

Experimental research on the formation of future ship engineers' communicative competence based on gamification approach

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Abstract. The articles is devoted to the experimental research on the of English-language communicative competence formation of future ship engineers. The method of usage of gamification approach to form the communicative competence is proposed. The model of English-language communicative competence formation based on gamification which includes target, normative, methodological, procedural, substantive and evaluative-effective blocks is described. The article also shows the experimental research results which confirm the effectiveness of the developed structural model of English-speaking competence of future ship engineers and the methods of its formation.

Keywords: communicative competence, LMS MOODLE, gamification, ship engineers, maritime education, English for special purpose.

1 Introduction

The problem of reducing the motivation of modern students to study is caused by the information society. Recently, native and foreign researchers have made many attempts to find new tools of motivation to solve this problem. One of such modern motivation tools is gamification (the use of game practices and mechanisms in a non-game context to engage the users in problem solving).

The gamification approach supposed the idea of using game elements to make teaching and learning more interesting and effective.

The purpose of our study is to experimentally test the model of communicative competence formation of future ship engineers on the basis of gamification approach.

1.1 Analysis of recent research and publications

1.1.1 *The problem of forming English-language communicative competence of future maritime professionals in scientific discourse*

Many modern foreign and native researchers have focused their attention on the problem of forming English-language communicative competence of future maritime professionals. Native researchers include: S. Voloshynov (blended learning), S. Kozak (communicative approach, “role-play” principle), L. Morska (communicative strategies), O. Popova (system of professional speech training), O. Timofeeva (qualification courses, experienced constituent, professional reflection), V. Kudryavtseva (deep learning), S. Barsuk (dialogical speech, training profession-based situations), N. Bobrysheva (Internet resources, informational technologies), L. Lipshits (competency-based approach), I. Litvinenko (subject-language education), O. Litikova (communicative method of teaching), V. Smelikova (case study), N. Ogorodnik (level-based approach), etc.

Thus, after analyzing the basics of using the MOODLE platform as a tool for implementing adaptive training technology in the formation of English-speaking skills of future ship navigators, S. Voloshynov and H. Popova proved that the development of communicative and professional navigational competences is the most important task in training future seafarers [1]. To develop these competences, the simulation technologies of mixed reality are used in the maritime educational institution. In the dissertation on the development of the English language communicative competence of future seafarers, S. Kozak introduced and applied the technology based on the role-playing principle, which produces positive results (the experimental model of English learning is 1.8 times more effective than traditional speaking) [2].

L. Morska has demonstrated the expediency of level training of English language teachers in non-philological higher education institutions for teaching English for professional purpose [3]. Among foreign researchers who have studied the English-language communicative competence of seafarers, we highlight L. Fan, J. Fei, U. Schriever, S. Fan (assessment practices), S. I. Devi, F. S. Feroz (electrical engineering undergraduates), D. Amogne, A. Yigzaw (oral communication apprehension), Y. Q. Wang, P. Gu (comprehensive study), C. Cole, B. Pritchard (profiling, twinning, typology), P. Trenkner (specialized communication), Y. Hua, D. Ratnaningsih (listening strategies) and others. Thus, in their work on the development of English-speaking communicative competence of Chinese seafarers, researchers L. Fan, J. Fei, U. Schriever and S. Fan analyzed the attitude of employers to the current level of English-speaking communicative

competence of Chinese sailors, correlating their communicative competence with international capacity [4]. They also investigated the human factor in cases of collisions at sea, where the third reason of all the collisions is due to a misunderstanding of foreign language communication.

1.1.2 The role of International Maritime Organization

The International Maritime Organization (IMO) invites all teachers of maritime English to use the IMO Model Course 3.17, which describes how to apply the communicative approach and its advantages over the traditional one. The book also offers summaries of lessons on the use of communicative approach, especially in teaching of grammar, vocabulary, phonetics, as well as the peculiarities of speaking, reading, writing, listening skills. The IMO provides a list of references to the requirements for the formation of English-speaking communicative competence of future seafarers under Standards of Training, Certification and Watchkeeping for seafarers Convention (STCW).

