

# Information and Communication Technologies and a Textbook *How to Master Scientific Skills in English for Academic Research Work in a Foreign Language*

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**Abstract.** Ural Federal University identifies project teaching as one of its priority areas. Thus, interdisciplinary projects are of particular significance, as graduates of universities should be prepared for the implementation of various projects, including international ones, in different scientific fields in a team with specialists from subject areas. Therefore, there is a need to create a specialized textbook that meets objectives of teaching and requirements of the students, teachers of foreign languages, and the heads of Bachelor and Master curriculums. We carried out theoretical researches of the principles of creating modern textbooks for university students. These principles of forming competences, conscientiousness and activity are determined as the priority ones. The didactic requirements for a contemporary textbook which include adequate correspondence of pedagogical process to the demands of modern life, purposefulness of education, reliance on a student and motivation are proposed in the article. We consider the use of computer science studies, information and communication technologies in the educational process at higher educational establishments as one of the essential requirements. We describe in detail the textbook *How to Master Scientific Skills in English* elaborated for academic research work in foreign language teaching at universities. This textbook is aimed at the formation and development of all types of speech activities (reading, speaking, writing and listening) in a foreign language and the foreign language communicative research competence in the sphere of the future career through the implementation of a project work in various fields. The results of the research include the testing assessment of the textbook with the students of the Institute of Radio Electronics and Information Technologies, who basically study Computer Science, at Ural Federal University and surveys of the teachers and students.

**Keywords:** Computer Science, Information and Communication Technologies, Foreign Language Teaching, Academic Research Work, textbook, project teaching, Bachelor curriculum, Master curriculum, Ural Federal University.

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## 1 Introduction

In the modern competition of higher education establishments, universities set priorities in the organization of the educational process. Ural Federal University (UrFU) is implementing project teaching [1]. According to V.A. Koksharov, the rector of UrFU; “It is important for the University to build the educational process so that the students understand the requirements of an employer and what they will need in their future job”. In this regard, we put into effect project teaching – in the nearest future the university will move to it” [2, P. – 4]. One of the results of a project work is supposed to be the publications in scientific journals, including ones in a foreign language. Practical experience showed that the use of authentic courses in foreign language teaching for academic purposes [3;4;5] is not enough to achieve the goals of the educational process. The authors of these courses are focused on certain results in educational process and often in a particular field of science. Most of the courses in Russia adhere to the traditional format without multimedia materials and access to on-line resources. In this regard, there is a need to create a textbook for the specific discipline to achieve necessary results of the educational process.

The textbook for higher professional education need not only to correspond to the structure of scientific knowledge and federal component of the disciplines of the State Educational Standards, be aimed at the formation of an integral humanitarian picture of the world among students, but also focus on the system of professional and educational skills [6]. A textbook for foreign language teaching of Bachelor and Master curriculums’ students, in our opinion, also targets the formation and development of communication ability and skills, as well in foreign languages in various sociocultural traditions. According to A.V. Khutorskoy a textbook is “a model reflecting the results, principles, content, technology of corresponding educational process and it also includes reality which is the condition for the implementation of this process. A textbook is the model which not only reflects the structure of the didactic system, but also projects its implementation [7, P. 13]. Admitting the above definition of the textbook, E.G. Gelfman proposes to consider the textbook both “ a strategic model” and “a tactical model” of educational process, as the former reflects the objectives of teaching, content of education, methods of teaching and its organizational forms, assumed by the group of authors. The latter offers a certain sequence of presentation of educational material, thereby, setting the script for the educational process [8, P. 116]. Considering the views of the scientists, it is important to note that in certain conditions there is a need to elaborate a textbook for achieving the university goals.

