Author, source	ICT for the development of self-educational competence
L. Bilousova, O. Kyselyova [9]	– electronic educational and information resources; – educational Internet resources
S. Bodnar [20]	– Internet information resources (sites, educational web portals, electronic journals); – WebQuests
B. Vovk [21]	– electronic learning tools (electronic manuals, e-libraries, multimedia, Internet);

	<ul style="list-style-type: none"> – mobile learning technologies (m-learning) with the use of mobile devices; – u-learning technologies (ubiquitous learning)
N. Voropay [3]	<ul style="list-style-type: none"> – different types of multimedia learning information – resources of the Web-multimedia encyclopedia (developed by the author)
G. Lebed [22]	<ul style="list-style-type: none"> – thematic websites; – educational web portals; – WebQuests; – problem task with elements of role-playing game
M. Olhovska [23]	<ul style="list-style-type: none"> – electronic media containing learning and methodical literature; multimedia programs; – self-diagnostics programs of acquired knowledge; – Internet resources
O. Fedorenko, G. Zyma [24]	<ul style="list-style-type: none"> – means of information exchange; – specialized software

At present, a large number of ICTs are available for training future IT specialists. These are resources and services, software for hands-on learning, automated test systems, services for team application development, teamwork for project execution. For the development of self-educational components of great importance is the student's ability to master new technologies, which is possible due to modern open online courses, acquisition of practical skills due to the large number of environments for programming and automatic code validation; to conduct independent research on the fundamental and applied aspects of using information technology working in a team.

Based on such tasks, we identified ICT tools that would contribute to the formation and development of self-educational competence of future IT specialists (Figure 1).

For the formation of self-educational competence of future IT specialists, it is expedient to use: first of all, resources and platforms for the study of theoretical material. The Moodle platform focuses on organizing the interaction between the teacher and the students through an e-learning course, in which you can place different types of learning resources (lesson, book, presentation) for students' independent study of theoretical material. Supplementary learning by future IT specialists of programming, working with office applications using the online academy (Microsoft Imagine Academy, Cisco Networking Academy, Microsoft Virtual Academy) and MOOCs (Coursera, Khan Academy, Prometheus, Udemy, Codecademy, edX), promote their motivation to deepen knowledge of professional disciplines and the ability to solve practical problems in the field of information technology, it also demonstrates their willingness to take additional online courses [28]. On the basis of researches and personal practical experience, the following selection criteria of the online academy and MOOCs are stated: broad coverage of the professional direction disciplines of the training curriculum for IT industry specialists; possibility of obtaining a certificate of completion (with subsequent professional certification); ergonomics (visual-auditory presentation of educational material, structuring); different types of academic performance assessment; the ability to use on mobile devices.

The use of automated systems, such as ejudge, e-olymp, algotester and practical courses (codecademy.com, threehouse, codeavengers.com, programr.com) in training IT specialists allows students to improve their practical programming skills through multiple tasks, forms self-motivation skills, develops their internal need for self-education, motivates the student to distribute and schedule the time of learning activities, choose the best ways to achieve goals,

determine the sequence and duration of the stages of activity. The criterion for choosing automated programming systems is automated checking of tasks, different programming languages support, multitasking and soft skills development.

