



KAPITEL 6 / CHAPTER 6⁶
**DESIGNING AND IMPLEMENTING EXPERIMENTAL TEACHING
METHODS FOR ESP WRITING TO IT STUDENTS**

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Introduction

As the vast majority of international contacts are made through English written language, and due to the fact that English has acquired the status of an international language, one of the modern requirements for an IT specialist is to master English for Specific Purposes (ESP) writing. Awareness of the role of ESP writing for future professional activities of future IT professionals necessitates the search for new constructive ideas to solve the problem of effective organization, optimization and intensification of teaching ESP writing to students of IT specialities in technical universities.

Foreigners made a significant contribution to the development of the methodology of teaching ESP writing: D. Slaouti (2000), T. Dudley Evans (2001), I. Badger (2003), J. Morley (2007), Hyland and D. Guillianiana (2009) and others.

Although the problem of teaching ESP writing occupies an important place in scientific research, it cannot be considered finally solved. Foreign methods do not take into account the requirements for the organization of the educational process in domestic technical universities. The textbooks contain an insufficient number of exercises aimed at the formation of ESP writing. Therefore, the results of the analysis indicate the need to develop a methodology for teaching ESP writing to students of IT specialities, which requires further theoretical and practical research.

The aim of the study is to introduce the model of the organization of teaching students of IT specialities ESP writing, develop a subsystem of exercises for students in IT specialities for writing the software requirements specification for their own software product.

In the ESP teaching methodology, the concept of "model" refers to an artificially created object in the form of a scheme, drawing or symbolic formulas, which is similar

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39 sheets, 74957 printed signs, 1,88 author's sheets*



to the object. It represents, reproduces in a simple form the structure, properties, relations between elements of the researched object, the direct study of which is associated with certain difficulties, and thereby facilitates the process of obtaining information about the object of interest. The teaching ESP model we understand as the teacher's individual interpretation of the teaching method of writing the software requirements specification within the framework of specific goals and the conditions for organizing students' educational activities.

The main goal of developing a model for mastering ESP writing is the step-by-step improvement of the skills of future bachelors to create technical documents in English, in particular, the software requirements specification.

We developed a model of the organization of teaching ESP writing for students of IT specialities according to such parameters as function, content, form, systematicity. The function of the model is to explain how the process of teaching ESP writing to students of IT specialities takes place, taking into account their psychological and professional qualities. The content of the model is determined by the types of exercises for ESP writing and their correlation with the stages of teaching. The form of the model of the educational process is the technology of teaching ESP. Under the system parameter we mean bringing all the components of the model to the optimal level. During the development of the model for the implementation of the methodology of mastering ESP writing on the example of creating a SRS, the specifics of the organization of teaching the discipline "ESP" for bachelor students of the fields such as "Computer Science", "Computer Engineering", "Software engineering", "Applied mathematics", "Informatics" were taken into account. The purpose of study, psychological and professional characteristics of students of IT specialities, stages of the organization of the educational process were also considered.

6.1. Designing the teaching model

We offer a model of teaching ESP writing, which is aimed at forming the



knowledge, skills and abilities of students in this type of speech activity. According to our methodology, teaching students of IT specialities how to write software requirements specifications has three stages: introductory, basic, and final, during which students have to solve specific tasks.

54 academic hours are allocated for 4th-year students to master Foreign Language at the B2, B2+ level, of which 36 are allocated to practical classes, and 18 hours to self-study work. So, for the implementation of our methodology, the amount of time allocated for learning English per semester was 54 hours: 36 hours of classroom classes and 18 hours of self-study work.

According to the methodical recommendations of the Foreign Language education organization, English classes at a technical university cover listening, speaking, reading and writing. Therefore, 1/4 of the total time of practical classes is planned for teaching writing. Since in the proposed methodology mastering writing does not take place in isolation, but involves all types of speech activity, reading to a greater extent, speaking and listening to a lesser extent, and taking into account the fact that writing the SRS is a long-term intellectual and creative process, we can count on 1/3 of the total time, i.e. 12 classroom hours and 6 hours of independent extracurricular work. The basis of the model is the education of IT-speciality undergraduate students of NTUU "KPI named after I. Sikorsky". The structure of the teaching model is shown in table 1.

The teaching model within which experiment will be conducted is presented in the table 1. The specified data, determine the stages and sub-stages of teaching, the number of hours of classroom and self-study work of students in IT specialities.

We will consider in detail each of the model options offered by us.

The introductory stage, during which the student gets acquainted with the peculiarities of writing the SRS, includes 1 hour of classroom classes and 1 hour of self-study work; 7 hours of classroom classes and 1 hour of self-study are intended for the main stage; for the final stage – 4 hours of classroom classes and 4 hours of self-study work. At the same time, the teaching is divided into 18 classes, each 30 minutes are devoted to the teaching ESP writing.

Table 1 Teaching Model

Stages	Subgroup of exercises	Lesson Number	Time	
			Academic hours	Self-study
Introductory stage	to get acquainted with the samples of the SRS	1	1	1
	to gain knowledge about stylistic features of the SRS	2		
Basic stage	to develop spelling skills	3, 4	7	1
	to develop lexical skills	5, 6, 7		
	to develop grammatical skills	8, 9, 10		
	to develop comprehension skills and the use of means of inter-phrase communication	11, 12		
Final stage	to develop skills compositionally correctly create the SRS	13	4	4
	to develop the ability to write the main part of the SRS	14, 15, 16		
	to develop editing and evaluating skills	17, 18		

Let's consider in more detail the assignment of classes and the process of implementing a subsystem of exercises for teaching how to write a SRS. The goal of each stage is the achievement of automated skills, speaking and writing skills and the acquisition of knowledge in ESP.

Introductory stage of teaching.

The first classroom lesson. At the first lesson, the teacher introduces students to the "SRS Development" training course, gives passwords, gives instructions for completing tasks, demonstrates the algorithm for writing the SRS. The main part of the work is self-study work, during which students acquire knowledge: they read a text about the importance of writing a specification of requirements for software development, answer questions, study a multimedia presentation on the topic "How to write a high-quality SRS for their own product. Students independently acquire



knowledge about the compositional structure of the SRS according to the standard of the international organization IEEE, their cognitive capabilities, norms and culture of behavior for interaction with customers of software products, differences in behavior in the professional environment of two cultures, language forms for writing specifications, methods of submitting material, tonality of information presentation. The consultations are provided by teachers of professionally oriented disciplines. In the self-study, students read and analyze an authentic sample text of the SRS according to the certain criteria.

The second classroom lesson. Students characterize the style of sentences, distinguish the scientific and technical substyle from other substyles, get acquainted with the syntax of a technical document, a certain structure of sentences when describing the technical requirements for the software. Exercises are performed individually and in groups. There is also frontal work during the teacher's explanations. The task of self-study work is to describe the technical requirements for own software in accordance with the stylistic characteristics of this writing genre.

