Analysing the Level of Academic Writing Literacy of TUSUR Graduate Students

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***Abstract*—The intensification of research at Tomsk State University of Control Systems and Radioelectronics (TUSUR) leads to the increase of publication activity of graduate students. However, numerous language and style problems in their research articles in English indicate the lack of academic writing literacy, which impedes the effective publication process. Up to date, there has been no specialized course for teaching English for Academic Purposes in TUSUR. The aim of this study is to analyze the current level of paper writing skills of TUSUR first-year graduate students and their motivation for studying EAP introduced into the curriculum according to the new educational standard. The authors conducted a questionnaire survey covering most common grammar, vocabulary, punctuation and genre mistakes from students' writings. The questionnaire analysis described in the paper outlines the extent of the problem and allows defining the range and profile of didactic units for an elective EAP course. We expect that the introduction of such course will lead to the increase of publication activity of young scientists.**

Keywords—academic writing literacy, questionnaire analysis, Master students, EAP, online course

I. INTRODUCTION

Universities play a leading part in equipping their students with knowledge and skills necessary for developing new devices and equipment and for pursuing research activities in various scientific fields. The growing significance and the intensification of research in different areas of science and technology lead to the increase of publication activity of graduate and postgraduate students in high-impact English language journals and international conference proceedings. As many authors note, for example [1], writing skills become central to constructing knowledge and educating students. In the meantime, the challenges of writing for publication in English are considerable in today's competitive environment. A lot of linguists agree that both native and non-native speakers experience many difficulties in writing [2]. Thus, the optimal and highly sought area of teaching academic literacy is English for Research Publication Purposes (ERPP) [3], which is aimed at teaching "the common core linguistic code" to a multilingual academic community. The English language is regarded as *lingua franca* with its rhetoric and publication conventions [4].

Tomsk State University of Control Systems and Radioelectronics (TUSUR) is one of the leading universities in Russia in the field of engineering, electronics and IT. In 2010, TUSUR defined the goals for the university to generate ideas and entrepreneurs for knowledge-intensive business, and got funding from the Russian Government Research and Development Program (Decree N218) [5], which was used to open R&D centers, Russia's first technological park and business-incubator, students' design offices, laboratories, research centers, etc. Since then, TUSUR has been in the top list of different university rankings for the high quality of education, high quality of graduate specialists, and Forbes Factor (the 27th place in 2019) [6], and it aspires towards even higher ranking positions, which implies increasing publication activity in high-impact international journals. The number of R&D institutions in TUSUR is still growing, hence creating opportunities for researchers to share their knowledge, findings and developments with the rest of the world.

In 2017, in TUSUR there was conducted a comprehensive analysis of top regional, national and international educational institutions of different forms of organization and status, which have high positions in different rankings [7]. The analysis showed that most universities offer both "English for Specific Purposes" (ESP) and "English for Academic Purposes" (EAP) courses during all 4 semesters of Master's Degree program. However, in our university there are no specific ERPP or EAP courses which would provide training academic writing skills in English. This leads to numerous language problems and the lack of academic writing literacy in general, admitted by both the authors of scientific papers in English and language specialists proofreading the articles before submitting them for publication, which hampers the effective publication process.

The authors of this article, having considerable experience in proofreading graduate and postgraduate students' articles before submitting them to national and international journals and conferences, have started a comprehensive work towards designing and implementing an online ERPP course in the curriculum of Master's Degree programs. This project was actively supported by the Department of Television and Control, in particular, the research laboratory "Safety and Electromagnetic Compatibility of Radioelectronic Facilities" (hereafter the SECRF laboratory).

Our views on the structure and performance of the basic-level ERPP course as an optional online resource within the program of Scientific Research Work of Students are reflected in [8], [9] and in our application to Vladimir Potanin Foundation Fellowship Program for an online course on Writing a Research Paper (Application N ГК190000680) [10] in 2019. The course will have 9 parts

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corresponding to all main sections of a scientific paper (Title, Abstract, Introduction, Review of Literature, Methods, Results, Discussion, Conclusion, References) and 1 part devoted to academic style. Each part will cover the most important language aspects specific for scientific articles: vocabulary, grammar, punctuation, and language functions (e.g. commenting a table, describing a process, etc.).