The IMO has also developed STCW: A GUIDE FOR SEAFARERS, which takes into account the 2010 Manila Amendments. These amendments are intended to incorporate all the 2010 amendments to the Manila Guidelines for the use of new technologies. Clear and skilled radio communication at the operational level becomes one of the most important requirements for seafarers. A distinct requirement for marine engineers is a clear and qualified internal radio communication. The primary duty of a watchman is to use an internal communication [5]. Having analysed the scientific literature on the problem of formation of future maritime specialists' English-speaking communicative competence, we have come to the conclusion that this issue is the area of interest of many modern scientists, both native and foreign ones. The IMO also addresses this issue and proposes methods and approaches, including communicative ones. For this reason, IMO Model Course 3.17 provides a step-by-step guide to introduce a communicative approach to teaching of Maritime English to future seafarers. However, the use of innovative technologies, for example gamification approach, in the formation of English-speaking communicative competence of future ship engineers has not been fully explored.

2.1 Theoretical substantiation of pedagogical conditions of future ship engineers' English-speaking communicative competence formation

More and more modern researchers are turning their attention to specialists' English-speaking communicative competence, trying to outline and implement in training most effective pedagogical conditions of its

formation, which would allow to achieve positive changes in the levels of future ship engineers' English-speaking communicative competence.

We understand pedagogical conditions as factors that have been created for the successful completion of tasks for the most efficient result of the educational process [6].

Taking into account the above pedagogical conditions in training of maritime specialists, we outline the most effective pedagogical conditions of formation of ship engineers' English-speaking communicative competence, which would allow to achieve positive changes in the levels of the studied communicative competence formation.

We used a simulation method to combine the results of theoretical searches with innovative approaches to the professional English training of future ship engineers. The modulation method is a method of studying phenomena and processes that is based on the replacement of a particular object of study with another one, similar to it.

In order to determine the structure of the model for the formation of English-speaking communicative competence of future ship engineers, we have passed the following stages: determination of the purpose; description of the model's content; list of methodological approaches, principles, traditional and innovative forms and methods of teaching, description of selected pedagogical conditions, determination of the main result, experimental verification of the structural model. Thus, in the structure of the developed model, we include the pedagogical conditions of the training in the process of learning English, the components of English communicative competence, principles, methods and approaches, under the conditions of which proper training on ships is carried out.

The structure of communicative competence of future ship engineers consists of four components: linguistic (grammatical knowledge of syntax, morphology, phonology etc.), sociolinguistic (how to use and respond to language appropriately), discourse (organize words, phrases and sentences in order to create conversations) and strategic (recognise and repair communication breakdowns) one.

In developing the final version of the structural model for the formation of future ship engineers' English-language communicative competence, we have taken into account that the previous variants of the model did not contain such blocks as regulatory and corrective, and the content block was preceded by the methodological block.

Thus, the final model for the formation of English-language communicative competence consists of the following blocks: target, normative, methodological, procedural, substantive and evaluative-effective

ones. This structural model gives an opportunity to demonstrate the basic methods and means of its implementation in a single system.

The structural model is based on the social contract for training of a competent ship engineers, which dictates its conditions to the purpose, resources and tasks of our study.

The target unit performs the functions of goal setting, motivation and stimulation. Motivation is a determining component of the organization of educational activities, characterized by orientation, stability and dynamism. This is a conscious direction for future professional activity; a focus on constructive interpersonal relationships in order to achieve the set goals; a sustained interest in improving their education and self-organization. There was a motivation for educational and cognitive activity, an interest in the future profession, English speaking in a mixed crew, the need for self-improvement and self-development; active involvement in the educational process (learning English for professional purpose) — the criteria for high level of professional English language training of future ship engineers. A professional activity cannot be successful without a constant high level of motivation. The formation of a conscious attitude, an interest in the future profession and in English speaking as a whole becomes crucial. It is the gamification approach that promotes activity and enhances motivation for learning English, which in turn directs the cadets to fulfil the main purpose of learning — the formation of English-speaking communicative competence.