The basic stage of teaching.

The third and fourth classroom lessons. Having worked through the exercises of the 1st stage, students learn the rules of punctuation, citations, references, necessary for writing the specification of requirements. The writing exercises are performed, the purpose of which is the development of punctuation and spelling skills. As a self-study activity, students formulate a topic that corresponds to the topic of the bachelor's project and create the title page of the SRS for their own software development.

The fifth, sixth, and seventh classes are devoted to the study of specific terminology, abbreviations, definitions, acronyms, symbols, directives, and continuances. Students work with educational materials and do the suggested exercises, perform self-monitoring with the help of built-in automated feedback, because this sub-stage mainly contains exercises with minimal guidance from the teacher. A fairly significant part of the exercises has special information, tips in which knowledge is presented. Exercises are done individually and in groups. There is also frontal work during the teacher's explanations. The task of self-study work is to create the crossword



with new vocabulary, exchange crosswords and solve them.

In the eighth, ninth, and tenth lessons, the exercises are aimed at developing and improving the grammatical skills of ESP writing and are performed individually. Control of students' learning activities is automated. The teacher's explanations take place in a frontal mode. During extracurricular self-study work, students continue to do certain exercises and master grammatical material.

In the eleventh and twelfth lessons, students develop the skills of using means of inter-phrase communication in the text of the SRS: conjunctions, pronouns, combining words into sentences. There is individual and frontal work. Studying the rules of using inter-phrase connection is assigned to self-study work.

The final stage of training.

Thirteenth classroom lesson. Students continue to study the field of creating software products, namely, standards for creating technical documentation in English-speaking countries and their compositional structure, differences in behavior in the professional environment of two cultures, semantic features of words and expressions of scientific and technical substyle. Then they create the content of the SRS for their own bachelor's project, form the input data to describe the requirements for their own software

The fourteenth, fifteenth, and sixteenth classes are aimed at students' knowledge gaining about filling out the structural parts of the SRS: Introduction, Overall Description, Specific Requirements. There is also a repetition of the material studied at the previous stages: it includes information about the compositional structure, standards for creating a specification, stylistic, lexical, grammatical features of the SRS, rules for punctuation and spelling of the text. Students gain knowledge about the field of scientific and technical sub-style: use full verb forms instead of short ones, avoid weak phrases and do appropriate exercises.

Each lesson is dedicated to learning how to create a separate part of the software requirements specification. The task of the self-study work after the 14th lesson is to write your own introduction, after the 15th – to write your own general description of the software, after the 16th – to write the last part of your own document. Students



describe the "use cases" of the program, add a number index and appendices to their requirements specification. Exercises are performed individually. In classroom classes, students receive teacher's comments on completed tasks with error analysis.

The seventeenth lesson is devoted to teaching text editing. The teacher provides students with knowledge about groups of errors, their marking symbols and how to correct errors in the written text. Students work in pairs. A table for error correction to check the SRS is provided. The ability to edit a technical document is developed. Then the students independently check each other's work, evaluate it, discuss the work, and give advice. Exercises are performed individually and in pairs. Extracurricular self-study work: edit your own text of the software requirements specification and send it to the teacher.

In the eighteenth lesson, the SRSs for own software development within the framework of the bachelor's project, evaluation by the teacher, and error analysis are presented.

So, we have considered in detail the variant model of the organization of teaching undergraduate students writing the SRS in English as a genre of writing. Areas, topics, situations, texts, linguistic, sociocultural material, language material, educational strategies, as well as knowledge, skills and abilities necessary to create a SRS were considered. The educational material was selected according to the following criteria: situations for mastering writing – a criterion of the frequency of their occurrence in the professional life of specialists in computer specialities; sample texts of software requirements specifications – criterion of authenticity, professional orientation, communicativeness, functionality, linguistic and sociocultural value, authority of the Internet source; lexical material – criteria of professional orientation, communicative value, semantic value, frequency, word-forming ability, connectivity, organizational ability; grammatical material – criteria of necessity, frequency, exemplarity; educational strategies – focus on the development of the skills of a productive type of speech activity, namely writing, focus on the development of student autonomy, focus on the optimization of interpersonal professional communication and overcoming socio-cultural difficulties of foreign language communication.



Thus, we have described the implementation of the subsystem of exercises developed by us for writing the SRS, which is correlated with the defined stages of teaching. The created model takes into account the peculiarities of students of IT specialities, curricula and the program of the ESP discipline. Despite the fact that we demonstrated the model on the example of teaching at NTUU "KPI named after I. Sikorsky", it can be adapted for other technical universities. The effectiveness of the developed methodology has been confirmed, which gives grounds for recommending it for the implementation in technical universities of Ukraine.

6.2. Implementation of the experimental teaching methods and results' interpretation

An experiment is a scientific study based on the study of the state and dynamics of one phenomenon, provided that other significant factors are neutralized (Korz, 2008).

In the organization of the experiment, we were guided by the basic provisions of the theory and methodology of conducting experimental research by M. V. Lyakhovytskyi, P. B. Hurvych, E. O. Shtulman, V. I. Yevdokimov, O. V. Berezhnova, V. M. Sheyko and V. I. Zagvyazynskyi. Taking into account the theoretical and practical experience in the organization of the experiment, developed by methodologists and practitioners (Zinukova, 2004, Bykonya, 2006), we will determine the object and task of the experiment, experimental material and phases of the experiment, unvaried and varied quantities, as well as the nature of the experiment.

The object of the experimental study was the process of writing the SRS in classroom and non-auditory mode.

Accordingly, the organization of experimental teaching involved solving the following tasks:

- prepare educational materials for the experiment;
- define and describe the criteria for evaluating the level of development of



speaking skills and the skills in ESP writing;

- select experimental groups;
- determine the entry level of written and spoken skills and creative skills at the pre-experimental stage;
- to conduct an experiment in order to check the effectiveness and expediency of the methodology of teaching ESP writing on the material of writing the SRS;
- determine the initial level of developed written and spoken skills and relevant skills for creating a SRS for own software development within the framework of a bachelor's project at the post-experimental stage;
- process and interpret the data of experiment;
- to determine an effective version of the model of experimental teaching.

The experimental material was a subsystem of exercises developed on the Moodle platform for teaching ESP writing, in particular, the “SRS Development” ESP course, pre- and post-experimental test materials that determined the level of the developed skills of IT students before and after the experiment, a questionnaire.

Following M. V. Lyakhovytskyi, four phases of conducting a methodical experiment were determined, namely:

- the organization phase includes the most significant component - the development and formulation of the hypothesis;
- the implementation phase involves the implementation of the ideas outlined in the hypothesis;
- the ascertainment phase represents the processed results and conclusions;
- the phase of interpretation of the results makes it possible to propose appropriate methodical recommendations.

The theoretical basis of the teaching methodology for writing the SRS is the basis for the development and formulation of the hypothesis: the training of future IT specialists to write the SRS in English is more effective under the condition of using the 1st training model, in which students independently work with “SRS Development” course at the introductory stage as a means of learning for mastering ESP writing.