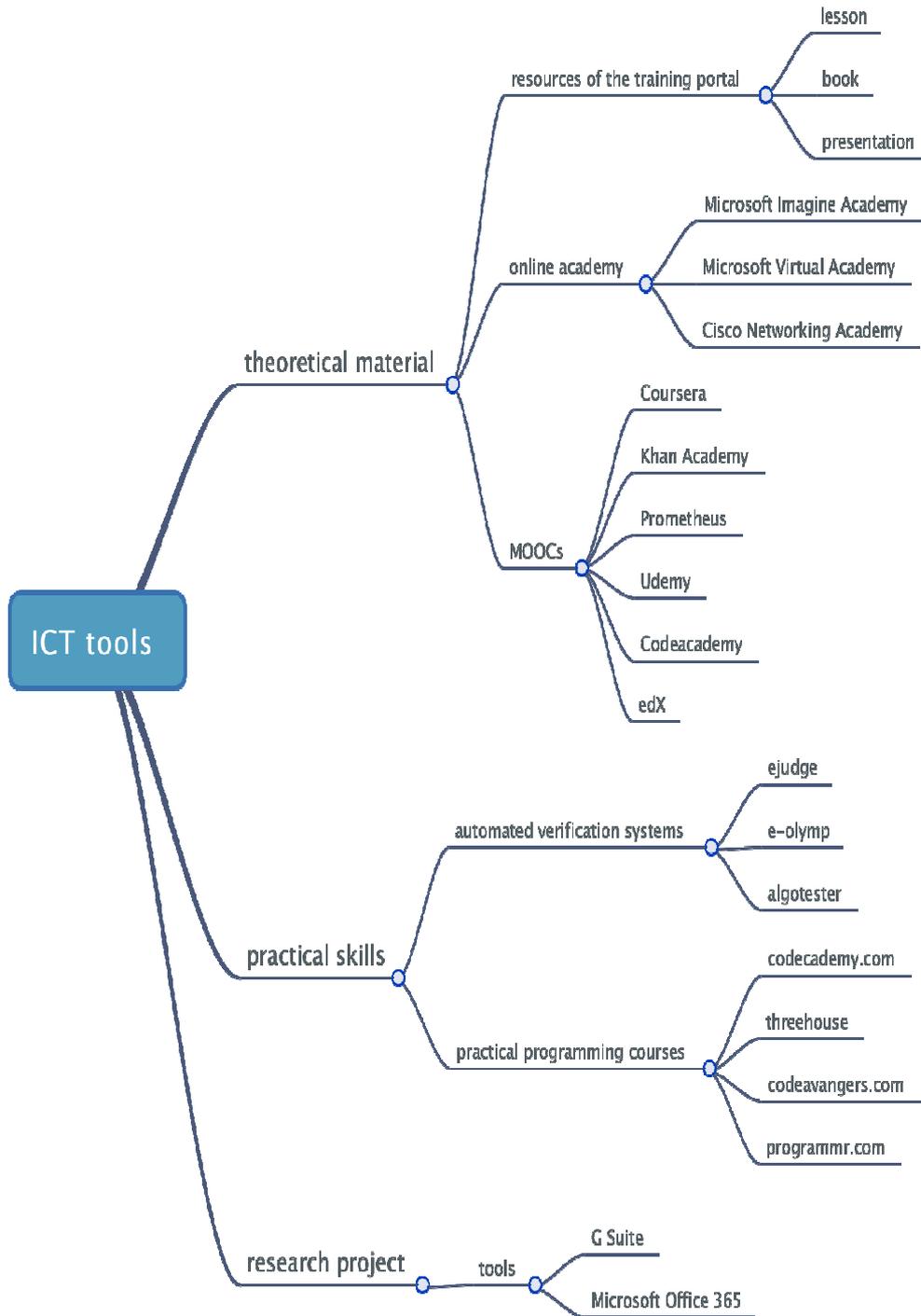


Fig. 1. ICT system for the formation of self-educational competence of future IT specialists

For the development of the students' professional and personal skills it is advisable to use group work and establish communication and collaboration among students using Microsoft Office 365 [29] or G Suite cloud services. The main criterion for choosing cloud

services for teamwork is the provision by the institution of students' user accounts, functional capabilities.

Based on the analysis of literary sources on the use of ICTs for the development of self-educational competence, we conclude that ICTs used for the development of self-educational competence are based on web technologies.

3. FINDINGS

In the course of the research, we put forward a hypothesis that the use of ICT tools system in the process of students' formal and informal education at the institution of higher education effectively influences the formation of their self-educational competence.

The research was carried out during 4 years of the project-based learning of the first-year students of the Information Technologies Faculty of the National University of Life and Environmental Sciences of Ukraine (NULES Ukraine) [30]. It was proved that all groups that participated in the experimental study at various stages were homogeneous.

