Information and Communication Technologies in a Staged Approach to Formation of a Foreign Language Communicative Research Competence

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Abstract. This paper deals with the components of the competence model of a student of a university realizing a research in the sphere of the future career in a foreign language with the usage of computer science. The paper analyses statistics that confirm the necessity of the development of the foreign language communicative research competence in the sphere of the future career of Computer Science students in higher educational establishments. The foreign language communicative research competence is a complex and multidimensional term, which combines the following components of the student's competency model: foreign language communicative competence, intercultural competence, career-oriented research competence, competence of scientific communication, educational competence and technological competence.

The authors of the article present the methodology of organising staged research work of Computer Science students during their Bachelor degree program. On the one hand, any research work is organised according to specific stages. This paper gives seven stages of students' research work. On the other hand, research work in higher educational establishments is realized in the form of formal and informal communication. These forms of scientific communication give an opportunity to identify the stages of the research work of students. This research work is realized in different forms during every year of education including the usage of computer science studies and information communication technologies. It starts with short reports and presentations on the career-oriented topic; and develops into interdisciplinary project for a year and a half duration which unites the work of foreign language teacher, teachers of career-oriented disciplines and Computer Science students. Moreover, this project work may be continued as Master's research paper.

Analysis of statistics, psychological-pedagogical and methodological literature allowed the authors to determine the foreign language communicative research competence and highlight methods of their formation and development. Empirical methods include the questioning of university students and teachers,

the introduction of research results in teaching practice at universities, the analysis of progress in the learning process, the mathematical processing of surveys, and the graphical presentation of the results.

We prove in this paper that the foreign language communicative research competence is multicomponent; the sequence of stages of a research work of university students in a foreign language allows evaluating the formation of each component of the foreign language communicative research competence; the formation and development of the foreign language communicative research competence in professionally-oriented teaching of a foreign language at universities is realized in the conditions of scientific communication in a foreign language; what finally increases motivation of university students to study a foreign language and forms interdisciplinary links. The development of every component of the foreign language communicative research competence provides effective progress in the career of a Computer Science graduate.

Keywords: Computer Science, Information and Communication Technologies, Statistic Analyses, Research Work of University Students, Competence Model of a University Student, Formal Scientific Communication, Informal Scientific Communication, Stages of the Research Work.

1   Introduction

Modern society is characterized by fast changes in all life spheres. The society has new requirements to the system of higher professional education and graduates of higher educational establishments. Those university students who plan to pursue science should be familiar with up to date information in the sphere of their scientific interests. Very often only foreign sources can provide this information. Moreover, in order to be introduced on an international level, become a part of an international scientific and professional society, have an opportunity to carry out research work in an international team, be able to introduce the results of scientific experiments, it is necessary to be able to write proceedings, scientific articles and introduce results of work at scientific conferences. An indisputable necessity for solving these problems is the knowledge of computer science and information and communication technologies.

In spring 2019, Round University Ranking (RUR) published its Annual University Rankings, which evaluates the performance of 761 universities around the world [1]. Performance is measured by 20 indicators related to teaching, research, international diversity, and financial sustainability. RUR partnered with Clarivate Analytics to collect statistical data from its Global Institutional Profiling Project, bibliometric data exclusively from the Web of Science, and reputation data from its Academic Reputation Survey. The Fig. 1 represents the countries where the best universities are situated.
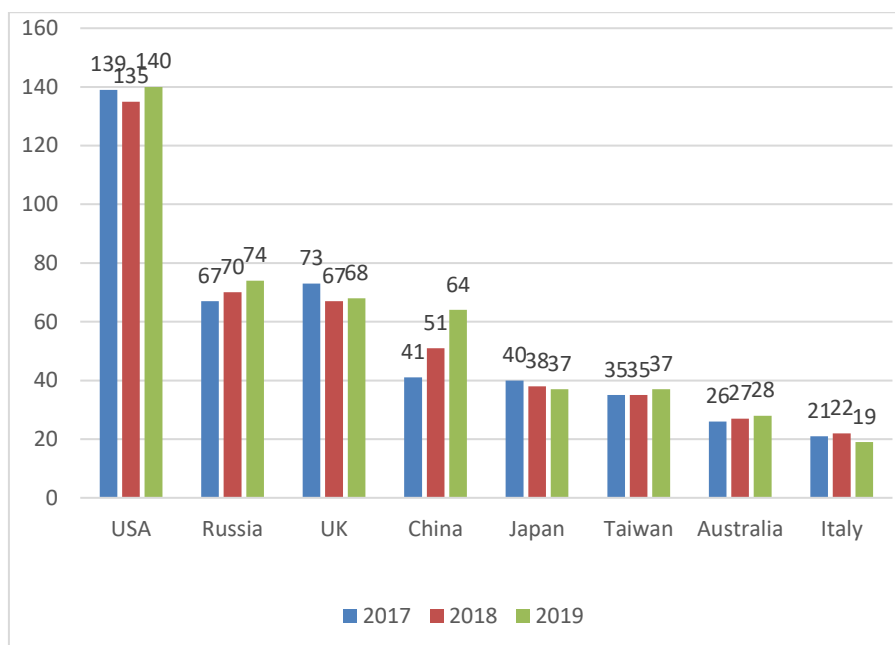
Fig. 1. Number of Top Universities in 2017 - 2019