In the experimental study, the unvaried dimensions were:



- 1) number of students in academic groups,
- 2) level of education of students,
- 3) experimenter,
- 4) tasks for conducting pre- and post-experimental sections,
- 5) ESP course "SRS Development" with a subsystem of exercises,
- 6) number of teaching stages,
- 7) duration of experimental teaching,
- 8) evaluation criteria.

The *varied condition* was the organizational forms of teaching ESP writing at the introductory stage using the course "SRS Development".

In the first version of the methodology, at the introductory stage, students get acquainted with the SRS, its compositional structure independently, and at the main and final stages of teaching there is classroom work with the teacher and independent work with the ESP course "SRS Development". According to the second version of the methodology, classroom and independent work with the course "SRS Development" takes place at all three stages of teaching. So, the difference between the two teaching methods lies in the forms of teaching at the introductory stage.

Table 2. Characteristics of two teaching methods

I Teaching method	II Teaching method
Introductory stage	Introductory stage
Self-study work with course “SRS Development”	Auditory work + Self-study work with course “SRS Development”
Basic stage	Basic stage
Auditory work + Self-study work with course “SRS Development”	Auditory work + Self-study work with course “SRS Development”
Final stage	Final stage
Auditory work + Self-study work with course “SRS Development”	Auditory work + Self-study work with course “SRS Development”

The first version of the technique, presented in table 2 provided only self-study work with the "SRS Development" course at the introductory stage, and the second option provided both classroom work with a teacher and self-study work with the course at all stages of teaching.



According to P. B. Hurvych's classification, our methodological experiment was characterized as basic, natural, vertical-horizontal. The ability of students to write SRS before and after teaching was compared vertically, and two variants of teaching methods for writing SRS were compared horizontally.

In order to achieve successful results in education, it is necessary to control the educational activities of students. It is known that in writing, one of the functions of controlling the process of teaching foreign language is to determine and evaluate the level of the developed written and spoken skills and relevant skills. This is possible provided there are scientifically based evaluation criteria. Therefore, such evaluation criteria should be defined, which would reflect the ultimate goal of teaching.

Practitioners offer different criteria for evaluating students' written works. The criteria of J. B. Huey, D. R. Ouemat, W. F. Hartfill, H. L. Jacobs include: vocabulary, structure, organization, content, mechanics. J. M. Reid considers the evaluation criteria to be: content, text organization, style, correctness. Each of the classifications can be used to evaluate students' written works.

Having analyzed the works of Methodist scientists: O. M. Ustymenko, G. S. Skurativska, N. V. Zinukova, T. M. Korzh, M. M. Met'olkina, V. V. Bebykh, O. P. Bikoni, O. S. Sinekop, E. V. Vasylieva, T. V. Glazunova, V. P. Svyridyuk, N. V. Mayer, who dealt with the issues of ESP writing, it was decided to be guided by the method of awarding points for tasks completed by students.

Considering the scientific works of foreign and Ukrainian researchers and taking into account the specifics of teaching ESP writing communication, for evaluating the SRS we define such criteria as the compliance of the content of the English SRS with the educational communicative situation, compliance with the structural and compositional components of the IEEE standard for writing the SRS, the quality of the presentation of information, that is, the logic and coherence of the presentation, relative linguistic correctness, including lexical, grammatical, orthographic, the scope of the SRS, with a maximum score of 100. We believe that 100 points correspond to the student's absolute assimilation of the material. The distribution of the number of points according to each criterion was carried out depending on the degree of importance of



a certain criterion for the student to write the SRS for their own software.

Let's consider the specified evaluation criteria and characterize them. By the first criterion, "compliance of the SRS content with the educational communicative situation" we understand the implementation of a communicative task by language and speech means, which contributes to the effective writing of the SRS for a bachelor's project. For the maximum assessment of skills according to this criterion, we choose a smaller number of points (relatively to the other criterion) 10 points, because, in our opinion, this criterion is not a decisive factor in the successful writing of the SRS. The student receives 10 points when his specification demonstrates full compliance with the given topic of the bachelor's project, discloses all aspects of software product development, and describes the requirements for it in detail. If the SRS mainly corresponds to the given topic, takes into account almost all aspects of the requirements for creating software, then the work deserves a good rating (7 points). If most aspects of the SRS are not taken into account, or if the written work does not correspond to the topic of the bachelor's project at all, the student receives the minimum number of points according to this criterion - 3 points. This criterion is presented in table 3.

Presented in the table 3 criterion of conformity of the SRS content demonstrates the students' skills, which ensure the ability to be correctly understood and is very important for the customer and future users of the developed software.

Evaluation according to the criterion "Compliance with the the structural and compositional elements of the IEEE standard" involves the correct and consistent placement of all necessary structural parts of the English SRS in accordance with the standard – title page, table of contents, introduction, general description, specific requirements for software development, number index. It is the presence of these indicators and the degree of development of students' abilities to adhere to these structural and compositional elements of the text that should be taken into account according to this criterion. In total, this criterion is 20 points. Of course, IT students must strictly adhere to the compositional form, so we rated this criterion higher than the previous one because we believe it is more important.



Table 3. Compliance of the SRS content with the educational communicative situation

Criterion	Points	Mark	Descriptor
Compliance of the SRS content with the educational communicative situation	10	5 “excellent”	Demonstrates full compliance with the given topic of the bachelor's project, revealing all aspects of software product development, describing in detail the requirements.
	7	4 “good”	A SRS, which mainly corresponds to a given topic, takes into account almost all aspects of the requirements for creating software.
	5	3 “satisfactory”	The content of the SRS does not fully correspond to the given topic, the student does not take into account all aspects of the requirements for creating the software.
	3	2 “unsatisfactory”	Ignores most aspects of software requirements. Or the written work does not correspond to the topic of the bachelor's project at all.

Table 4. Compliance with the the structural and compositional elements of the IEEE standard

Criterion	Points	Marks	Descriptor
Compliance of the SRS with the structural and compositional elements of the IEEE standard	20	5 “excellent”	The student clearly follows the compositional form through the correct presentation of all necessary structural parts: introduction, general description, specific requirements for software development, number index.
	15	4 “good”	Mainly adheres to the structural and compositional elements of the IEEE standard, but does not always correctly present the structural parts of the SRS.
	10	3 “satisfactory”	The student does not provide all the necessary structural parts of the text, presents them incorrectly.
	5	2 “unsatisfactory”	The student provides only one section from the necessary structural parts of the SRS, or does not follow the structural and compositional form at all.



The presence of the described criterion in the table 4 gives the teacher an opportunity to find out how students have learned the rules for placing structural and compositional elements of the SRS for the software development.