Each subsequent academic year the totality of the use of ICTs in the process of training IT students changed as follows:

- 2013-2014 – ETC use based on the Moodle platform;
- 2014-2015 – supplementing ETC e-learning resources by online technology platform courses (Microsoft Imagine Academy, Cisco Academy, Prometheus, etc.);
- 2015-2016 – supplementing the e-learning environment, which consists of ETC and external online courses, by the system of automated programming tasks testing;
- 2016-2017 – supplementing e-learning tools by Microsoft Office 365, G Suite for the organization of project work by students of the first year.

To measure the students' achievement of a certain level of self-educational competence, questionnaires were developed based on the indicators identified in Table 3. To assess the level of achievement of the relevant indicator, a 100-point scale was used.

Table 3

Indicators of self-educational competence measurement

Component of self-educational competence	Indicators of self-educational competence	Measurement scale
Motivational-value-based	knows modern trends in the IT market	1...100
	is willing to take supplementary online courses	1...100
	is subscribed to professional communities (blogs, forums, sites)	1...100
	is eager to deepen knowledge of professionally-oriented disciplines	1...100
	realizes the need for self-education	1...100
	displays interest in the results of his or her work and team members	1...100
Organizational-technological	understands the peculiarities of organizational component of self-educational activities	1...100
	is able to develop an individual trajectory of self-education	1...100
	is able to plan his/her activities (to set the goal, to determine the sequence of actions)	1...100
	effectively manages the process of self-	1...100

Component of self-educational competence	Indicators of self-educational competence	Measurement scale
	improvement	
	can constantly update knowledge in the IT sphere	1...100
	is able to efficiently distribute and use resources to manage the self-educational process	1...100
	is able to effectively interact within the team	1...100
Practice-activity	is able to independently deepen the knowledge of professionally-oriented disciplines	1...100
	takes additional online courses	1...100
	can solve practical tasks of professionally-oriented disciplines in the field of information technologies	1...100
	does tasks unassisted and independently makes decisions	1...100
	can independently work on an IT project	1...100
	is capable of building a professional relationship in the team	1...100
Reflexive-analytic	is ready for the assessment of his/her self-education and results of work	1...100
	can analyze the results of self-educational activities	1...100
	can analyze the shortcomings of the self-educational process and correct methods of work depending on the results	1...100
	is able to objectively assess the results of his/her activities	1...100
	is able to develop perspective trends of further professional self-development	1...100
	adequately evaluates the work of team members	1...100

All the students who participated in the pedagogical experiment were evaluated by each indicator. The mean for all indicators was taken to form a contingency table. Clustering of values was carried out according to the following principle: students who received an average score of 1 to 60 have a low level of self-educational competence, 61 to 82 – a middle one and 83 to 100 – a high one. Thus, the results of self-educational competence assessment according to three levels depending on the use of the ICT tools system in the learning process are grouped in Table 4. The table also demonstrates the expected frequencies, assuming there are no differences between the levels of self-educational competence in experimental groups.

Table 4

The contingency table of the levels of self-educational competence depending on the system of ICT tools used

			levels of self-educational competence			Total
			low	middle	high	
ICT tools	e-learning course	Frequency	20	18	6	44

		Expected frequency	12,9	17,7	13,4	44,0
	MOOCs	Frequency	16	20	10	46
		Expected frequency	13,5	18,5	14,0	46,0
	MOOCs/ejudge	Frequency	12	18	14	44
		Expected frequency	12,9	17,7	13,4	44,0
	MOOCs/ejudge/ o365 (G Suite)	Frequency	9	22	29	60
		Expected frequency	17,6	24,1	18,2	60,0
Total		Frequency	57	78	59	194
		Expected frequency	57,0	78,0	59,0	194,0

In the contingency table (Table 4) the expected frequency column shows the theoretical (expected) value of the self-educational competence level, provided that the totality of ICT tools did not produce any effect. As we see from the analysis of the table, the actual levels significantly differ from the theoretical ones: at low levels of competence, the actual values are lower than expected and vice versa. Given that we work with ordinal variables, we can observe a direct relationship.

