Practical Realization of English Knowledge Control of Future IT-specialists Using Distance Learning

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Abstract. At teaching English for specific purposes (ESP) at the university, it is important to find the ways to increase students' motivation for understanding the importance of learning the foreign language and how they might use the communication skills at professional activity. The model and its practical realization of English knowledge control of future software engineers in distance learning are performed. The designed model is based on task based learning and interdisciplinary connections of different cycle disciplines: "English for Special Purpose" and disciplines of the software cycle. The various types of control tasks and testing are realized using electronic-educational environment "Kherson Virtual University".

Key words: Distance learning technologies, Knowledge control, Electronic-educational environment, Distance learning system "Kherson Virtual University", IT-specialists, Electronic educational resources.

1 Introduction

Today, the English Language for Professional Communication Program (2005) [1] sets the task for teachers: to provide bachelor English training level B2 (on the scale of Common European Framework of Reference for Languages: Learning, Teaching, Assessment), i.e. "to form common and professionally oriented communicative language competences in students (linguistic, sociolinguistic and pragmatic) to ensure their effective communication in the academic and professional environment [2]".

It concerns the future IT-specialists, new informational technologies is constantly developed and increased. The specificity of professional training of IT-specialists requires the use of a foreign language at study of professional disciplines, that is, in the educational sphere. In the professional field the foreign language use manifests itself at searching and processing of information from Internet resources, programming, as well as communication with foreign partners by electronic communication, etc.

Modern society requires the specialists who have systemic analytical thinking, are able to generate, formulate and develop ideas, understand the social context of the problem being solved, realize the responsibility for the consequences of the decisions made, quickly adapt to new conditions, and find ways out of problem situations.

Informatization of all spheres of the life demands from the specialists the ability to navigate the information space, to quickly find and process the necessary information, to use electronic communications, software in solving professional problems.

In the era of rapid IT development there is information-communication technologies (ICT) introduction into all spheres of human activity, including education. The newest paradigm "student – education technologies – teacher" comes to replace the traditional one of teaching "teacher – textbook – student". The focus on informatization of education is declared in the state documents: Law of Ukraine "On the National Informatization Program" [3], The Law of Ukraine "On Higher Education" [4]; the main tasks are the ICT introduction into the educational process and research activity; development, implementation and legalization of educational software; implementation of distance learning technologies. Its introduction will improve the quality, accessibility and competitiveness of national education and science in the world labor market and educational services provide citizens with access to scientific and educational resources and make conditions for lifelong learning (LLL).

The IT use in English language learning for professional communication (ELLPC) of future IT-specialists is quite natural, there will made the educational lingual environment which are as close as possible to the real use of foreign language by IT professionals at professional activity.

The significant increase in the motivation of students to learn a foreign language (English) is realized if IT integrates into the learning process and in disciplines of mathematical and software cycle. IT includes attracting multimedia technical means, telecommunication facilities, and software applications with a "friendly" interface. However, there is the lack of complexity and systematization in IT use in education process of future IT-specialists. In addition, the most educational software tools are characterized by "lack of clarity" and also do not meet the principles of computer linguodidactics – an independent area of didactics and teaching methods of foreign languages. It requires research on a range of theoretical and practical issues related to the development of IT-based teaching materials that are relevant to the profile of the university and the goals of learning, and are subject to a certain methodological concept. In recent years, the methodological tools of computer linguodidactics have been replenished with a large number of up-to-date researches.

2 Relative works

The number of researches is devoted to methodological problems of teaching disciplines of mathematical and software cycle of different specialties, such as "Cybernetics", "Management of Information Systems", and "Applied Informatics in Economics" and so on. There are not so many researches to methodology of effective teaching the discipline "English for Special Purpose" for future IT-specialists using distance technologies in the university. S. Dyudyakova [5] offered to teach students basic concepts of information sciences in foreign language for effective reading manuals. I. Chirva [6] taught future IT-specialists questioning using computer

programs. Y. Bulakhova [7] proposed integrated multimedia use. L. Salnaya [8] developed an algorithm for organizing a conference in foreign languages for the third and fourth year students of the university. O. Synekop [9] developed an interactive course for teaching writing using mind maps and Wiki-resources. V. Strilets [10] focused on teaching reading and writing, implementing a project to develop a site with a focus on its content.