All these studies and activities provided the grounds for the initiative of the Foreign Language Department on expanding the curriculum of Master's and Bachelor's levels towards increasing the number of academic hours for ESP and introducing elective EAP courses. In accordance with the new version of Russian Federal State Educational Standard for Higher Education (hereafter the Standard), which took effect in September, 2019 [11], the optional part of Masters' curriculum in our university includes 3 credit hours in semester 3 for an elective EAP course and the optional part of Bachelor's program includes 6 credit hours of EAP courses in semesters 4, 5 and 6.

The authors of this article are now faced with a broader task of designing educational programs and teaching materials for elective EAP courses for both levels of education. As the underlying technology, we are planning to use blended learning, which implies using e-courses. This technology has already proved its efficiency for various academic purposes, such as in [12], where the authors used it in teaching EFL and thus increased the level of students' self-sufficiency.

The aim of this study is to analyze the current level of motivation for studying EAP among TUSUR first-year graduate students and the level of their academic writing literacy after the ESP course completion in order to reveal the areas which will require special attention in the EAP program. For this purpose, the authors developed a questionnaire containing the questions on students' motivation and experience in paper writing in both languages and covering some key aspects of paper writing skills. Other objective motivating factors were also considered in the research. Then, we tested some random groups of first-year graduate students and a control group of first-year postgraduate students having an optional basic ERPP course in their curriculum. The results were then compared to check the hypothesis that the skills of writing scientific papers in English require special training, which is not enough within a regular ESP course for graduate students in our university.

Students from Electromagnetic Compatibility (EMC) MSc Degree Programs were analyzed as a separate group, as the SECRF laboratory was chosen as a pilot site for testing the ERPP e-course under development before introducing it into the elective EAP course in other Master's Degree programs as part of blended learning technology.

Section II of this paper will review the current state of the publication activity as a factor motivating students' writing on the example of the SECRF research laboratory and will analyze the level of students' motivation in improving their academic writing literacy. Section III will provide the results of the questionnaire study conducted with the first-year graduate and postgraduate students, and its analysis. Section IV will discuss the results, taking into consideration the requirements of the Standards of Generation 3 and Generation 3++ for Master students and the competencies to be obtained during ESP and EAP courses, and present our view on how to improve academic writing skills within the optional part of the MSc Degree curriculum.

II. Situation Analysis

A. SECRF laboratory as a pilot site

The SECRF laboratory was the first in our university who showed interest in a dedicated academic writing course and supported the authors in their application for the Vladimir Potanin Program [9]. This laboratory is one of the leading laboratories of TUSUR: their intense research activity has provided them with a lot of victories in federal foundation programs. The importance of EMC and the active research work carried out in this laboratory means high publication activity, which allows us to assume that the students of this laboratory may have high motivation for increasing academic writing literacy. That was one of the reasons for choosing the students of this laboratory for testing the ERPP online course.

The analysis of the laboratory activity showed that their students have really advantageous conditions to succeed in their studies. First, the laboratory carries out research in topical engineering areas: signal and power integrity, modal filtering, protecting against ultrashort pulses, mathematic simulation of onboard space equipment, creating programming and hardware tools for modelling, simulating and providing EMC of critical equipment, etc. Second, the members of laboratory, including graduate and postgraduate students, have received numerous Russian patents of invention and certificates on registered software. During their research work students are involved in a wide range of grant activities which are funded by various prominent Russian institutions: Russian Foundation for Basic Research, Russian Science Foundation, Russian Ministry of Education and Science, etc. and within the Russian Government Decree on Research and Development N218. Next, the publication activity of the laboratory is constantly growing. The number of articles in international journals has grown from 5 in 2015 to 11 in 2018 to 10 in 2019 so far, with 9 articles published in such high-impact journals as *Symmetry*, *Complexity* and *IEEE Transactions on EMC*. Students' participation in international conferences numbers 80 reports, with 70 made so far in reputable IEEE Conferences (SIBCON, SIBIRCON, EDM and Dynamics). Finally, in their work, students widely use state-of-the-art equipment and simulation software, as well as develop their own devices and software, and get considerable incentive and support from their scientific advisors in research and publishing experience.