The criterion "quality of the information presentation" (Table 5) is also important and related to the previous one since the structure of the text of the SRS requires a certain organization. The specified criterion assumes that the specification of the software requirements must be written in a scientific and technical style. The maximum number of points for this criterion is also 20, taking into account that compliance with the appropriate style of any written text is also important for the adequate understanding of information, especially when it comes to ESP writing.

Table 5. Quality of the information presentation of the SRS

Criterion	Points	Mark	Descriptor
Quality of the information presentation of the SRS	20	5 “excellent”	The student adheres to the appropriate scientific and technical sub-style in all parts of the SRS. The text is laid out quite logically and coherently. The SRS is completely unambiguous, complete, verifiable, consistent, changeable, and traceable.
	15	4 “good”	The student almost always adheres to the appropriate style of the SRS. The text is sufficiently logically and coherently presented.
	10	3 “satisfactory”	The student sometimes does not follow the appropriate style of the SRS. The requirements for the software product in the specification are not quite logical and coherent.
	5	2 “unsatisfactory”	The student does not follow the appropriate style of the SRS at all. The described requirements for the software product are mostly stated illogically and incoherently.

According to the criterion presented in the table 5, the text of the SRS from the linguistic point of view should be logically and coherently presented, and from the professional side, the software requirements specification should be unambiguous, complete, verifiable, consistent, modifiable, traceable. When each established



requirement of a SRS has only one interpretation, then it is considered unambiguous. The text of the SRS is complete when all important software requirements are described, tables and figures are signed, and all terms and units of measurement used in the document are defined. A SRS is considered verifiable if there are processes by which a human or computer can verify that the software product meets the requirements described. The presentation of information in the SRS is consistent, when none of the requirements conflicts with another, does not overlap one another, that is, it is described in the appropriate logical sequence. A SRS is modifiable if its structure and style are such that any changes can be made easily. A technical document is traceable if the source of each requirement is clear.

We also use the "appropriate language correctness" criterion described in table 6. The maximum number of points according to this criterion is 40. The student receives the maximum number of points when he correctly uses common, professionally oriented lexical units, grammatical structures that correspond to the target level and are characteristic of the genre of the SRS, follow the rules of punctuation, spelling. We preferred this criterion because it is the most weighty and significant for the successful writing of a professionally oriented text. This is quite natural, because the correct use of lexical units, grammatical structures and the use of appropriate punctuation, spelling, reflect the specificity of the genre of the text and reveal the communicative orientation of writing.

According to the criterion of appropriate linguistic correctness of the SRS presented in table 6, the lexical, grammatical, and orthographic literacy of the text of the software requirements specification is checked.

Evaluation according to the criterion "scope of the SRS" (Table 7) involves writing a text within the regulated limits of 1,800 words. The amount of information within any topic should be sufficient for the customer reader to have a complete picture of the software to be developed. We estimate the degree of importance of this criterion as equal to the first, that is, it receives 10 points.



Table 6. Appropriate language correctness of the SRS.

Критерій	Бали	Оцінка	Descriptor
Appropriate language correctness of the SRS.	40	5 “excellent”	The student correctly uses lexical units (general, professionally oriented) and grammatical structures that correspond to the target level and are characteristic of the genre of the SRS; can make minor mistakes due to trying to use complex constructions. The rules of punctuation and spelling are followed by the developer of the SRS.
	30	4 “good”	Basically, the student correctly uses lexical units and grammatical structures that correspond to the target level and are characteristic of this genre; may make several mistakes by trying to use complex constructions. Spelling and punctuation errors are rare.
	20	3 “satisfactory”	The student uses a significant number of lexical units and grammatical structures incorrectly, making mistakes. The rules of punctuation and spelling are often violated.
	10	2 “unsatisfactory”	Most lexical units and grammatical structures are used incorrectly, making a large number of mistakes. Errors lead to incorrect perception of information. Significant spelling errors.

The considered criteria in the table. 3 – 7 – such as the correspondence of the content of the communicative situation, compliance with the structural and compositional components of the IEEE standard for writing the SRS, the quality of the information presentation, i.e. the logic and coherence of the presentation, appropriate linguistic correctness, including lexical, grammatical, orthographic, scope of the SRS, allow you objectively evaluate the text, determine and evaluate the level of developed skills for writing the SRS.

So, the outline of the object, tasks, experimental material, hypothesis, unvaried and varied values, as well as the definition of the phases of the methodical experiment and the evaluation criteria for writing the SRS for the software allow us to move on to the description of the implementation of experimental teaching.



Table 7. Scope of the SRS

Criterion	Points	Mark	Descriptor
Scope of the SRS	10	5 “excellent”	The scope of the SRS contains a sufficient amount of information within the specified topic and program requirements.
	7	4 “good”	The scope of the SRS is smaller in proportion to the amount of information required by the program of the corresponding teaching course within the specified topic.
	5	3 “satisfactory”	The scope of the SRS is insufficient for a comprehensive coverage of the topic.
	3	2 “unsatisfactory”	The scope of the SRS does not meet the requirements for graduation theses and does not give an idea of the developed bachelor's project. Very little information is presented.

The experiment was conducted at National technical university of Ukraine “Igor Sikorsky Kyiv Polytechnic Institute” at the Faculty of Applied Mathematics in two experimental groups (EG-1 - 20 students, and EG-2 - 20 students) with a total number of 40 students in the 7th academic semester from September to December 2021. The experiment included three stages (pre-experimental, experimental, post-experimental), each of which had a specific purpose.

At the pre-experimental stage, we set a goal to find out the level of skills in writing and development in the process of creating a software requirements specification.

The experimental stage before performing the following tasks: to find out the effectiveness of the method of creating an English-language specification of software requirements using two variants of the method; check the effectiveness of the developed exercise subsystem.



The post-experimental stage provided the determination of the students' achieved level of formation of English language skills and the development of skills in writing the SRS.

In the table 8 the structure of the experiment is presented, which covers the stages of experimental teaching, tasks and conditions of conducting the experiment.

Table 8. The structure of the experiment

Stages of the experiment	Time and conditions	Task of the experiment stage
Pre-experimental	September (1.09.2021 - 14.09.2021). Auditory and extra-auditory work.	Find out the level of formation of skills and development of skills in the process of creating a SRS; analyze the obtained results.
Experimental	September (21.09.21) - December (07.12.21). Auditory and extra-auditory work.	To find out the effectiveness of the teaching method using the Moodle platform with two variants of the method; check the effectiveness of the developed exercise subsystem.
Post-experimental	December (14.12.21 - 28.12.21). Auditory and extra-auditory work.	Determine students' level of knowledge, skills and ability to write the SRS.

As can be seen from the table 8, studies lasted one semester, with the allocation of time for classroom and independent extracurricular work of students. The organization of the educational process took place with the use of elements of distance learning.