The pilot teaching project was implemented at the Institute of Radio-electronics and Information technologies of Ural Federal University. The Department of foreign languages and translation was given the task to elaborate the methodology of interdisciplinary projects in a foreign language. The project includes the study of scientific literature in the field of educational program in a foreign language on a topic and problem chosen by a student with the follow-up multimedia presentation of the research results [9]. The students should be prepared for public speaking at scientific events of various levels and participation in international and interdisciplinary projects. Thus, on the one hand, it is necessary to form and develop all speech activities of students in a foreign language

(reading, speaking, listening and writing). On the other hand, it is necessary to form science-research and intercultural competences [10]. These purposes determine approaches and principles to create courses for foreign language teaching for academic research work.

The subject aspect is the primary one in selecting the content as it plays the key role and it allows determining the nature of the language material, genre and stylistic features of the texts. Since the essential principle of creating the textbook is the principle of forming competences, we can conclude that a subject field of textbooks includes specially selected knowledge and understanding reflecting the regularities of the field of activity that form the content of academic discipline as well as methods of their realization and application. This forms critical thinking and teaches to solve challenging tasks.

Great attention in elaborating the textbook is given to the principle of conscientiousness and activity in education. The principle is presented in the following aspects [12]:

a) understanding (by the students) goals and tasks in educational process, intention to achieve them, and, hence, conscientious and active attitude towards learning;

b) active acquisition of knowledge and conscious creative appliance of it. It is impossible to develop an idea, to enrich oneself with knowledge and form opinion, views, basic elements of science without revision of learning material in mind. This activity paradigm is closely related to information. Both the ability to work skillfully with information and information and communication literacy become the most important requirement in training teachers and students [13, 14]. In modern conditions of the development of information and communication technologies and their widespread use in all life spheres, it is difficult to imagine learning materials without multimedia technologies. However, it is important to follow the principle of information and communication justification [15, 16, 17]. A modern textbook should be possibly multimedia based and include tasks with the Internet use, simultaneously, it should take into account the principle of advanced computer training [18, 19, 20] which is highly important for the students of the Institute of Radio-electronics and Information technologies, who basically study Computer Science.

There is a need to determine didactic requirements for a textbook of foreign language teaching for academic research work. Primarily, it should set up the correspondence between the real needs of the time and requirements of pedagogical process that is determined in curriculums and programs, adapt the teaching process to modern conditions and consider the awareness level of students. The determination of adequate correspondence between the needs of the time and pedagogical process allows meeting the requirement of purposefulness of teaching. A modern textbook should solve the certain pedagogical tasks determining the entirety of its elements. Fulfillment of this requirement meets the need of a textbook to be focused on a student. Consequently, it takes into account personal peculiarities to rely on the existent experience and determine optimal conditions for individual work and apply various teaching methods and types of class activities. The teaching process focused on a student indisputably enhances the learning motivation. A modern textbook should stimulate a cognitive activity based on individual significance of learning material and problematics. The design and sections of the textbook play great importance.

The Bachelor curriculums of the Institute of Radio-electronics and Information technologies implement the project work into “Foreign language of Speciality” module and within the Master curriculums – “Foreign language for scientific-research work”. The market of authentic educational courses cannot provide textbooks for the implementation of interdisciplinary projects in a foreign language in various curriculums. The development of methodology of project teaching in a foreign language at the Department of foreign languages and translation of Ural Federal University, the theoretical studies in the field of project teaching and the development of educational technologies have led to the need of creation of a modern textbook that meets the teaching objectives and requirements of students, teachers of foreign languages and the heads of curriculums.

The purpose of the research is to identify the main elements of a modern educational course of the discipline “Foreign language for scientific-research work”. The object of this paper is the process of foreign language teaching for scientific-research work at University. The subject of the research is the methodological features of the methodological support for scientific-research work of the students of the Institute of Radio-electronics and Information technologies (IRIT-RTF) of Ural Federal University.

## **2 Research results**

Improvements in computer science and information and communication technology combined with the possibilities of the Internet provide almost unlimited opportunities for education, both for teachers and students. On the one hand, there is availability of electronic resources and educational literature of any quality, for audiences of any age, designed for teaching any goals in any language, with the help of original and adapted sources, which creates the illusion of a large selection of educational publications. On the other hand, it allows choosing the best educational material for teaching.