Resources that contribute to the goal of the study and completion of the tasks include the following: content disciplines (Foreign Language, Maritime English and English for Professional Purposes) and teaching aids. Upon completion of the Foreign Language course, the student must understand and use common expressions and simple phrases. After completing the Maritime English course, the cadet must be able to communicate on professional topics with mixed crew members. Upon completion of the course “English for Professional Purpose”, the cadet must be able to communicate on professional topics of ship-engineering orientation with members of multinational crews.

The regulatory block contains the legal framework, state standards, educational programs, the STCW international convention and Code and the IMO Model Course 3.17.

The methodological block of the structural model of the English-language communicative competency-based underlies the following approaches: personality-oriented, systemic, gaming, and competence ones. A person-centered approach aims at concentrating on a person's

holistic personality. The advantages of using a person-centered approach are: transferring the focus from the teacher to the cadet, developing the cadets' independence. The systematic approach provides a conscious understanding of linguistic facts and phenomena in their interrelations and holistic system; encourages cadets to be careful in the choice of linguistic means, the system of each block and the holistic system of the section and the topic being studied; forms the ability and skills to choose from the list of most appropriate grammatical forms and constructions, promotes understanding of the logic of the subject; allows you to trace the existing links between different levels of language, etc. The systematic approach encompasses the study of English-language training for future ship engineers as a complex system. The gamification approach uses the idea of a gamified approach to increase the motivation to learn English (for example: gamified exercises in an information- communicative pedagogical environment, role-playing games in a face-to-face practice). The gamified approach uses game mechanics in non-game processes [7]. The-based competency approach is used to identify professional training targets, to analyze the list of competences that a future ship engineer should possess.

The methodological block also contains dominant principles, which are divided into general and specific. To the general we refer the principle of scientific, active, systematic and consistent one, clarity, unity of theoretical and practical training. Specific principles include the development of motivation.

The methodological block also consists of traditional forms (individual work in full-time practical classes) and non-traditional forms (group work, trainings, project work: forums, glossaries, gamified exercises, videos and audio exercises, quests, etc.). Thus, the block includes face-to- face training (textbooks, tutorials, handouts) and e-learning (Web 2.0 technologies: LMS MOODLE, e-guides, etc.).

The procedural block contains the criteria for the formation of English-speaking communicative competence of future ship engineers. These criteria include: cognitive, content, activity, motivation, communication and reflexive ones. The cognitive- content criterion is seen in the completeness of knowledge in the process of performing professional activities in English and the level of knowledge of the content used for English-speaking communicative competence. Activity criterion is the display of professional English-speaking communication competence in action, the ability to interact productively with team members. The motivational criterion is the students' personal preference for professional activity, their desire to use their knowledge and skills in the process of speaking English. The

communicative criterion reflects English communication skills, and the reflective one — the ability to control the results.

The indicators of the formation of communicative competence include knowledge of the English language by professional direction, skills, professional position, individual and psychical properties of the individual, acmeological invariants (professional tasks of a certain kind and specific level of professional development).

The procedural block also contains interactive technologies for the formation of English-language communicative competence of future ship engineers, including gamification.

The content block includes the structure of English-language communicative competence and its structural components. Investigating the components of English-speaking communicative competence, let us consider the works of such scholars: B. Spitsberg and V. Kupakh, D. Godlevskaya, N. Dolovova, E. Tarmaeva and others.

The proposed structural model meets a number of requirements that ensure its functioning. We used the following structural model requirements:

- 1) Integrity (coherence with the socio-cultural component of the environment);
- 2) Simplicity (ease of understanding and use);
- 3) Adequacy (coincidence of properties (functions, parameters, characteristics, etc.) of the structural model and the corresponding properties of the simulated object).