We consider the implementation of such projects to be a good foundation for the transition to more advanced learning technologies such as business game as they lay the foundations of team work. The results of these studies are undoubtedly important, but their analysis shows there are no researches of knowledge control of foreign language of future IT-specialists using distance technologies. This problem is very urgent and need to be analyzed.

The purpose of the paper is to present the author's model of English knowledge control of future IT-specialists using distance technologies and describe its practical realization.

3 The Main Problem

The concept "professional competence" is reflected in a large number of scientific works, but in today's psychological and pedagogical science, the problem of professional competence of future IT-specialists is not unambiguous. Various interpretations of "professional competence" of future IT-specialists are due, above all, the peculiarities of the structure of the professional activities of various professional industries. However, the basic characteristic of this concept is the degree of formation of knowledge, skills, abilities and experience that ensure the performance of professional activities (L. Konoplenko [11] etc.). There isn't currently the one definition of "competence formula" (M. Choshanov [12]), professionalism criteria (A. Markova [13]), qualities of professional competence, and also personal professionalism. This term has not yet been fully studied, is not sufficiently investigated in psychological and pedagogical science and in most cases it is used to determine the high level of qualification and professionalism of a specialist.

After analyzing the researches we provided the following definition of the "professional competence of future IT-specialists" is a set of value orientations, knowledge, skills, determining the effectiveness of professional activity, professional psychological knowledge, a complex of professionally significant personal qualities and properties, unity of the theoretical and practical readiness to professional activity.

The most important professional quality competent of IT-specialists is communicative i.e. communication skills are essential for professional IT work, the future specialist works in the human-person field, which implies the ability to function successfully in the system of interpersonal relationships. The communication is closely linked to the communicative competence of a specialist in general. There are many scientific advances in terms of the concept "communicative competence": ability, property or a set of knowledge, skills and abilities.

So, “communicative competence of future IT-specialists” is a multifunctional and hierarchically-built system, which is formed in the professional training of future IT-specialists in a higher educational institution.

The analysis of the pedagogical concepts of scientists gives the reason to consider the formation process of professional competence, in particular, the effectiveness and quality of knowledge control of future software engineers with the use of distance learning technologies, will be successful due to the following requirements:

- Formation of a positive motivation to study and professional activity;
- Immersion of future IT-specialists in lingual (English) environment to improve the communication skills using ICT and distance learning technologies;
- Introduction developed electronic educational resources (EER) of knowledge control of students of IT specialties in educational process.

To substantiate the first requirement, the researches of V. Bykov, H. Kravtsov, O. Hniedkova and others were analyzed. It makes possible to determine the main factors for increasing the motivation of students for studying and professional activities, such as: pedagogical interaction, developing of a comfortable psychological climate and positive emotional mood of students in the educational process.

To immerse students into lingual (English) environment, it is necessary to choose authentic texts that correspond to modern realities (authentic innovative materials). The important factor in improving the communicative skills of future IT-specialists is the use of information and communication and distance technologies at immersing students into the lingual (English) environment. Due to the rapid ICT development, it is possible to develop the informational and educational environment (IEE). It includes electronic educational resources: educational Internet resources and distance courses. EER provide students with information in foreign language; students acquaint with cultural information of the country, learn the world, communicate with native speakers, improve and develop communication skills in IT sphere. It makes the IEE [16].

The third requirement is introduction developed EER of knowledge control of students of IT specialties in the educational process. Testing, laboratory works, project and group student’s activity were developed in IEE in the form of distance course and realized in English learning process of future IT-specialists in the university.

At conducting practical experiment of using distance learning technologies in English knowledge control of future IT-specialists, the criteria, indicators, diagnostic tools of professional competence formation of future IT-specialist were developed (Table 1).

Summarizing the results on determining the levels of professional competence formation, we have identified three knowledge levels: low, medium and high.