We faced a problem of selection of the study guide for the students of IRIT-RTF on the discipline "Foreign language for science-research work". The problem is that there are different curriculums in the Institute. However, if, for example, for the program of "Information technology" there can be found authentic textbooks for teaching English, then for the program of "Radio-frequency engineering" there are no such textbooks. On the other hand, the Institute is interested in developing students' foreign language communicative research competence in the sphere of the future career. Therefore, the discipline "Project module. Foreign language for science-research work" appeared in the curriculum. Taking into account the fact that the students of IRIT lack verbal communication, have narrow-mindedness in many social and professional issues, it was decided to develop our own textbook.

We faced several challenges:

- - teaching a foreign language for professional and scientific activities, including all types of speech activity;
- - communicative approach to teaching;
- - use of computer science and information and communication technologies in education;
- - relevance of topics and content.

In current conditions projects are implemented in almost all spheres of modern life - social, economic, political, scientific, etc. The main approaches, principles and stages of project implementation in various fields are identical, so we decided to teach the students project activities in a foreign language in the professional and scientific fields. This framed the name for our textbook *How to Master Scientific Skills in English*.

Due to the fact that we need to pay special attention to all types of speech activity and teach students to work with different sources of information, the following thematic sections were identified: From Words to Events, From Essays to Projects, Reliable Resources, Effective Reading, Public Speaking, Active Listening, Effective Infographics. Each thematic section teaches a certain type of speech activity, forms and develops skills to work with different sources of information and gives an idea of the different stages of implementation of science-research work (Table 1).

Each thematic section begins with a story picture and discussion, which is the "insight" into the topic under study. Each thematic section of the study guide consists of 10 practices that describe the material studied in detail. Depending on the content, goals and objectives of the section, some practices can be duplicated for a more detailed study of the topic and the necessary skills. The order of practices can also be different, according to the organization of training sessions or the logic of presenting information.

Practice Insight into the topic is the main text on the topic under study, which presents key notes with the vocabulary required to study.

Practice Reading combines additional relevant authentic texts for in-depth study of the topic. This section introduces students to the peculiarities of the topic as well allows expanding the horizon and increasing vocabulary with modern words and expressions as through the use of modern educational materials.

Practice Listening contains authentic audio and video excerpts on the studied topic. The modern format of recordings and challenging tasks allow students to listen not only to the speech itself, but also to understand different accents and pronunciation features, which allows students to be prepared for face to face communication with people of different nationalities (and consequently with different pronunciations and accents) in various social and professional situations.

Practice Speaking/discussion is aimed at the development of monologue and dialogue speech, based on existing and acquired vocabulary. Discussions are aimed at discourse based on existing and acquired knowledge in social, professional, scientific spheres, taking into account intercultural peculiarities.

**Table 1.** The content of the thematic sections of the study guide for teaching a foreign language for science-research work.

<b>Thematic section</b>	<b>The main functions of the thematic section</b>
From Words to Events	This thematic section helps students: <ul style="list-style-type: none"> <li>- understand the importance of differences in word meanings in various situations and spheres;</li> <li>- see the difference between formal and informal foreign language;</li> <li>- study different types of business, academic and informal events.</li> </ul>
From Essays to Projects	The main purpose of this section is to acquaint students with different types of written projects, with the formulation of the topic as well as approaches to writing different types of projects. The section gives an idea of strategies that can be used both for writing a short essay and course projects.
Reliable Resources	The purpose of this section is to form the skill to assess the reliability of information sources on certain features, focusing on Internet resources.
Effective Reading	The section forms the ability to use different types of reading to solve research questions in project activities. The purpose of this section is to show students how to achieve their goals in reading effectively.
Public Speaking	The content of this section helps students to prepare their oral report on the project properly, taking into account current public speaking trends. In the process of studying this section, students can prepare their defense of the project and a multimedia presentation, following the step-by-step instructions.
Active Listening	Objectives of this thematic section: <ul style="list-style-type: none"> <li>- show students the techniques of active listening and their importance for the ability to extract the necessary information;</li> <li>- formation of verbal and non-verbal communication skills for professional communication.</li> </ul>
Effective Infographics	This thematic section forms the ability to describe tables, graphs, charts and other visual means of demonstrating data.