The submitted data shows that USA universities continue to dominate the leader board. Russia occupies the second position in the world in terms of overall representation in the rankings of 74 institutions, last year it was also the second position with 70 universities. The UK occupies the third position with 68 participating universities.

The data shows that the competition of universities around the world takes place in the increasingly changing and competitive environment. Russia is far behind the leader, the USA, but basically is apace with the UK and China. It means that Russia needs to continue educational and scientific improvements to enhance the position in different spheres of economics. Educational, scientific and economic development and improvement require wide international communications. Young people are the basis of the progress in a long-term perspective. Therefore, education of young people and formation of a foreign language communicative research competence using modern tools of education (information and communication technologies) are primary objectives of Russian educational establishments.

2 Methodology

Research in a foreign language with the usage of computer science studies and information communication technologies in higher educational establishments is the objective of our research. The methodology of staged approach to the development of the foreign language communicative research competence is the subject of this research. In order to define components of the competence model of a computer science student

realizing research in a foreign language with the usage of information communication technologies we conducted analysis of scientific publications of Russian and foreign scientists who research the formation and the development of competences of university students while studying at higher educational establishments.

To achieve the purpose of this study, theoretical and empirical methods of scientific and pedagogical research were applied. Analysis of statistics, psychological-pedagogical and methodological literature allowed the authors to determine the foreign language communicative research competence and the methods of their formation and development. Empirical methods include the questioning of students and teachers, the introduction of research results in teaching practice, the analysis of progress in the learning process, the mathematical processing of surveys, and the graphical presentation of the results.

3   Foreign language communicative research competence

The teaching of a professionally-oriented foreign language at a higher educational establishment is closely connected with research work of university students in a foreign language, which leads to the formation of various components of the foreign language communicative research competence (FLCRC). The foreign language communicative research competence is multicomponent (Fig.3) and unites the communicative competence, the intercultural competence, the professional scientific competence, the competence of scientific communication, the educational competence and the technological competence [3].
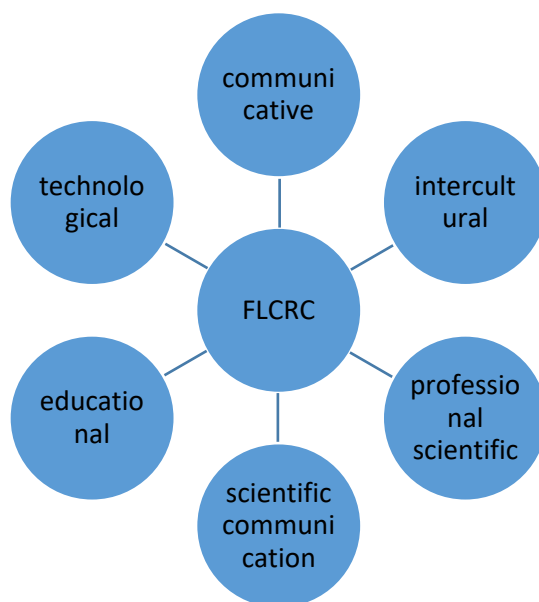
Fig. 2. Components of the foreign language communicative research competence

FLCRC is defined as an ability to generalize and critically evaluate the results obtained by domestic and foreign researchers, to identify prospective directions, to compile a research program, to discuss the stages and results of research with researchers from different countries, solving the main tasks of vocational activity, to report the results of the research in different countries in a foreign language.

4   Scientific communication

The formation and the development of the foreign language communicative research competence (FLCRC) in vocationally-oriented foreign language teaching is implemented in terms of scientific communication in a foreign language.