The formation of the professional competence of future IT-specialists as a holistic process involves the dynamics of passage from a low level, that is, from the formation of the optimal invariant of knowledge and skills at the user level to the high level that corresponds to the conscious, methodically competent ICT use in professional

activity, due to the high level being considered as ability and readiness to apply their knowledge.

Table 1. Criteria, indicators, diagnostic tools of professional competence formation of future IT-specialist

Criterion	Indicator	Diagnostic tools
1.Motivational	professional motives	Methodology "Motivation of studying at university" by T.Ilina
	professional orientation	Methodology "Structural orientation of IT-specialists"
	motivation for information activities	Methodology for determining the motivation to informational activity (based on the questionnaire by V. K.Gerbachevskiy)
2. Linguo sociocultural	the ability correctly pronounce the sounds of English with the corresponding to the semantics of utterance intonation and appropriately to use lexemes and grammatical constructs in phrases according to context;	Didactic testing
	the ability to determine the nationally-marked units in the text and use them in monologue and dialogical speech in order to influence the mindset of the addressee;	Exercises
	the ability to distinguish the linguistic and socio-cultural information, understand its meaning, compare it with the culture of its country, apply it in the speech;	Exercises
3.Informational	Software knowledge, ability to develop, test the programs applications	Testing

In order to study the problem of organizing knowledge control of future IT-specialists using distance learning technologies, the pedagogical experiment was

conducted in the universities. The experiment covered 250 persons, among them: 224 students, 26 teachers of Ukrainian universities.

The preliminary stage of the experiment was conducted in two stages: the first one is the analysis of educational and methodological support for students' knowledge control, interviewing teachers and students with the aim of studying the experience of organizing knowledge control using distance learning technologies, developing diagnostic tools, experimentally determining the initial state of formation of professional competence of future IT-specialists, proving the equivalence of the control and experimental groups.

At the analysis of the curricula of professional disciplines, the procedure of conducting current, intermediate, routine and final control of academic achievements of students was determined. Analysis of the curricula showed the lack or insufficient level of ICT use and distance learning technologies at the study of future IT-specialists' training disciplines.

The greatest contradiction of the higher school is the lack of identity of the subjects to activity, the educational and future professional one. One way to overcome this contradiction is to introduce the integrating subjects into the educational process, studying of professional disciplines should be in English. One of the most important disciplines is "English for Special Purpose". It directly influences the formation of professional foreign language communicative competence of future IT-specialists. However, at practical English classes, lessons in lingua phone office are rarely conducted using ICT and distance learning technologies. Also, ICTs and distance learning technologies are not used at knowledge control. To enhance the effectiveness of "English for Special Purpose", we propose to use of ICTs and distance learning technologies in the educational process and knowledge control. To implement it, we propose to organize the learning and controlling of knowledge using the testing system of distance learning system "Kherson Virtual University" (DLS KVU) (http://dls.ksu.kherson.ua/dls/Default.aspx?l=1) [17]. It provides a great opportunity to design training courses for students and organize knowledge control process. At qualifying stage of the pilot study, the survey was conducted by teachers of higher educational institutions regarding the substantive substantiation of professional competence formation and the ICT use and distance learning technologies in professional training and knowledge control organization of future IT-specialists. The data of the questionnaire indicate that a significant number of teachers (about 60-70%) are convinced that the formation of the professional competence of the future IT-specialists should be changed in ICT application in the educational process and distance learning technologies, in order to implement more effective professional training of IT- specialist in labor activity.

In order to do the second stage of the experiment – determining the level of professional competence of future IT- specialist by motivational, linguo socio-cultural, informational criteria, the number of diagnostic techniques was conducted.

Two groups of respondents were selected to identify the levels of professional competence of the future IT- specialists: Experimental group (EG) is 106 students and Control group (CG) is 118 students.

The general characteristics of the levels of formation of the professional competence of future IT-specialists (according to the criteria) are presented.