At the pre-experimental stage, we offered two groups of students the following professionally oriented task:

You are going to participate in the international competition for university students "The Best Spec Writer" organized by the company EPAM (in the USA). The



winner of the competition will have an opportunity to have some practice in the company. To take part in this competition you need to write a SRS (about 1500 words) on one of the topics:

- a) Create a SRS for the development of a text editor with the functionality similar to MSWord.*
- b) Create a SRS for the development of a software with the functionality similar to Power Point.*
- c) Create a SRS for the operations with electronic tables using the functionality similar to MS Excell.*

The task was carried out in September, at the final stage of the bachelor's degree.

The results of the pre-experimental section showed that the students' level of knowledge, skill formation, and development of skills in writing SRS was insufficient.

The analysis of students' works allowed us to identify the following shortcomings:

1. Lack of a clear definition of the purpose of the SRS.
2. Failure to comply with the structure of the SRS, absence of one or more compositional parts of the text.
3. Absence of a list of documents that are the basis for creating a SRS.
4. Violation of the rules of reference in the text (cross referencing).
5. Lack of explanations and comments on illustrative material.
6. Non-compliance with the style of the SRS text (use of abbreviations, slang, failure to decipher abbreviations, acronyms).
7. The presence of grammatical errors (errors in the use of tense forms of the verb; errors in the use of the infinitive, gerund, participle; errors in the use of conditional sentences, the absence of an article or the incorrect use of an article; the correct order of words in a sentence; errors in the use of conjunctions; non-observance of spelling individual words).
8. Presence of punctuation errors.
9. Small amount of work.
10. Lack of registration of the number index.

The maximum number of points that students could receive for writing the SRS was 100. To determine the learning rate, we used the formula $K = Q/N$, where Q is the total number of points for all criteria, N is the maximum number of points for the relevant criteria (conformity of content of the SRS in the educational communicative situation, compliance with the structural and compositional components of the IEEE standard for writing the SRS, the quality of the presentation of information, relative linguistic correctness, the scope of the SRS).

Table 9. Comparison of the pre-experiment results in groups EG – 1 and EG – 2

Group	Criteria					Average score of the group	Average learning rate
	Compliance of the SRS content with the educational communicative situation	Compliance with the structural and compositional elements of the IEEE standard	Quality of the information presentation of the SRS	Appropriate language correctness of the SRS.	Scope of the SRS		
EG- 1	5,5	8,8	9,8	21,5	3,5	48,9	0,49
EG- 2	5,7	9,5	10,5	23,5	3,3	52,4	0,52
The maximum learning rate							
	10	20	20	40	10	100	

The pre-experimental results of the creation of the specification in the EG–1 group showed that the average score of the group according to the criterion "correspondence of the content of the SRS to the educational communicative situation" is 5.5; "adherence to the structural and compositional components of the IEEE standard of the SRS writing" – 8.8; "quality of information presentation" was 9.8; according to the criterion "relative linguistic correctness" – 21.5; according to the criterion "volume



of the SRS" – 3.5. Accordingly, the average learning coefficient in the EG–1 group turned out to be 0.49.

The results of writing the SRS in the EG–2 group before the beginning of the experimental teaching showed that the average score of the group according to the criterion "compliance of the content of the SRS with the educational communicative situation" was 5.7; "adherence to the structural and compositional components of the IEEE standard for writing the SRS" – 9.5; "quality of presentation of information" – 10.5; according to the criterion "relative linguistic correctness" – 23.5; according to the criterion "scope of the SRS" – 3.3. The average learning coefficient in the EG–2 group was 0.52.

The data for each group before the experimental training made it possible to compare the average score of the learning coefficient.

So, the average learning coefficient in the EG–1 group was 0.49, and in the EG–2 group – 0.52 with a maximum learning rate of 1. The digital indicators in the two groups showed approximately the same level of development ESP writing skills and development of abilities at the pre-experimental stage . This level was not high enough.

The experimental stage took place both in the classroom (18 hours) and outside the classroom (36 hours allocated for self-study work). The experimental teaching was carried out in order to check the effectiveness of the teaching methodology for creating the SRS according to its two variants, as well as the effectiveness of the developed exercise subsystem.

The final task of the experimental teaching was a post-experimental evaluation of students' knowledge, skills, and abilities in ESP writing. The tasks of the pre-experimental and post-experimental sections differed in that, in the pre-experimental section, students wrote SRS for known and existing software products such as MSWord, Power Point, MSExcell, and in the post-experimental section, students created the SRS for their own software products, which they developed within the framework of a bachelor's project:

You are going to take part in the competition “The Best Spec Writer” recommended by the supervisor of your Bachelor's project. To win the competition,



you need to write a SRS (about 1500 words) on the base of your Bachelor project. The best SRS will be published on the Internet.

After determining the results of the post-experimental sections in the EG–1 and EG–2 groups, we will compare the quantitative indicators of the post-experimental section in Table 9. The results are shown in the table 9 allowed us to conclude that in the EG group - 1 the average indicators according to the criteria "correspondence of the content of the English-language specification of requirements to the educational communicative situation" (10), "compliance with the structural and compositional components of the IEEE standard for writing the specification of requirements for software" (18.8), "quality of presentation of information" (18.8), "relative linguistic correctness" (33) and "scope of specification of requirements" (8.6), higher than in the EG group - 2 according to the same criteria: "correspondence of the content of the English-language specification of requirements to the educational communicative situation" - 9.1; "adherence to the structural and compositional components of the IEEE standard for requirements specification writing" - 15; "quality of presentation of information" - 12.8; "relative linguistic correctness" - 25.5; and "scope of specification of requirements" - 7.1. Accordingly, the average learning coefficient in the EG-1 group (0.89) was higher than in the EG-2 group (0.69).

After determining the results of the post-experimental sections in the EG-1 and EG-2 groups, we will compare the quantitative indicators of the post-experimental section in Table 3.8. The results are shown in the table. 3.8 allowed us to conclude that in the EG group - 1 the average indicators according to the criteria " Compliance of the SRS content with the educational communicative situation" (10), "Compliance with the structural and compositional elements of the IEEE standard" (18.8), "Quality of the information presentation of the SRS" (18.8), "Appropriate language correctness of the SRS" (33) and " Scope of the SRS " (8.6), higher than in the EG group - 2 according to the same criteria: " Compliance of the SRS content with the educational communicative situation " - 9.1; " Compliance with the structural and compositional elements of the IEEE standard" - 15; " Quality of the SRS information presentation" - 12.8; " Appropriate language correctness of the SRS " - 25.5; and "scope of the SRS" -



7.1. Accordingly, the average learning coefficient in the EG-1 group (0.89) was higher than in the EG-2 group (0.69).

**Table 10. Comparison of the post-experiment results
in groups EG – 1 and EG – 2**

Group Index	Criteria					Average score of the group	Average learning rate
	Compliance of the SRS content with the educational communicative situation	Compliance with the structural and compositional elements of the IEEE standard	Quality of the information presentation of the SRS	Appropriate language correctness of the SRS	Scope of the SRS		
EG-1	10,0	18,8	18,8	33,0	8,6	89,1	0,89
EG-2	9,1	15	12,8	25,5	7,1	69,1	0,69
The maximum learning rate							
	10	20	20	40	10	100	

Thus, the results of the experimental study showed that the coefficient of learning in the EG-1 group as a whole for the group was 0.89. According to the results of the post-experimental section, the learning coefficient for the EG-2 group reached 0.69.