For quantitative confirmation, we use the Pearson consistency criterion χ^2 . The estimated value of the Pearson criterion (Table 5) is higher than the critical for 6 degrees of freedom: $20.510 > 12.5916$. This statement is supported by the value of asymptotic significance, which determines the error probability in the rejection of the null hypothesis. Consequently, we adopt the alternative hypothesis: the use of the ICT tools system affects the increase in the level of students' self-educational competence.

Table 5

χ^2 criteria

	Values	Degrees of freedom	Asymptotic value (bilateral)
Pearson's chi-squared test	20,510 ^a	6	,002
Relation of plausibility	21,083	6	,002
Linear-linear connection	19,665	1	,000
Number of valid observations	194		

We will additionally analyze the table of symmetrical measures (Table 6) in which the correlation coefficients are given. In this table, we are interested in the Spearman correlation, which indicates a direct relationship between the factors.

Table 6

Symmetrical measures

		Values	Asymptotic standard error	Approx. T ^b	Approx. significance
Interval by interval	R Pearson	,319	,065	4,667	,000 ^c
Ordinal by ordinal	Spearman correlation	,320	,065	4,688	,000 ^c
Number of valid observations		194			
a. Not having in view the truth of the null hypothesis					
b. An asymptotic standard error is used in assuming the truth of the null hypothesis					
c. On the basis of normal approximation					

Given that we are dealing with ordinal variables, we can observe a direct relationship. Graphically, this can be seen in the cluster diagram (Figure 2), where we observe an increase in the level of self-educational competence, depending on the more frequent application of the ICT tools totality.

In particular, 45% of the students who used only the internal resources of the academic cloud in the educational process, namely, electronic training courses in disciplines, show a low level of self-educational competence and their average point is 60.1; 41% of students show a middle level with an average point of 63.9; 14% of students demonstrate a high level and their average point is 88.2.

35% of the students who used the ETC e-resources in the training process, complemented by online courses of technological platforms, show a low level of self-educational competence, the average point of 60.4; 43% of students showed a middle level and accordingly an average point was 65.0; a high level of self-educational competence was demonstrated by 22% of students, the average point is 85.2.

27% of students using in their learning process ETC and external online courses complemented by a system for automated testing of programming tasks showed a low level of self-educational competence and an average point of 60.1; 41% demonstrate the middle level and the average score is 66.1; 32% of students showed a high level of self-educational competence with an average point of 84.2.

In the course of studying their professionally-oriented academic disciplines 15% of students who used ETC, online academies, MOOCs, automated testing systems and programming sites and services Microsoft Office 365, G Suite for the organization of project work demonstrate the low level of self-educational competence and their average point of 60.5; 37% show a middle level and their average score is 68.0; 48% show a high level with an average point of 89.1.