Table 2. General characteristics of the levels of formation of the professional competence of future IT-specialists

Student groups	Levels	Criteria							
		Motivational		Linguo socio cultural		Computer Science		Arithmetical mean	
		n	%	n	%	n	%	n	%
EG n=106	High	21	19,8	17	16	15	14,2	16	15,1
	Medium	21	19,8	29	27,4	25	23,6	25	23,6
	Low	64	60,4	60	56,6	66	62,3	65	61,3
CG	High	26	22	20	16,9	12	10,2	18	15,3
n=118	Medium	33	28	37	31,4	29	24,6	33	28,0
	Low	59	50	61	51,7	77	65,3	67	56,8

In order to verify the probability of the results of the confirmatory stage of the experiment, a statistical analysis of the obtained diagnostic results, which is characteristic for pedagogical researches, was conducted.

The reliability of coincidences or differences between the number of points scored by students of EG and CG was calculated by the criterion of homogeneity χ^2. Comparing χ^2 emp with the critical value of χ^2 is 0.05, we see that the characteristics of EG and CG coincide with the level of significance of 0.05 because the obtained value χ^2 emp = 0.6 < χ^2 critical = 5.99. In the case when χ^2 emp < χ^2 crit it is a confirmation of the fidelity of our hypothesis i.e. the control and experimental samples are identical. Other results χ^2 emp > χ^2 crit will mean that the distribution of students in the CG and EG is statistically different.

Consequently, the results of the calculations showed that there is no statistically significant difference in the control and experimental groups, so they can be used for the next stage of the experiment – the forming experiment.

The obtained generalized results of the levels of the formation of professional competence of future IT-specialists are presented. (see Fig. 1).

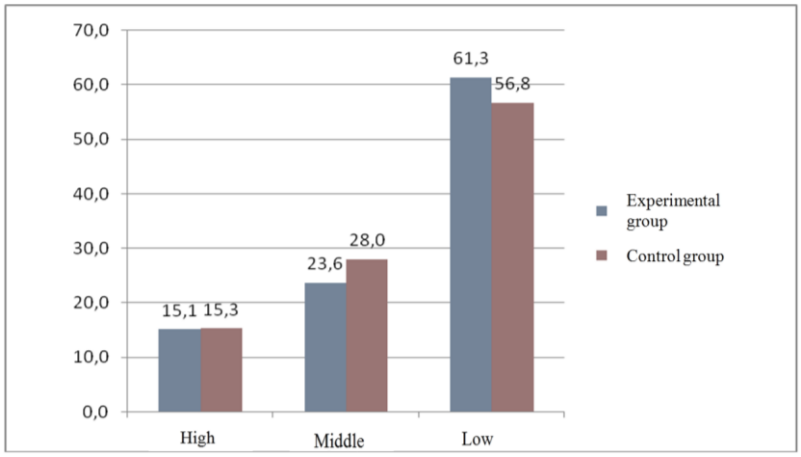

Fig. 1. Levels of formation of professional competence of future software engineers (based on the results of the experiment).

Thus, analyzing the obtained data, we note the future IT-specialists are dominated by average and low quantitative indicators of levels of formation of professional competence by the criteria.

According to the results of the qualifying stage of the pilot study, the initial state of the formation of professional competence of future IT-specialists is determined: the majority of students 61,3% of the EG and 56,8% of the CG have a low level of professional competence, 23,6% of the EG and 28% of the CG are middle level and only 15, 1% EG and 15,3% CG have a high level of professional competence.

The next step was to conduct a phase aimed at testing the hypothesis of the study: knowledge control of future IT-specialists using distance learning can be an effective means to improve the professional competence quality according the requirements.

In the experimental group, the learning process was carried out with the introduction of the structurally functional model knowledge control of future IT-specialists using of distance learning technologies.

In the control group, professional training was carried out in accordance with the traditional curricula and programs without the introduction of ICT and distance learning technologies for the knowledge control. Students of the experimental group studied the course "English for Special Purpose" using the DLS “KVU”. The purpose of the course “English for Special Purpose” is the practical mastery of the English language system by the students of technical specialties and the norms of its functioning in foreign language communication situations, the formation of students' linguistic competence for the purpose of free usage of the acquired material and skills in professional activities. Teaching English in this course has a comprehensive implementation of practical, cognitive-educational, emotional-developing, professional and educational goals. As a result of learning in the course: students have to attain B2 levels in listening, writing and dialogue, and monologue speech and reading. Schematic structure of the developed distance course “English for Special Purpose” is presented (see Fig.2).