The evaluation and output unit identifies the following components of English-language communication competence of future maritime professionals: levels of English-language communication competence and the result (sufficient and high level of English-language communication skills).

The study revealed four levels of English-language competence: initial, satisfactory, sufficient and high. The initial level of English language competence is characterized by a low ability to use English, an inability to apply knowledge in communicative situations. The entry level, or empirically intuitive, is characterized by elementary theoretical training (less than 3 points out of 5 possible). A satisfactory level, or reproductive level, is characterized by the partial use of communicative activity in English (3 points). Sufficient level is functional and with adequate ability to practice English (4 points). High (5 points) — reflexively creative, when a foreign language is used at the level of reflexes, the cadet is able to use the language even in non-standard situations.

To the pedagogical conditions that are present in the structural model, we refer: the creation of a positive motivation for the formation of English-language communicative competence in the process of learning English for professional purpose; introduction of a gamification approach in the system of professional training of future ship engineers with the help of information-communicative pedagogical environment; introduction of blended learning in the training course “English for Professional Purpose”.

Thus, in order to test the effectiveness of the developed structural model, it is necessary to evaluate the level of future ship engineers, the development of value orientations, assimilation of knowledge, their systemacity, depth, strength, effectiveness, awareness, etc., communication styles and changes in relationships.

The result achieved is to form a sufficient, or high level, English-speaking communicative competence for the future ship engineers. In order to determine the result, it is necessary to analyze the obtained results of the formation of English-speaking communicative competence.

In case of traditional training of future ship engineers, insufficient attention is paid to the use of the innovative technologies to form English-speaking communicative competence. It is the innovative technologies that have made this process more efficient, which has led to the need of increasing the level of efficiency of the process of maritime English-language communicative competence formation.

Introducing a structural model for the formation of English-speaking communicative competence using the innovative technologies (e-courses with elements of gamification in the system of training of future ship engineers, took place at ship engineering departments of the following educational institutions: Kherson State Maritime Academy (KSMA); Maritime College of KSMA).

During the implementation of the structural model of future ship engineers' English-speaking communicative competence formation, the emphasis was made on the realization of the pedagogical conditions mentioned above.

The results of the ascertaining stage of the study proved the feasibility of solving the research objectives. The content of the interactive electronic author's training course on Maritime English has been developed for future ship engineers. The software-technical implementation of the author's course was carried out, its effectiveness and suitability for the tasks of the research were evaluated.

The introduction of the electronic courses was carried out by us at the next stage of the experiment — following e-courses formed with

the help of the site of electronic training of KSMA: Maritime English I semester and Maritime English II semester, which are part of the English language courses of the ship engineering department. Location to be determined by address: <https://mdl.ksma.ks.ua/course/view.php?id=1530> and <https://mdl.ksma.ks.ua/course/view.php?id=1891>.

The content of the e-course, according to the gamification approach, was supplemented by progress loops, storyline, badges, leaderboards, avatars, maps, gamified exercises, quests, missions and levels.

2.2 Implementation of pedagogical conditions for the training of future ship engineers in the process of learning English for professional purpose

Taking into account all aspects of the category “pedagogical conditions” and different views of researchers on the interpretation of its essence, we have justified our definition of this concept. Pedagogical conditions, based on the definition of O. Dendrenko, are understood by us as factors that were created to successfully complete the tasks with the aim of the most efficient tools of the educational process. In order to determine the most suitable pedagogical conditions for the training of future ship engineers in the process of learning English for professional purpose, the specifics of training were taken into account (selection and systematization of the content of educational material, interest in educational and professional activity, students’ ability to learn — peculiarities of thinking, memory, etc.) [6].

In scientific-pedagogical discourse [1, 3, 5, 7] to refer to the professionalism of a specialist, the term “professional competence” is used, which is interpreted by modern researchers as a result-activity characteristic of specialist’s personality, which allows him to set and effectively solve professional problems in various situations on board.