To classify scientific communication, various concepts are used that determine its various characteristics: formal - informal, oral or written, planned or spontaneous, etc [4]. All these types of scientific communication are closely connected with communication in a foreign language, where there is oral and written speech, prepared and unprepared speech. Formal and informal interaction is specific for communication in a foreign language in the process of scientific communication. Formal communication reflects the subject-object relationship, corresponds to the linear-code model (mechanistic approach), is expressed primarily in a written form, monologue, standardized, unified, invariant forms of speech, aimed at the result, implemented in an official setting, often acting as a management tool. Informal communication, on the contrary, reflects subject-subject relations, corresponds to the interactive model (activity approach), assumes the equity of participants, is spread mainly orally, is dialogical, arbitrary, unique, less reliable, aimed at the process, and is characterized by an informal atmosphere [5]. It is necessary to emphasize that formal and informal communication complement each other. The combination of the two types of communication makes the communication process richer and the product of communication more qualitative.

In the process of informal scientific communication, the teacher puts forward a certain idea, a problem, or gives students the opportunity to choose the most interesting research direction for them. This stage is aimed at the formation and development of the foreign communicative competence in the field of scientific research. At this stage, university students can come together in thematic groups for further research work or exchange of existing information on the topic of the scientific research. At the next stage of the research process, students enter into formal communication with scientists who consider this issue in their articles, scientific publications and monographs. This stage makes it possible to form educational, foreign language, communicative, intercultural, technological, career oriented research competences and the competence of scientific communication. After a detailed study of the question, students again enter into informal communication with each other and the teacher in class during the educational process, in order to exchange the accumulated information and analyze the data obtained during the research. The final stage is aimed at the formation of the foreign language communicative competence and the competence of scientific communication. It is necessary to emphasize that all stages of the

project can be put into practice distantly with the usage of modern means of communication.

5 Stages of the research work

The rotation of formal and informal communication determines the stages of research work [6] aimed at the formation and development of each component of the foreign-language communicative research competence in vocationally-oriented teaching of a foreign language with the usage of information communication technologies (Table 1). The sequence of the stages of the research work of university students in a foreign language allows us to evaluate the formation of each component of FLCRC:

Table 1. Stages of the research work and developing competences

Stage	Content of the stage	Developing competence
Stage 1	statement of the research problem, definition of its goals and objectives	communicative competence; competence of scientific communication; educational competence; technological competence
Stage 2:	identification of participants of the research group	communicative competence; intercultural competence; technological competence
Stage 3	search and systematization of information and analytical material and scientific literature on the problem in a foreign language	intercultural competence; professional scientific competence, competence of scientific communication; educational competence; technological competence
Stage 4	analysis of the obtained data, evaluation of theories, concepts and approaches, determination of the main directions for resolving contradictions	professional scientific competence, competence of scientific communication; educational competence; technological competence
Stage 5	development of solutions to the research problem	communicative competence; competence of scientific communication; educational competence; technological competence

Stage 6	independent evaluation of the results of the study	communicative competence; competence of scientific communication; educational competence; technological competence
Stage 7	discussion of research results in the professional scientific environment	communicative competence; professional scientific competence; competence of scientific communication; educational competence; technological competence

6   From short reports and presentations to master's research paper

Systematic research work with the students of the Institute of Radio Electronics and Information Technology (IRIT-RTF), who study Computer Science, at Ural Federal University is conducted. The first year university students research historical aspects related to their future vocational activity using various tools of computer science: they study biographies of famous scientists, the stages of science development and achievements in the professional sphere. The second year university students study computer science technological processes, which are described in popular scientific literature. At the end of their research, university students prepare a report in a foreign language in the form of a multimedia presentation, which is presented and defended at the Open Colloquium of the 1st and 2nd year students. Students, teachers of foreign languages and specialized disciplines are present at this Colloquium. After the defense of each project, those who are present, ask questions and express their points of view.

This form of organization of the independent work of students allows them to get acquainted with well-known facts in the field of their future career activity, to learn to find and use various sources of information, including digital, first of all, in a foreign language, master their skills in computer science to begin studying specialized terminology. Teachers of a foreign language control all stages of the research, hold interim hearings of reports in a foreign language and help in the formation of the final report [7].

Computer Science students of the 3d and 4th years of education conduct research works which are planned by the educational plans of their educational programs. Heads of educational programs, curators of groups in IRIT-RTF help students to determine the topic of their research and the choice of reliable sources of information including digital in a foreign language. The topics of the research works are closely connected with future vocational activity and include theoretical and practical work. Students study the scientific literature and articles on the topic from the list of reliable sources adopted by the heads of educational programs. The aim of this stage is to get

knowledge on the topic, learn terms in a foreign language and determine the perspectives of the practical part of the work. Students make reviews in a foreign language of the read articles and discuss them with students and the teacher of a foreign language. Moreover, students assemble a glossary of vocationally-oriented terms. They have a term, its definition in a foreign language, an example from the text where they find the term and the translation of the term into Russian.