It is also necessary to compare the results of the pre- and post-experimental studies in the EG-1 and EG-2 groups, according to the relevant criteria (Table 11). In the EG - 1 group, the average indicator according to the criterion " Compliance of the SRS content with the educational communicative situation" increased from 5.5 to 10, in the EG - 2 group it increased from 5.7 to 9.1.

The average indicator for the criterion "compliance with the structural and compositional elements of the IEEE standard" in the EG group - 1 increased from 8.8 to 18.8, in the EG group - 2 from 9.5 to 15. In general, we observe an increase in average indicators by each criterion in both groups.



Таблица 11. Comparison of the pre-experiment and post-experiment results

Group Index	Criteria					Average score of the group	Average learning rate
	Compliance of the SRS content with the educational communicative situation	Compliance with the structural and compositional elements of the IEEE standard	Quality of the information presentation of the SRS	Appropriate language correctness of the SRS	Scope of the SRS		
Pre-experiment results							
EG-1	5,5	8,8	9,8	21,5	3,5	48,9	0,49
EG-2	5,7	9,5	10,5	23,5	3,3	52,4	0,52
Post-experiment results							
EG-1	10,0	18,8	18,8	33,0	8,6	89,1	0,89
EG-2	9,1	15	12,8	25,5	7,1	69,1	0,69
The maximum learning rate							
	10	20	20	40	10	100	

From the table 11 it can be seen that in the EG-1 group the average learning coefficient before the experiment was 0.49, and after the experiment it was 0.89. The second result is higher by 0.4. In the EG-2 group, the average learning coefficient before the experiment was 0.52, and after the experiment - 0.69. The second result in this group is higher by 0.17. Therefore, the results in the EG - 1 and EG - 2 groups showed positive dynamics in teaching to create the SRS for the software development.

We compare in the table. 3.10 indicators of growth according to the criteria of pre-experimental and post-experimental results in groups EG-1 and EG-2.

Indicated in the table. 3.10 indicators show that before and after the experiment in the EG-1 group, according to the criterion "Compliance of the SRS content with the educational communicative situation" the increase was 4.5 (from 5.5 to 10), "Compliance with the structural and compositional elements of the IEEE standard" – 10 (from 8.8 to 18.8), "Quality of the SRS information presentation" – 9 (from 9.8 to

18.8), "Appropriate language correctness of the SRS" – 11.5 (from 21.5 to 33) and "Scope of the SRS" – 5.1 (from 3.5 to 8.6).

Table 12. Comparative table of growth indicators according to the criteria of pre-experimental and post-experimental sections in groups EG-1 and EG-2

Criteria	EG-1			EG-2		
	Before the experiment	After the experiment	Growth	Before the experiment	After the experiment	Growth
Compliance of the SRS content with the educational communicative situation	5,5	10	4,5	5,7	9,1	3,4
Compliance with the structural and compositional elements of the IEEE standard	8,8	18,8	10	9,5	15	5,5
Quality of the SRS information presentation	9,8	18,8	9	10,5	12,8	2,3
Appropriate language correctness of the SRS	21,5	33	11,5	23,5	25,5	2
Scope of the SRS	3,5	8,6	5,1	3,3	7,1	3,8

In the EG-2 group, the increase was 3.4 (from 5.7 to 9.1) according to the criterion "Compliance with the structural and compositional elements of the IEEE standard", according to the criterion "Compliance with the structural and compositional elements of the IEEE standard " the increase was 5 .5 (from 9.5 to 15), "Quality of the



SRS information presentation" – 2.3 (from 10.5 to 12.8), "Appropriate language correctness of the SRS" – 2 (from 23.5 to 25.5) and "Scope of the SRS" – 3.8 (from 3.3 to 7.1).

So, as the results of the experiment showed (*Tables 8 - 12*), the teaching method of creating a SRS on the basis of the developed subsystem of exercises contributes to a significant increase in the acquisition of knowledge, the level of skill formation and the development of relevant skills in ESP writing. Statistical data make it possible to determine the first variant of the methodology as more effective.

It should be noted that certain difficulties arose during the experiment. Among them: students did not adhere to a single version of the text of the SRS, there were certain difficulties in formulating the topic of the SRS and its design, inaccurate adherence to the structure, difficulties in observing punctuation rules and the appropriate style of the text of the SRS, not all students managed to describe all the requirements for their software product from a bachelor's project.

The next step of our research paper involves the formulation of methodological recommendations for the application of an experimentally proven teaching methodology for writing the SRS.

6.3. Methodological recommendations for teaching ESP writing to IT Students

The conducted theoretical and experimental research, interpretation of the results of experimental teaching make it possible to formulate methodological recommendations for effective teaching writing the SRS in English.

- 1) Adherence to the principles of teaching foreign language, in particular:
 - didactic principles: intersubject connections, student autonomy;
 - methodological principles: interactivity, integration of teaching writing with other types of speech activity, variability, self-control and mutual control;
 - a special methodical principle: taking into account the professional intelligence of students.



2) Selection of educational material according to the following criteria:

– criteria for selecting sample texts of SRS: authenticity, professional orientation and communicativeness, functionality, linguistic and sociocultural value, authority of the Internet source;

– criteria for the selection of lexical material: professional focus, communicative value, semantic value, frequency, word-forming ability, connectivity, structural ability;

– criteria for selecting grammatical material: necessity, frequency, exemplarity;

– criteria for selecting communicative and educational strategies: focus on the development of the skills of a productive type of speech activity, namely writing, focus on the development of student autonomy, focus on optimizing interpersonal professional communication and overcoming socio-cultural difficulties of foreign language communication.

3) The readiness of the teacher to organize the teaching of ESP writing using the elements of distance learning (DL) and his/her ability to manage this teaching process, which requires constant improvement of the level of professional competence of the teacher (Secret, 2011, Mayer, 2010). The work of a teacher, who organizes the education of students in the classroom and outside the classroom with the use of DL, as noted by E.S. Polat, requires an appropriate set of professional knowledge and skills. Taking into account the listed knowledge and skills, given by I. V. Secret, E. S. Polat, N. V. Mayer, we will single out those that, in our opinion, are necessary for a teacher of a foreign language at a technical university:

– knowledge of the principles of operation of a personal computer and the principles of operation on the Internet;

– knowledge of methodical materials and scientific literature on the problem of using elements of DL during teaching ESP;

– knowledge of the specifics of the organization of students' educational activities using remote technologies: the use of educational platforms, computer programs (in particular, MS Office), means of communication (e-mail, forum) for the organization of the educational process and its management by the teacher;

– ability to create educational and methodological materials using the Moodle



educational platform;

- the ability to conduct an independent search for information on the Internet for self-education and selection of educational material taking into account the purpose of education;

- ability to organize and monitor students' educational activities;

- the ability to organize an effective system of monitoring the student's educational achievements and a system of self-control and mutual control between students.