The training of a competent marine engineer is determined by the level of his / her competence in all disciplines. Communicative competence is a part of the humanities training cycle, to which the training course “English for Professional Purpose” applies.

The effectiveness of the process of formation of English-speaking communicative competence will depend on the implementation of the following requirements: consistency of the material with the curriculum of the discipline “English for Professional Purpose” and its compliance with the professional training of future ship engineers; selection of profession-oriented lexical material with regard to subject matter and relevance (including standard maritime phrases) of appropriate complexity; proper provision of

the selected material with educational and methodological recommendations and literature; systematization of lexical material, appropriate visualization; selection, systematization of speech exercises based on professional material (including international maritime conventions and codes); creation of profession-oriented real life situations onboard the ship (cases).

To determine the optimal pedagogical conditions for the English-language training of future ship engineers, we took into account the specific training of future maritime specialists, according to which the effectiveness of the training of cadets depends on certain factors:

- significance of the content of the material studied by marine engineers;
- taking into account the interest in the educational and professional activity and educational opportunities of the cadets;
- efficiency and quality of training;
- management of this process by the teacher and the optimal organization of the cadet's cognitive activity.

For a certain period of time we have carried out a thorough analysis of modern research scientific studies on the formation of English-speaking communicative competence, the requirements for the professional training of maritime specialists, the results of the practice of educational work. The requirement of our time is the use of the innovative technologies, e-courses in the educational system. The low results of electronic testing in foreign crewing companies and oral interviews with representatives of these crewing companies have led to the creation of a new structural model of future ship engineers' English-language communicative competence.

To distinguish the pedagogical conditions that should be taken into account of the formation of future ship engineers' English-language communicative competence, we conducted a purposeful and thorough analysis of scientific searches (dissertation research of N. Bobrysheva, T. Shvets, S. Barsuk, S. Vinnyk, S. Yashchuk, L. Lipshits, etc.), whose subject areas were compared with the research area.

When the subject field and the field of professional training coincided, the first pedagogical condition was formulated, which would contribute to the formation of English-language communicative competence of future ship engineers: to create positive motivation for the formation of English-speaking communicative competence in the process of learning English for professional purpose. To implement this pedagogical condition, an e-course to study English for professional purpose was created.

The course contained following gamified elements: Wordgrids, Hangman gamified exercises, Horse race gamified exercises, Pairing games,

Crosswords, Group puzzles, The Millionaire games, Multiple choice quizzes, Matching pairs exercises, Group assignments, Number lines, Simple order exercises, Free text input exercises, Matching Pairs on Images, Cloze tests, Audio/Video with notices etc.

The examples of gamification elements can be seen in fig. 1.