All these stages of the research work are implemented with the active usage of computer science and information communication technologies. All the research works are presented with multimedia presentation is defended every half of a year. These presentations are assessed by the head of the educational program and the teacher of a foreign language. The head of the educational program pays attention to the content of the research work and the teacher of a foreign language assess the foreign language. Many students make their research work with their own calculations, computer programs and analytics on different items. These research works are the bases for their future research works in the Master Degree Programs.

7 Results

The systematic research work with the Computer Science students of the IRIT-RTF at Ural Federal University develops the foreign-language communicative research competence with the usage of computer science and information communication technologies, on the one hand. On the other hand, this research work increases the interest to the foreign language. The students were interviewed in order to receive the feedback. If in the first year of study only 12% of students saw the prospects of a foreign language in their future professional activity, subsequent surveys showed steady growth (Figure 2) [6].
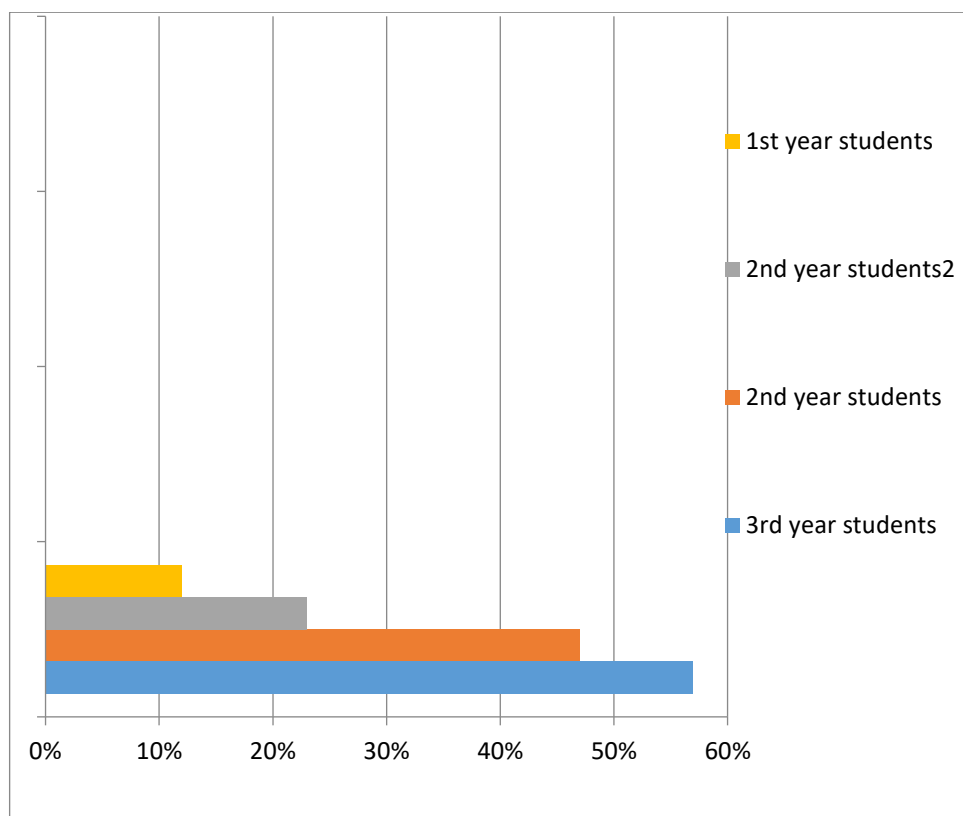
Fig. 3. Indices of students' interest in learning a foreign language for future professional activity

Questioning of the students and the teachers was necessary to improve the quality of the organization of students' work and the methodology of conducting a research work of students in a foreign language with the usage of information communication technologies. Based on the results of the questionnaire, consultations of students during the period of the research work have been organised and the procedure for conducting the Open Colloquiums and the defending the research works have been changed.

8   Conclusions

It is important to develop the foreign-language communicative research competence of university students to make the graduates competitive in modern scientific environment and successful in their career. The foreign-language communicative research competence is multicomponent and combines the foreign language competence, the intercultural competence, the career oriented research competence, the scientific

communication competence, the educational competence and the technological competence. Each component is developed on different stages of the research work of university students. The staged approach to research work unites not only staged work on the research work but also the systematic research work of students on every stage of education: from the first year until the Master Degree Program. The staged approach to the research work increases the motivation for learning a foreign language with the usage of computer science, information and communication technologies, which ensures the prospective development of a graduate of the university in his future career as the research wok forms interdisciplinary links. As a result, staged approach to the research work develops all components of the foreign-language communicative research competence of university students.

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