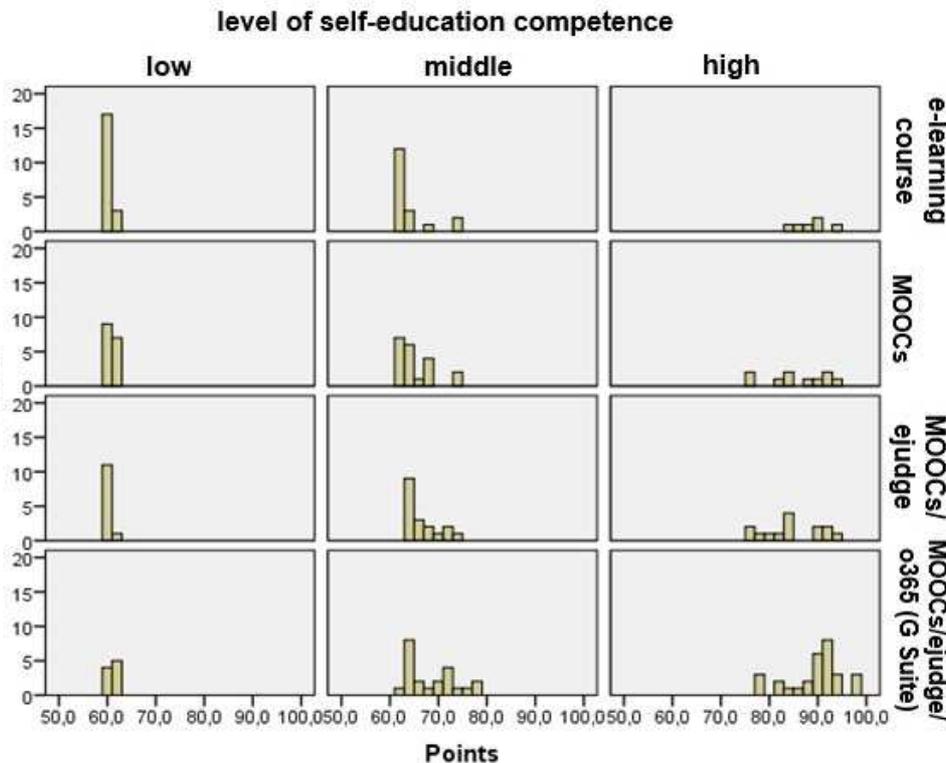


Fig. 2. Cluster diagram of the dependence of the self-educational competence level on the use of ICT tools system

The presented results of the experimental study indicate a positive effect of using the ICT tools in the learning process on the level of self-educational competence of future IT specialists.

4. CONCLUSIONS AND PROSPECTS FOR FURTHER RESEARCH

The analysis of the research results indicates the dynamics of the growth of the students' self-educational competence level depending on the use of the ICT tools system. The proposed system of ICT tools, which includes the resources of the University educational portal, the online academy, massive open professionally-oriented online courses, computer-aided code verification systems, practical programming courses, cloud platforms for the development of software systems, the environment for implementing collective projects, affects the formation of self-educational competence of future IT specialists. In particular, as a result of the conducted experimental study, the number of students with a low level of self-educational competence decreased by 30%, with a middle level increased by 4%, with a high level increased by 34%.

REFERENCES

- [1]. Bilousova L., Kiselyova O., «Competence of self-education in modern conditions», *Information Technologies and Learning Tools*, vol. 1 (27), 2012. [Online]. Available: <http://www.journal.iitta.gov.ua> (in Ukrainian).
- [2]. Bukhlova N., «Organization of students' self-education activity». Kharkiv, Ukraina: Osnova, 2003 (in Ukrainian)
- [3]. Voropay N., «Formation of Self-Educating Competence in Future Primary School Teachers by Means of Information and Communication Technologies», author's abstract. dis Cand. ped Sciences: 13.00.04, Kherson. state Unt., Kherson, 2011 (in Ukrainian).
- [4]. Gurevich R., «Formation of Self-Educating Competence of the Future specialists on the basis of educational and professional activities», *Adult Education: Theory, Experience, Perspectives*, vol. 5, p. 39-44, 2012 (in Ukrainian).