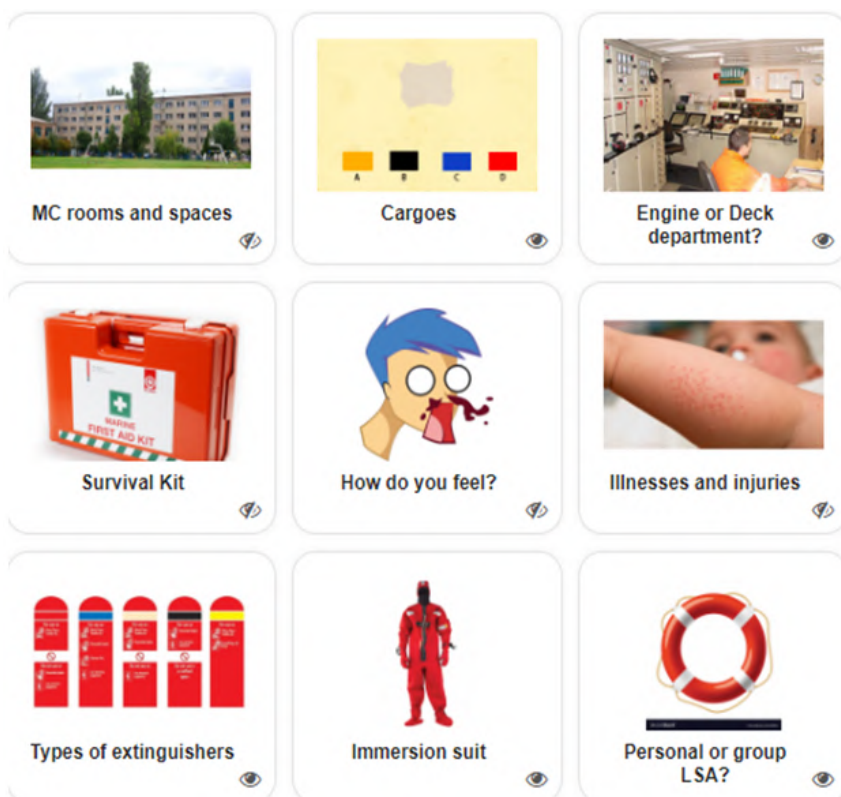


Fig. 1. Examples of gamified activities (learningapps.org)

In the process of further analysis of scientific and pedagogical literature concerning trends in education, namely: V. Kostyuk (situational and communicative technologies), O. Frolova, V. Smelikova and O. Dendrenko (case study) [6], Yu. Petrovskaya (paraphrasing strategy), D. Osadchuk (information and communication technologies, simulators), N. Vovchasta (imitation, operational and production methods), Adam Weintrit, Tomasz

Neumann, Adam Weintrit (simulation technologies), we have compared subject fields and the fields of professional training of specialists and the second pedagogical condition was formulated. This pedagogical condition is introduction of a gamification approach in the system of professional training of future ship engineers by means of information and communicative pedagogical environment [8, 9]. The author's interactive electronic training and methodological complex of the discipline "English for Professional Purpose" was developed and implemented in the system of training of future ship engineers on the site of electronic training of KSMA — LMS MOODLE. This e-course introduces a gamification approach that creates a positive motivation for learning in the process of English study, actively involves students, encourages them to work, enhances communication processes, etc. [10].

The course also contains gamification elements: maps, progression loops, leaderboards, gamified activities (Wordgrid, Hangman, Horse race, Pairing game, Crossword, Group puzzle, The Millionaire game, Multiple choice quiz, Matching pairs, Group assignment, Number line, Simple order, Free text input, Matching Pairs on Images, Cloze test, App Matrix, Audio/Video with notices etc.).

These elements have increased the cadets' interest in learning English for professional purpose, enhanced cadets' motivation for learning and the effectiveness of proposed tasks.

The sample of cadets to take part in pedagogical experiment was calculated, taking into account the total number of cadets of the Ship engineering department 2015–2016 yr. (686 cadets).

Thus, the sample of cadets for the pedagogical experiment was 253 cadets. The next stage was the division of cadets into the experimental group (EG) and the control group (CG). In order to carry out the pedagogical experiment objectively, we tried to ensure that the EG and the CG were as uniform as possible in age, number, sex and level of training [11, 12].

Comparison of the distributions of CG and EG cadets prior to the experiment was performed according to the success rates of the cadets of the ship engineering department (testing to find out level of English knowledge). This gives grounds for claiming that the distributions of cadets in EG and CG are approximately the same, which can be checked in Table 1. The EG was 127 and the CG was 126. The homogeneity of the groups was determined by the fact that they had English-language practical training in one program, approximately at the same time and in similar conditions. So, the initial level of English before starting the experiment was mostly satisfactory (after secondary school).

The same syllabus on the discipline “English for professional purpose” to regulate English language training is used with the following IMO Model courses:

- IMO Model Course 2.07 — Engine Room Simulator;
- IMO Model Course 4.05 — Energy efficient operation of ships;
- IMO Model Course 7.04 — Officer in charge of an engineering watch.

The difference was that training of cadets in the CG was carried out traditionally (without the use of innovative technologies — a gamification approach), and in the EG — through a developed system of using innovative technologies, e. g. electronic courses based on the gamification approach.