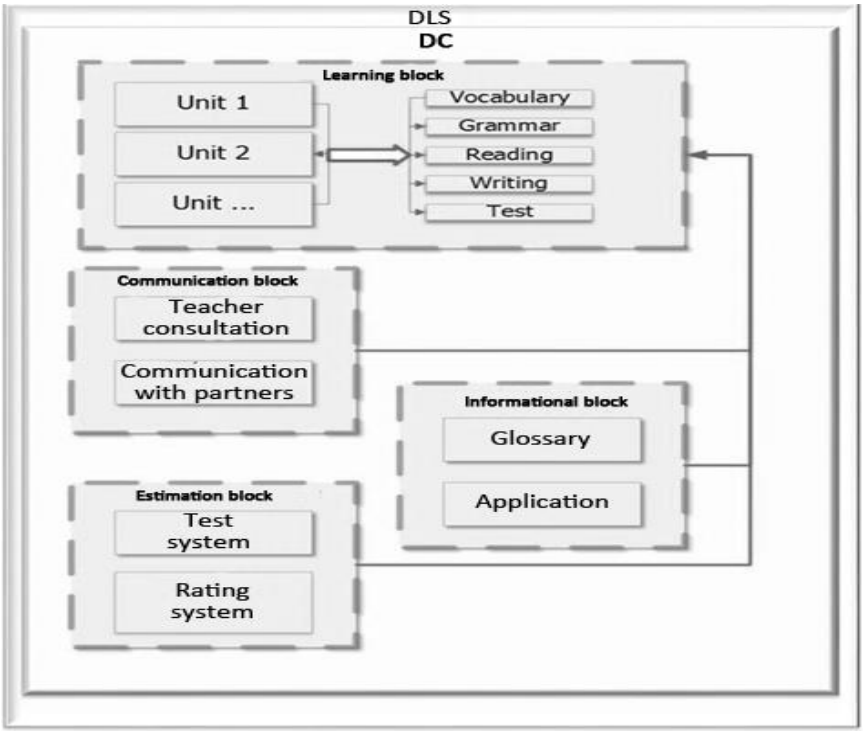

Fig. 2. Distance course "English for Special Purpose"

Let's consider the basic elements of the distance course:

- Main page;
- Course plan (list of modules (units);
- Test system;
- Forum, chat, virtual board (webinars);
- Glossary;
- Rating system.

On main page the title, annotation, goals, status of group, number of participants and advertisements are presented. There are menus "Group Pages", "Actions with Group", "Group Documents" on the main page.

"Curriculum" contains the list of units. Each topic (unit) of course includes tasks (exercises), aimed at the formation of all types of speech activity (listening, reading, writing and speaking) and tasks for self-activity, control knowledge (testing), additional learning materials (audio, video materials or online resources).

For formation speaking skills, the exercises of problematic nature, the aim of which is description, comparison, contrasting, analysis, evaluation and drawing conclusions, defending the own point of view are developed.

For formation reading skills, exercises on forming contextual surmise for understanding unfamiliar words in text, recognition the main idea of text, structure, elements and relations between them are developed.

For formation of writing skills, exercises on writing essay, works etc. are developed. There is improvement of grammar skills in the course. Each unit includes exercises for training the various elements of the grammatical system. Exercises of correction of imperfect texts, formation of words from a given foundations and others are presented.

Thus, the exercise on improving skills in reading is presented. Students read text and use the links in text on online encyclopedia Wikipedia to get more information.