- use of the exercise subsystem placed on the Moodle platform in the form of the "SRS Development" teaching course as a means of mastering ESP writing.

- the ability to conduct an independent search for information on the Internet for self-education and selection of educational material taking into account the purpose of education;

- ability to organize and monitor students' educational activities;

- the ability to organize an effective system of monitoring the student's educational achievements and a system of self-control and mutual control between students.


The educational course hosted in Moodle has the following components: a model of the organization of the educational process, educational and reference material, and a subsystem of exercises for improving and forming certain skills, developing skills and acquiring knowledge. The study covers one semester, classroom classes (30 minutes in each class 18 lessons) and extracurricular independent work - 6 hours.

In order to work with the "SRS Development" course, the teacher must register on the website at the address uiite.kpi.ua/ua.html and receive confirmation from the administrator about assigning him the appropriate role. The teacher must prepare passwords and logins for students in advance. This means that the teacher must enter the names and surnames of students in the lists of exercise performers in advance. Before starting work with a set of exercises, the student must register on the website, entering a password and a login, which the teacher provides for each individual.

While performing the exercises, the student has the opportunity to use



educational reference information, while he is not limited in the number of attempts to ask for help. The teacher has the opportunity to observe the students' work, can review the number and quality of the exercises performed by each student, the points they received. In addition, the teacher can leave recommendations for students in the corresponding window, where the results of the exercise are recorded, and analyze students' mistakes during classroom classes. In the course of the exercises, students receive evaluations in points for each exercise, which are automatically displayed in the group list, where a statistical calculation of the student's educational achievements is automatically made. Students also have access to information. Thus, students exercise self-monitoring thanks to automated communication. A correct answer is highlighted in green, an incorrect one in red. Students have only 3 attempts to complete the exercise. At the same time, the grade is set according to the results of the last attempt, and the same grade is included in the report.

The "SRS Development" course includes exercises of a creative nature - communicative, productive exercises, students have the opportunity to create a text and submit completed tasks for review by the teacher. These exercises are called exercises that have a freely constructed answer. The development of writing skills is impossible without performing this type of exercise. There is an icon next to these exercises . The teacher checks the exercises, writes a review of the student's work, corrects mistakes, comments on them, assigns a grade by adding points to the general information.

Since learning takes place both outside the classroom and in the classroom, the teacher can communicate with each student separately, orally and in writing.

During the training process, the teacher is recommended to regularly review the materials posted on the Internet, evaluate the results of the exercises and inform in advance the teachers-colleagues of professionally oriented disciplines about the cooperation in the process of learning to write the English-language specification of software requirements, which is the first stage of creating a bachelor's project. Managers of bachelor's projects should advise students, provide advice on the formulation of the topic, content filling, technical indicators from a professional point



of view.

Since learning takes place both outside the classroom and in the classroom, the teacher can communicate with each student separately, orally and in writing.

During the teaching process, the teacher is recommended to regularly review the materials posted on the Internet, evaluate the results of the exercises and inform in advance the teachers-colleagues of professionally oriented disciplines about the cooperation in the process of students' learning to write the SRS in English, which is the first stage of creating a bachelor's project. Tutors of bachelor's projects should provide advice for the students on the formulation of the topic, content filling, technical indicators from a professional point of view.

We will consider the introductory, basic and final stages of teaching how to write a software requirements specification and give appropriate methodological recommendations for working with the "SRS Development" course.

In the classroom work with a teacher and self-study work, written text activity should be implemented, which is complicated from reception (understanding) to production (Tarnopolskyi, 2008, 246p.). Acquiring competence in ESP writing is a long process that requires considerable time.

In the final year of the bachelor's degree, when students have already developed certain skills and abilities in ESP writing, we offer IT students at the introductory stage to familiarize with the peculiarities of writing the text of the SRS, providing them with the necessary information and exercises that gradually reveal structural, linguistic, stylistic features of the genre.

At the introductory stage, the teacher must:

- introduce students to the educational computer course, give the address of the site where the course is located,
- give students passwords and logins to work with the course,
- explain that the course is intended for work in the classroom and outside the classroom,
- show the components of the course and indicate the purpose of each component,



– focus students' attention on the step-by-step implementation of actions, starting with the study of information and reference material and theoretical material for each stage.

At the introductory stage, students need:

- discuss the subject of the SRS with the tutor of the bachelor's project,
- be consistent and perform tasks step by step as they are performed independently,
- if the result turns out to be unsatisfactory during the exercises, the student has the opportunity to review the theoretical material and complete the task again.

The first stage of teaching is designed for self-study work of students. We recommend introducing students to the course components and explaining the organizational points of study at the first classroom session. In an extracurricular activity, students independently review the presentation "How to write a high-quality software requirements specification", study certain sources from the Internet and pay attention to the main requirements for creating a SRS in English. At this stage of learning, students are invited to read and orally discuss a sample of the SRS, as well as write an impression of the text, critically evaluate the text, then analyze each part of the SRS, determine the features of the text style, linguistic features of the text.

The second stage of teaching is designed for ten lessons, consists of four subgroups of exercises. Work at this stage takes place in the classroom mode with the teacher and in self-study mode. Students need to study the theoretical material that is located before the exercises of this stage. Some of the exercises were created using Hot Potatoes.

At the main stage, the teacher acquaints students with the rules of punctuation of the topic, citations, references, necessary for writing the SRS. In the third and fourth lessons, we recommend to assist students in formulating the topic of the project, we recommend involving teachers of professionally oriented disciplines, supervisors of diploma projects. The topic of the project should highlight the professional aspects of the research and be interesting for the student. This will make it possible to carry out an interdisciplinary connection of special subjects and English language, to coordinate

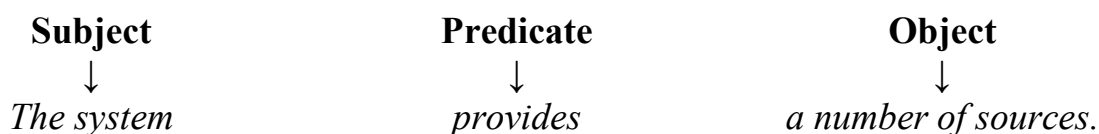


the actions of teachers-colleagues and students in order to ensure the fulfillment of the assigned task as much as possible.

From the fifth to the sixth lesson, attention is paid to the development of lexical skills in ESP writing (exercises 9 – 14). The teacher is recommended to teach students the peculiarities of the use of vocabulary in the SRS: to decode and create abbreviations, acronyms, definitions, symbols, to use terminology, indicative phrases, phrases-extenders. Students should also be given the task of solving a crossword puzzle and creating their own crossword puzzle to consolidate the learned terms used in the SRSs. Crosswords are solved in an extracurricular session with discussions in the Forum and orally.