Practice Writing allows students to practice writing letters, notes, instructions, messages, etc. for different purposes and in different situations using different techniques. This practice involves the use of the studied vocabulary and grammar structures on the topic.

Practice is a set of exercises for practicing certain skills of speech activity, which are important in terms of the topic under study, for example, acquiring the lexical minimum when working with text materials.

Practice Internet use offers live links to online sources to perform various tasks. This section shows students a variety of educational resources that allow them to improve their language skills in extra-curricular time as well and master their skills in computer science.

Practice Grammar tips explains some particular grammar structures that are relevant for the topic under study. The practice also includes theoretical rules and practical tasks. Explanation of theoretical aspects is given in a foreign language, which is additional practice for students.

Practice Advancement questions is the final stage of each unit with the concluding questions on the studied topic. The purpose of this section is to check students' understanding of the basic concepts as well as evaluate formation of the necessary skills. The proposed questions can be used both for self-control by students and for control activities.

Reliable information source combines current live links to reliable sources with additional information, as well as relevant additional sources: textbooks, study guides, web addresses of universities dealing with the studied topic, web sites with additional listening tasks.

Taking into account the amount of information shared on the Internet and its inconsistency all the texts used in the educational process have a backup copy in the .doc format and, accordingly, they are available regardless of the Internet access and can be found in Appendices. The study guide has keys to the tasks that allows using it both for independent work and self-control.

The textbook is designed in such a way that, having defined the research topic in the first thematic section, the student can develop it, gaining new knowledge in each of the subsequent thematic sections. On the other hand, depending on the educational goals and objectives, the teacher can change the order of the thematic sections.

At the moment, the testing of the textbook has taken place during one academic year, which allows making changes to the content of thematic sections quickly, replacing or adding tasks. So far we have received only positive feedback from the teachers. One of the negative aspects is the complexity of listening and speaking tasks for students with a low level of English proficiency. In this regard, it has been decided to differentiate the listening tasks into difficulty levels. Students note that the acquired knowledge helps to work not only on the project in a foreign language, but also to carry out research projects in other disciplines using computer science skills and information and communication technologies effectively.

### **3 Main results**

On the basis of the conducted research, we conclude that the modern textbook for the discipline "Foreign language for science-research work" should contribute to the for-

mation and development of not only foreign language competencies, but also professional, technological and research ones for communication in the process of implementation of international interdisciplinary projects.

The textbook *How to Master Scientific Skills in English*, designed to teach a foreign language for science-research work, is implemented in the educational process on the discipline "Foreign language for science-research work" for Bachelor and Master curriculums' students of the Institute of Radio Electronics and Information Technology, UrFU. In the process of testing we have confirmed that such elements of thematic sections as Reading, Listening, Speaking/Discussion, Writing, Grammar tips contribute to the formation and development of foreign language communicative research competence with the help of the material focused on project activities in a professional field. Practice Internet use provides the use of multimedia technologies in the educational process. Practice Advancement questions, Reliable information source and Practice provide individual work of students.

Feedback from the teachers confirm the compliance of the textbook with the previously established didactic requirements. It also demonstrates a high degree of satisfaction with the thematic sections and practices presented in the textbook for working with students with different levels of foreign language and information-communication proficiency. As a result, we have demonstrated that information and communication technologies in combination with the textbook form the basis of required competences for successful scientific and professional practice of Computer Science students.

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