B. Motivation analysis

All these achievements clearly demonstrate that students of this research laboratory must have a high level of motivation to pursue their research and to report the results in journals and conference proceedings both in Russian and in English. Moreover, writing research papers for refereed international journals can guarantee students an increased state academic scholarship or different foundation scholarships. In our survey, 4 out of 9 EMC first-year students reported they would like to have a special ERPP

course in their studies. Considering all mentioned above, we can suggest that in such conditions the students who choose the elective EAP course may achieve good results and increase publication activity in the English language.

III. Questionnaire Study

A. Participants of the Study

The questionnaire respondents consisted of 28 first-year Master's Degree students of electronic engineering and radioengineering specialties, including 9 EMC graduates, who had completed only a regular ESP course without specific focus on writing. Their language proficiency could be defined as mostly B1 (CEFR scale). The curriculum of the investigated groups of graduate students was based on the Standard [11] of Generation 3. This Standard allocated 5-6 credit hours of the ESP course in semesters 1 and 2.

Table I shows graduate students' experience in writing scientific papers in Russian (L1) and in English (L2).

TABLE I. Graduate Students' Writing Experience (%)

	Multiple	Some	None
Writing conference articles in L1	10.7	46.4	42.9
Writing research papers in refereed journals in L1	7.1	28.6	64.3
Writing conference articles in L2	0	14.3	85.7
Writing research papers in refereed journals in L2	0	3.6	96.4

As can be seen from the table, most first-year graduate students have only written articles for Russian conferences, although 1 student (from the EMC group) has a publication in a refereed international journal. The number of publications in English is very low. Quite astonishing is the fact that 42.5% reported no experience in writing papers in Russian, which can mean their unawareness of peculiarities of the scientific style in general.

As a control group, we chose a group of postgraduate students of the first year (3 people), who completed an optional basic-level ERPP course "EAP: Research Paper and Report" comprising 36 hours of classroom work.

B. A Questionnaire

As an analysis technique, we used a questionnaire, which had 30 examples of phrases and sentences from several published papers from electronic engineering and radioengineering fields (some of them were intentionally miswritten) for the students to decide if they were correct or incorrect and to correct mistakes if any. The phrases and sentences for the questionnaire were taken from our database of typical mistakes, which we had accumulated proofreading our graduate and postgraduate students' articles before submitting them for publication in different international conference proceedings and journals [8].

The questionnaire tested some of the key areas of language and academic writing literacy: 1) style, 2) attributive noun groups, 3) use of articles, 4) punctuation, 5) attributive clauses, 6) commenting tables and graphs, 7) prepositions, 8) use of grammar in academic style. It should be noted that the questionnaire did not include all the aspects relevant to paper writing and academic writing literacy.

C. Questionnaire results

Table II shows the average number of correct answers per group for the whole test. The percentage of correct answers of graduate students (28.4%) is less than half the percentage of the control group (62.2%). EMC students have the average result which almost coincides with the average results of the other graduate students. Comparison with the control group leads to the obvious conclusion that a basic-level ERPP course gives a significant increase in the level of academic writing literacy.

TABLE II. Correct Answers of Graduate Students and the Control Group

	Average number (out of 30)	Percentage
Group 1	7	23
Group 2	9.8	32
Group 3	8.5	28.3
Group 4	8.62	28.7
EMC group	8.77	29
Average number	**8.53**	**28.4**
Control group	**18.6**	**62.2**

Table III shows the average results for different aspects of academic writing literacy. Here we can clearly see that, having the same average result as the other graduates, EMC students show slightly better results in some areas than other graduate students (style, attributive noun groups, prepositions, and use of grammar in academic style), which we assume is the result of their active involvement in publication activity both in Russian and in English. However, they have lower percentage of correct answers in the use of articles. We suppose, this can be explained by a number of reasons, including Russian language interference, i.e. the lack of such phenomenon in Russian, and a large number of specific points in the usage, which are really difficult to master. We can also see that some areas present more difficulty for students of all tested groups (e.g. commenting tables and graphs).