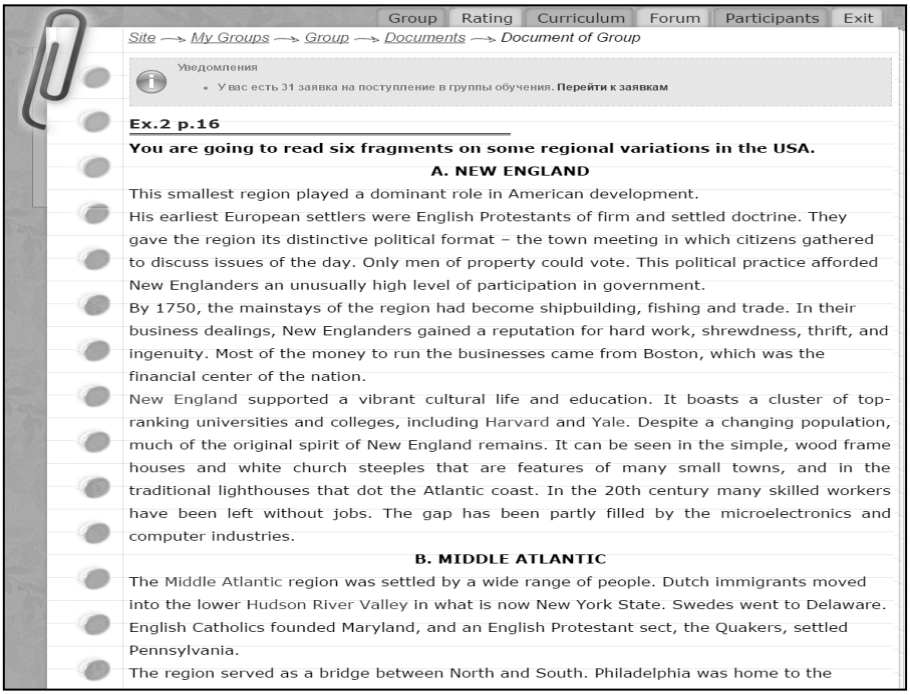

Fig.3. Improving reading skills

Fig. 4. Exercise on improving skills in reading "The USA Regions".

Then students pass tests to control knowledge. It should be noted implementation of electronic tests in educational process is one way of learning optimization and improving the process of verification and assessment. Researcher A. Mayorov said "electronic test" is system of tasks of specific form that requires simple answers and provides rapid results processing, with the help of which teacher can efficiently evaluate and measure the level of knowledge and skills [18].

In the process of educational test development it is necessary to follow certain requirements and recommendations. Thus, M. Chelishkova identifies the following requirements:

- question's content should meet curriculum requirements;
- use literary language and not use multi terms, rarely used words, slang and dialect;
- avoid trivial tasks that do not cause any difficulties;
- text of question should be formulated briefly;
- answer to one test question should not contain tips for others;
- motivated scale of assessment [19].

DLS "Kherson Virtual University" gives an opportunity to conduct testing and use the different types of questions which are realized according to IMS standard of distance learning [20].

Three types of testing are realized:

- Linear test (for correct answer the student gets the certain amount of points);
- Adaptive test (testing begin with easy questions, if the student answers questions correct, next questions are complicated, if he gives not correct answers, then simple questions are offered);
- Psychological test (each question of test has ranges of meaning, the student gathers the certain amount of points and the system determines the result).

In distance course "English for Special Purpose" all types of testing were used. Testing in the course has some specifics regarding the formation and improvement of foreign communicative language skills (reading, speaking, writing and listening). All tasks (exercises), aimed at formation and improvement of the skills are represented in such types of questions:

- one choice from many;
- many choices from many;
- open question;
- associativity;
- order;
- text in context;
- choice in context;
- multiple choices in context;
- combo box in context;
- graphic order.

At the end of the course the adaptive test is realized. Adaptive testing model is used at computer testing according to the complexity of tasks when the level of student's training with increasing accuracy is measured immediately after the response. Each next task in adaptive testing, depending on previous answers: every next task will be complicated if the previous task was done correctly. If the previous question was done with mistake, the next task will be offered easier by computer testing.

Number of test tasks is not fixed in advance, and the testing is completed after achieving of the specified assessment accuracy of level of students' knowledge. This occurs when the student has a constant level of complexity, for example, he answers to define critical (predetermined) number of questions of the same level of difficulty.