- [5]. Yevsyukova L., «Formation of self-education competence is necessary condition of qualitative training of future life safety specialists», *Modern information technologies and innovative teaching methods in the training of specialists: methodology, theory, experience, problems*, vol. 30, p. 351-355, 2012 (in Ukrainian).
- [6]. Kasiyants S., «The Role of Self-Educating Competence in the Process of Professional Elaboration of Future Economists», *Humanitarian Bulletin of the Hryhorii Skovoroda Graduate School of Pedagogical Sciences Pereyaslav-Khmelnytsky State Pedagogical University: Thematic issue Higher Education of Ukraine in the Context of Integration into the European Educational Space*, Annex 1 to vyp. 31, vol. II (44) p. 442-450, 2012 (in Ukrainian).
- [7]. Kasiyants S., «Formation of Self-Educating Competence of the Future economists in the process of training», author's abstract. dis Cand. ped Sciences: 13.00.04, National Pedagogical University named after M.P. Dragomanov, Kyiv, 2017. (in Ukrainian).
- [8]. Mosya I., "Formation of self-educational competence of skilled workers: monograph" dyser. Cand. ped Sciences, National Academy of Sciences of Ukraine, Institute of Technology, prof. Education, Kyiv, 2013. (in Ukrainian).
- [9]. Bilousova L., Kiselyova O., «Technology of formation in the future Teachers of competence of self-education using the potential of the information-learning environment», *Information Technologies in Education*, vol. III, p. 11-20, 2009 (in Ukrainian).
- [10]. Kopul O., «Pedagogical conditions of use of information communication Technologies in the formation of self-educational competence», *Humanization of the educational process*, vol. LIX, p. 108-113, 2012 (in Ukrainian).
- [11]. Fedorenko O., «Factors of formation of self-educational competence of the future teacher by means of information and communication technologies», *Visnyk of Zhytomyr State University. Pedagogical sciences*, vol. 1 (73), p. 155-158, 2014 (in Ukrainian).