Table 1. Distribution of future ship engineers by progress rates

Groups	Amount of cadets at the appropriate levels			
	Satisfactory	Good	Excellent	Total
CG	68 — 53,96%	31 — 24,6%	27 — 21,44%	126 — 100%
EG	66 — 53,54%	40 — 31,49%	21 — 14,96%	127 — 100%

The CG and EG cadets are as typical as possible, equal in age, number, sex and level of training. As a result of the experiment, the beginning level was found in the number of cadets (in %): by motivational criterion — 58% of the EG and 51% of the CG; the beginning is 22% of the EG and 29% of the CG; excellent — 20% of the EG and the CG, which indicates that future ship engineers are generally not sufficiently motivated for professional activity.

The graphical representation of results can be seen in fig. 2.

According to the reflexive criterion — the beginning level (EG 63% and CG 64%), the satisfactory (20% in the EG and the CG), the excellent (16% in EG and CG).

The beginning level by cognitive-content criterion is CG — 10%, EG — 2.5%, satisfactory in CG — 52.5%, EG — 37.5%, good in CG — 25%, EG — 40%, excellent — CG 12.5%, EG — 20%. According to the communicative criterion, beginning — CG 12.5%, EG — 7.5%, satisfactory — CG 47.5%, EG — 40%, good — CG 35%, EG — 37.5%, excellent — CG 5%, EG — 15%.

Thus, quantitative indicators of the pedagogical experiment testified to the available beginning and satisfactory levels of English-language communicative competence of future ship engineers in the control and experimental groups, which confirmed the hypothesis of our study on the

need to implement our pedagogical conditions aimed at increasing the level of competence [13, 14].

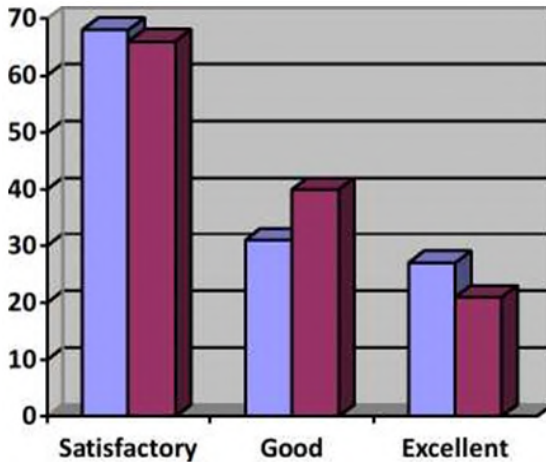


Fig. 2. Future ship engineers levels distribution according to groups

3 Conclusions

The hypothesis of our study was that the training of future ship engineers in the process of learning English for professional purpose will be productive, if in the educational process the pedagogical conditions proposed by the author are implemented. The hypothesis was confirmed by approbation of the method of forming a professional English language competence of the future ship engineers. At the experimental research stage of our study, the following methods and means of research were used: literature research and analysis, discussions and surveys, observation method, questionnaire, synthesis, modelling, introspection, expert evaluation of pedagogical experiment, statistical methods.

After a comparative analysis of all diagnostic results, we have come to the conclusion that the control and experimental groups showed positive dynamics of change of indicators at all levels. These results confirm the effectiveness of our developed structural model of English-speaking competence of future ship engineers and the methods of its formation by all criteria: cognitive-content, motivational, activity, communication and reflexive. This structural model and methodology were shown to be the most effective at the motivational level.

Thus, the positive dynamics of the growth of the cadets' readiness for professional communication activities were theoretically substantiated and practically implemented in the EG, which is necessary and sufficient to achieve the goals of our study.

The experimental research results confirmed the effectiveness of the developed structural model of English-speaking competence of future ship engineers and the methods of its formation.

The perspectives of further research are found in the study of different innovative trends (e. g. m-Learning, Deep Learning, Personalized Learning, Collaborative Learning) and their implementation in the system of professional training of future ship engineers.

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