The advantages of adaptive testing are:

- to measure students' knowledge more flexibility;
- to measure the student's knowledge by fewer tasks than at the traditional testing;
- to identify themes that student knows bad, and test knowledge on this topic later.

Scientists in testing noted the reliability of the results of this test is the highest, so the computer program adjusts to student's level of knowledge [12, p.25].

Final test of course, built on an adaptive model, contains a set of questions structured in five levels of difficulty. Exercises are designed to determine the levels of foreign language communicative competence defined by Common European Framework of Reference for Languages [2].

So, the experimental test at the final stage of the study suggests that in the experimental group of future IT-specialists there are positive changes in the levels of the formation of professional competence for all criterion indicators. The changes that took place in the learning process in the experimental group due to the implementation of the knowledge management organization model significantly influenced the quality of the professional competence of future IT-specialists.

The general characteristics of the levels of professional competence of future IT-specialists at the formative stage are presented.

Table 3. Generalized results of the formation of professional competence of students of EG and CG (forming stage)

Students group	Levels	Criteria							
		Motivational		Linguo Socio Cultural		Informational		Arithmetic means	
		n	%	n.	%	n	%	n	%
EG n=106	High	56	52,8	39	36,8	49	46,2	48	45,3
	Medium	36	34	40	37,7	36	34	37	34,9
	Low	14	13,2	27	25,5	21	19,8	21	19,8
CG n=118	High	38	32,2	22	18,6	14	11,9	23	19,5
	Medium	27	22,9	39	33,1	30	25,4	34	28,8
	Low	53	44,9	57	48,3	74	62,7	61	51,7

The dynamics of the formation of the professional competence of future IT-specialists demonstrates the diagram (see Fig.5).

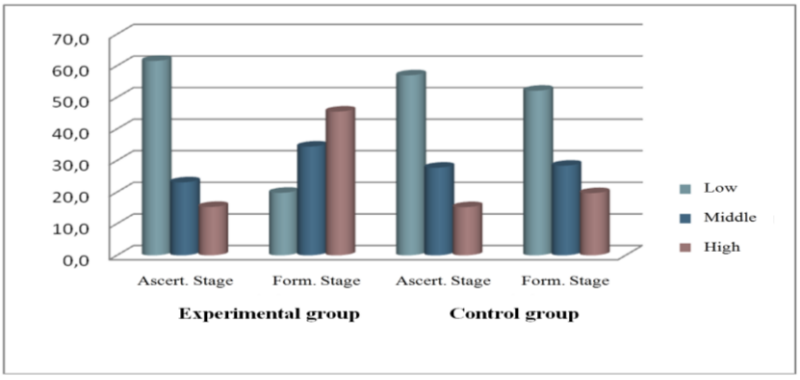

Fig. 5. Dynamics of the formation of professional competence at the formative stage of the experiment

The statistical significance of differences in the changes in the formation of professional competence in the control and experimental groups is proved by the criterion. Since χ^2 emp > χ^2 crit (27,87 > 5,99 ($p \leq 0,05$), the differences in the formation of the professional competence of the control and experimental groups are statistically significant. Thus, the statistical significance of the difference in the changes in the formation of professional competence in the control and experimental groups based on the results of the forming stage of the experiment has confirmed the effectiveness of the structural-functional model of knowledge control of future IT-specialists with the use of distance learning.

4 Conclusions and perspectives

The study identified the characteristics and structure of future IT-specialists training. The determined criteria, their informative characteristics and indicators are the basis of the selected levels of formation of professional competence: low, medium, high. The developed distance course "English for Special Purpose" and results of experimental verification of the effectiveness of knowledge control of future IT-specialists using distance learning technologies are described. It is statistically proved that the ICT introduction in English learning and the structural-functional model of knowledge control has made it possible to achieve significant changes in the levels of the studied characteristics of students in the experimental group compared to the control one. The study does not pretend to be the ultimate solution to the problem of organizing the knowledge control management of future IT-specialists with the use of distance learning. Prospects are the following areas for further research: the role and functions of a teacher in the organization of monitoring and evaluation of knowledge in the conditions of distance learning, improving the quality management system knowledge.

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