- [12]. Chebotareva E., «Development of self-educational competence students in the process of project activities», *Bulletin of Tambov University of G. R. Derzhavin. Series Humanities*, vol. 5 (73), p. 121-125, 2009 (in Russian).
- [13]. Scholok O., «Informational and educational environment as a factor formation of competence in the future specialist in the process of self-education», *Collection of scientific works. Pedagogical sciences*, vol. 43, p. 366-370, 2006 (in Ukrainian).
- [14]. Dovmantovich N., «Self-education competence of future specialists in pedagogical theory», *Pedagogical Process: Theory and Practice*, vol. 3, p. 18-22, 2014 (in Ukrainian).
- [15]. Striguna S., «Essence of Self-Education Competence in Pedagogy», *Society. Integration. Education*, vol. I, p. 405-414, May, 2015. doi: 10.17770/sie2015vol1.308 (in English).
- [16]. Nasimov A., «Shaping self-educational competence beside pupils of the institutions of the average vocational training», *ILT'2015 conference Singapore*, p. 122-123, 2015. doi: 10.15550/ASJ.2015.06.122 (in English).
- [17]. Kovalenko N., «Formation of self-educational competence of students of the main school of rural area», author's abstract. Cand. ped Sciences: 13.00.09, Institute of Pedagogics, Academy of Pedagogical Sciences of Ukraine, Kyiv, 2009 (in Ukrainian).
- [18]. Pryshupa Yu., «Formation of self-education competence of future engineers-builders in the process of professional training», diss. Cand. ped. Sciences: 13.00.04 Theory and Methods of Professional Education, Kyiv, 2016 (in Ukrainian).
- [19]. Chebotareva E., «Information technologies in the development of self-educational competence of students», *Bulletin of the Moscow City Pedagogical University. Series Informatics and Informatization of Education*, vol. 6 (16), p.185-186, 2009 (in Russian).
- [20]. Bodnar S., «Formation of self-educational competence of students economic specialties in the process of studying a foreign language», *Scientific notes Series: Pedagogy*, vol. 2, 2014. [Online]. Available: <http://pedagogica.tnpu.edu.ua/wp-content/uploads/2015/11/19.pdf> (in Ukrainian).
- [21]. Vovk B., «Pedagogical Conditions for the Formation of Self-Educating Competence of Future Teachers of Practical Training in Vocational Education», *Bulletin of the Cherkasy University*, vol. 18, p. 24-31, 2016 [Online]. Available: <http://ped-ejournal.cdu.edu.ua/article/view/1165/1223> (in Ukrainian).
- [22]. Lebed G., «Intensification of the educational process as a necessary condition for the development of self-educational competence of future technical specialists profile», *Information technology in education, science and production*, vol. 4 (9), p. 180-186, 2014 (in Ukrainian).
- [23]. Ol'khovskaya M., «Specificity of the formation of self-educational competence of future engineers-teachers», *Scientific papers*, vol. 173, no. 161, p. 84-88, 2013 (in Ukrainian).
- [24]. Fedorenko O., Zima G., «The use of computer technologies for the formation of self-educational competence of future technology teachers in the historical aspect». [Online]. Available: [http://nvd.luguniv.edu.ua/archiv/2016/N1-2\(33-34\)/7.PDF](http://nvd.luguniv.edu.ua/archiv/2016/N1-2(33-34)/7.PDF) (in Ukrainian).
- [25]. Samusevica A., Striguna S., «The Development of Teachers' Pedagogical Competence in The Process of Self-Education at The University», in *3 International conference on lifelong education and leadership for all ICLEL 2017*. [Online]. Available: <http://www.ijlel.com/conference17/108.pdf> (in English).
- [26]. Yavorskaya T., «Structure, criteria and levels of self-education competence development among future specialists of the economic branch», *Vocational education: problems and perspectives*, vol. 8, p. 56-61, 2014 (in Ukrainian).
- [27]. Shvachka L., «Analysis of the results of the experiment of development of professional self-education competence of future teachers of higher education», *Engineering and Educational Technologies*, vol. 1 (9), p. 28-33 2015 (in Ukrainian).
- [28]. Glazunova O., Voloshyna T., Dorosh N., «Development of professional and soft skills of future IT specialists in cooperation with leading IT companies», *Information Technologies and Learning Tools*, vol. 60, no. 4, p. 141-154, 2017. [Online]. Available: <https://journal.iitta.gov.ua/index.php/itlt/article/view/1697> (in English).
- [29]. Glazunova O., Kuzminska O., Voloshyna T., Sayapina T., Korolchuk V., «E-environment based on Microsoft Sharepoint for the organization of group project work of students at higher education institutions», *Information Technologies and Learning Tools*, vol. 62, no. 6, p. 98-113, 2017. [Online]. Available: <https://journal.iitta.gov.ua/index.php/itlt/article/view/1837> (in English).
- [30]. Voloshyna T., «The use of a hybrid cloud-based learning environment for forming the self-education competence of future IT specialists», M.S. thesis, NULES, IITLT of NAPS of Ukraine, Kyiv, 2018 (in Ukrainian).