Lessons from the eighth to the tenth are devoted to the development of grammar skills in ESP writing. Adherence to the rules of grammar contributes to the logical and understandable expression of students. We recommend that the teacher actively gives advice to students individually in the comments to the exercises and during classroom classes, as well as to direct students to a thorough study of the theoretical material before performing the exercises of this subgroup. Students should master the grammar material: tense and form of verbs – active and passive (Present Simple, Future Simple), infinitive, participle, gerund, modal verbs, conditionals, clauses, pronouns, articles. They need, in addition to the exercises prepared by the teacher in paper form, to complete the exercises in the computer test mode (exercises 15 – 24).

It is necessary to devote the eleventh and twelfth classes to the exercises for the development of comprehension skills and the use of means of communication and to perform exercises on the use of conjunctions, pronouns, combinations of words in a sentence (exercises 25 – 27). It is appropriate to draw students' attention to the syntactic features of the SRS text sentences. The structure of the sentences has mainly direct word order:



Often, technical documentation uses complex sentences, but with a fixed word



order to avoid ambiguity of interpretation. We recommend showing students the structure of sentences and presenting them formulas for describing four types of requirements: performance requirements (behavior/performance), design requirements, design constraint requirements, operation requirements.

Requirement Wording Template for Behavior/Performance Requirement

The<System name>shall<behavior>if<conditions>, where<quality factor>.

The ATM shall reject withdrawal requests if the amount requested is not divisible by 20.

Upon<conditions>,the<System name>shall<behavior>where<quality factor>.

Upon Operator Request, the system shall disable all audible alarms.

Requirement Wording Template for Production Capability

The system name shall produce<output>for use by<nodes>, if <conditions>, using <inputs/outputs>, where<quality factor>.

The system shall produce a launch alert message for use by the Missile Defense Agency if a launch is detected within the programmed target area within 2 minutes of launch detection.

Requirement Wording Template for Design Constraints

The<system name>shall have<instance>with this<feature>, and/or<constraint>.

The Ground Segment Software shall be programmed in ADA.

Requirement Wording Template for Process Compliance

The system name shall be<programmatic process>in accordance with<document>where<quality factor>.

The ATM shall be developed in accordance with ISO9001, Quality System Management Guidelines.

The final stage of training begins with the thirteenth class and lasts until the eighteenth class. At this stage, there is also classroom work and independent work of students with the "SRS Development" course. In the thirteenth session, students structure the content of the requirements specification "Web Accessible Alumni Database" (exercise 28) and use this sample to compile the content of the requirements specification for their own software development. In exercise 29, students learn to form



input data to the SRS.

Students gain knowledge about writing three parts of the SRS: introduction, general description of the document, and specific requirements for the software.

From lessons 14 to 16, the main part of the software requirements specification is created (exercises 30 to 37). The SRS consists of three parts detailing the information stated in the content of the document. Each individual lesson should be devoted to the assimilation of knowledge, the formation of skills and the development of students' ability to write a certain part of the text. The result of the fourteenth lesson should be the student writing an introduction to his/her own specification. The task of the fifteenth lesson is to teach how to write the second section of the SRS. After the self-study work, students write their own second section of the requirements. In the sixteenth lesson, students need to learn the characteristic features of the description of specific requirements for the development of software – the sequence of the presentation of information, the presence of illustrative material, which should be supported by explanations, drawings, graphs or tables, learn how to describe use cases (use cases) of the program: fully dressed use case, step by step description of the use case, which are often used in the third part of the document. The teacher must pay attention to the thoroughness of exercise 35 in pairs, necessarily in classroom mode, since the exercise requires special control from the teacher. Students create the third part of the software requirements specification as part of their own bachelor's project.

The instructor provides guidance on writing appendices to the specification of requirements and the number index, which are optional sections of the document.

Taking into account exercise 37, where a clear structure of the software requirements specification is presented with certain phrases, clichés, students write the final version of their own text.

A feature of the final stage of teaching is the development of students' skills in editing and evaluating the SRS. The teacher needs to aim students at evaluating the compliance of the content of English SRS with the educational communicative situation, compliance with the structural and compositional components of the IEEE standard for writing technical documentation, the quality of information presentation,



language correctness, volume. It should be noted that students are well versed in professionally oriented questions, so they can act as experts in assessing the quality of information presentation. During the seventeenth and eighteenth classes, the teacher should devote time to discuss the questions that arose from the students during the exercises (38, 39, 40), to analyze the mistakes made. It is worth orienting students to the thoroughness of identifying errors in grammar, vocabulary, punctuation, spelling both in their own work and in the work of their groupmates, as well as on marking them in the text.

We recommend discussing errors verbally, giving advice to each other on how to correct them. Exercises should be performed in groups. Observation of students' work showed that peer review and discussion of mistakes is effective. It should be noted that students find mistakes in other people's work faster than in their own. Advice from groupmates is very useful. This contributes to the development of a communication culture, fosters politeness and mutual respect.

Students in the self-study mode need to edit their own SRS, taking into account the advice of their groupmates, and attach a file with a final version to the 40th exercise for the teacher to review.

In the last lesson, we recommend giving students the opportunity to present their SRSs for the future bachelor's diploma project. This orients the teacher to the evaluation of the work.

Conclusion

A very important role of ESP writing for future professional activities of future IT professionals necessitated our search for new constructive ideas to solve the problem of effective organization, optimization and intensification of teaching ESP writing students of IT specialities in technical universities. The experimental methodology of teaching IT students to write the software requirements specification (SRS) is highlighted, the object, task, phases of the experiment, hypothesis, varied and non-



varied values are considered in the paper.

The criteria for evaluating students' works are defined and described – such as the compliance of the content of the English software requirements specification with the educational communicative situation, compliance with the structural and compositional components of the IEEE standard for writing the corresponding text, the quality of the presentation of information, relative linguistic correctness, the scope of the SRS, which make it possible to evaluate the text of the SRS, to determine and evaluate knowledge, the level of skills formation and the development of skills in ESP writing among students of the final stage of the bachelor's degree.

The implementation of experimental teaching writing a SRS for future IT students is described, its results are interpreted, and the effectiveness of the developed methodology is confirmed.

The effectiveness of the developed methodology has been confirmed, which gives grounds for recommending it for implementation in technical universities of Ukraine. The results of the experimental study gave reason to claim that the use of both teaching methods leads to an increase in the level of students' competence in ESP writing.

However, the first teaching method turned out to be more effective, in which at the introductory stage only independent work of students with the "SRS Development" course takes place, and at the main and final stages of teaching there is classroom work with the teacher and self-study work with the "SRS Development" educational course.

Methodological recommendations have been made for teachers regarding the organization and teaching future IT specialists ESP writing on the example of writing a SRS, which will contribute to the effective application of the developed methodology in the educational process.