Text of the article was accepted by Editorial Team 23.02.2018.

ФОРМУВАННЯ САМООСВІТНЬОЇ КОМПЕТЕНТНОСТІ МАЙБУТНІХ ФАХІВЦІВ З ІНФОРМАЦІЙНИХ ТЕХНОЛОГІЙ

Глазунова Олена Григорівна

доктор педагогічних наук, доцент, декан факультету інформаційних технологій
Національний університет біоресурсів і природокористування України, Київ, Україна
ORCID 0000-0002-0136-4936
o-glazunova@nubip.edu.ua

Волошина Тетяна Володимирівна

старший викладач кафедри інформаційних і дистанційних технологій
Національний університет біоресурсів і природокористування України, Київ, Україна
ORCID 0000-0001-6020-5233
t-voloshina@nubip.edu.ua

Стариченко Євгеній Михайлович

старший викладач кафедри інформаційних систем
Національний університет біоресурсів і природокористування України, Київ, Україна
ORCID 0000-0001-8608-5268
starychenko.e@gmail.com

Анотація. Стаття присвячена теоретичним та практичним аспектам формування самоосвітньої компетентності студентів ІТ-спеціальностей. Визначено поняття та структура самоосвітньої компетенції. Здійснено аналіз інформаційних ресурсів та сервісів, які використовуються для формування та розвитку самоосвітньої компетенції. У статті запропоновано систему ІКТ-інструментів для формування самоосвітньої компетентності майбутніх фахівців з інформаційних технологій: ресурсів університетського освітнього порталу, онлайн академій, масових відкритих професійно-орієнтованих Інтернет-курсів, комп'ютерних систем перевірки коду, практичних курсів програмування, хмарних платформ для розробки програмних систем, середовищ для реалізації колективних проектів. Запропоновано систему індикаторів для визначення рівня самоосвітньої компетентності за такими компонентами, як: мотиваційно-ціннісний, організаційно-технологічний, практично-діяльнісний, рефлексивно-аналітичний, і визначено такі рівні формування самоосвітньої компетентності майбутніх ІТ-спеціалістів, які будуть відображати якісні та кількісні характеристики досліджуваної концепції: високий, середній та низький. У статті наведено результати експериментальних досліджень щодо формування самоосвітньої компетенції майбутніх спеціалістів з інформаційних технологій за допомогою розробленої системи інструментів ІКТ, зокрема, позитивний вплив використання інструментів ІКТ у навчальному процесі на рівні сформованості самоосвітньої компетенції майбутніх ІТ-фахівців. Обґрунтовано теоретичні та методологічні аспекти формування самоосвітньої компетентності майбутніх ІТ-фахівців за допомогою використання ресурсів та послуг інформаційно-освітнього середовища вищого навчального закладу.

Ключові слова: самоосвітня компетентність; ІТ-фахівець; інформаційні та комунікаційні технології; навчальний портал; хмарні платформи.

ФОРМИРОВАНИЕ САМООБРАЗОВАТЕЛЬНОЙ КОМПЕТЕНТНОСТИ БУДУЩИХ СПЕЦИАЛИСТОВ ПО ИНФОРМАЦИОННЫМ ТЕХНОЛОГИЯМ

Глазунова Елена Григорьевна

доктор педагогических наук, доцент,
декан факультета информационных технологий
Национальный университет биоресурсов и природопользования Украины, Киев, Украина
ORCID ID 0000-0002-0136-4936
o-glazunova@nubip.edu.ua

Волошина Татьяна Владимировна

старший преподаватель кафедры информационных и дистанционных технологий
Национальный университет биоресурсов и природопользования Украины, Киев, Украина
ORCID ID 0000-0001-6020-5233
t-voloshina@nubip.edu.ua

Стариченко Евгений Михайлович

старший преподаватель кафедры информационных систем
Национальный университет биоресурсов и природопользования Украины, Киев, Украина
ORCID ID 0000-0001-8608-5268
starychenko.e@gmail.com

Аннотация. В статье рассматриваются теоретические и практические аспекты формирования самообразовательной компетентности студентов ИТ-специальностей. Определены концепция и структура самообразовательной компетентности. Проанализированы информационные ресурсы и сервисы, которые используются для формирования и развития самообразовательной компетентности. В статье предлагается система ИКТ-инструментов для формирования самостоятельной образовательной компетенции будущих ИТ-специалистов: ресурсы образовательного портала университета, онлайн-академии, массовые открытые профессионально-ориентированные онлайн-курсы, системы проверки кода с использованием компьютера, практические курсы программирования, облачные платформы для разработки программных систем, среда для реализации коллективных проектов. Предложена система индикаторов для определения уровня сформированности самообразовательной компетентности по таким компонентам, как: мотивационно-ценностный, организационно-технологический, практический, рефлексивно-аналитический, а также определены такие уровни формирования самообразовательной компетенции будущих ИТ-специалистов, которые будут отражать качественные и количественные характеристики исследуемого понятия: высокий, средний и низкий. В статье представлены результаты экспериментальных исследований по формированию самообучающейся компетенции будущих ИТ-специалистов с использованием разработанной системы инструментов ИКТ, в частности, положительного влияния использования инструментов ИКТ в учебном процессе на уровень сформированности самообразовательной компетенции будущих ИТ-специалистов. Обосновываются теоретические и методологические аспекты формирования самостоятельной образовательной компетенции ИТ-специалистов посредством использования ресурсов и сервисов информационно-образовательной среды вуза.

Ключевые слова: самообразовательная компетентность; ИТ-специалист; информационные и коммуникационные технологии; учебный портал; облачные платформы.



This work is licensed under Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License.