TABLE III. Results on Specific Aspects Tested (% of Correct Answers in Tested Groups)

	Aspects tested	All graduate students	EMC students	Control group
1	style	24.75	**27.75**	57.5
2	attributive noun groups	21.3	**25.9**	76.6
3	use of articles	24.6	15.5	62
4	punctuation	33	33.3	73.3
5	attributive clauses	10.3	11.1	50
6	commenting tables and graphs	15.6	15.5	32
7	prepositions	50	**59.5**	86.6
8	use of grammar in academic style	22.25	**27.75**	40

Figures 1-4 below present the average results for all questions (Q) grouped into four categories (grammar aspects, punctuation rules, style of scientific articles, diagrams and graphs description).

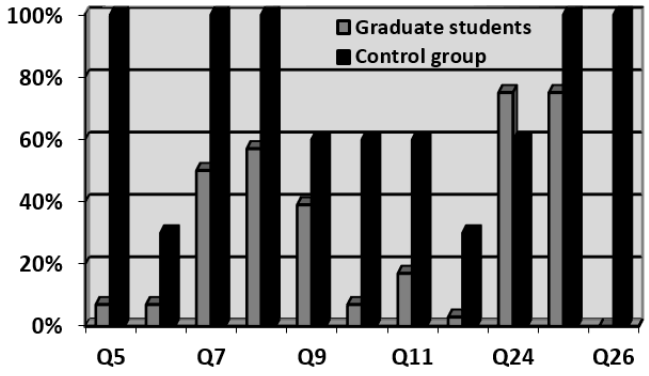

Fig.1. Percentage of correct answers for questions concerning English grammar aspects: Q5-Q7 – possessive case and attributive noun groups; Q8-Q12 – use of articles; Q24-Q26 – prepositions

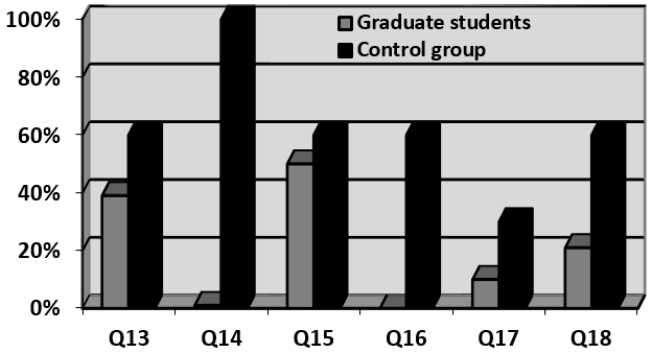

Fig.2. Percentage of correct answers for questions concerning English punctuation rules: Q13-Q15 – punctuation rules; Q16-Q18 – punctuation in attributive clauses

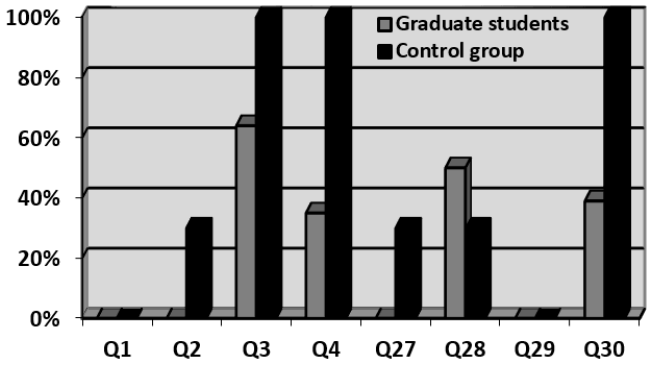

Fig.3. Percentage of correct answers for questions concerning style of scientific articles: Q1-Q4 – formal style; Q27-30 – use of grammar in academic style

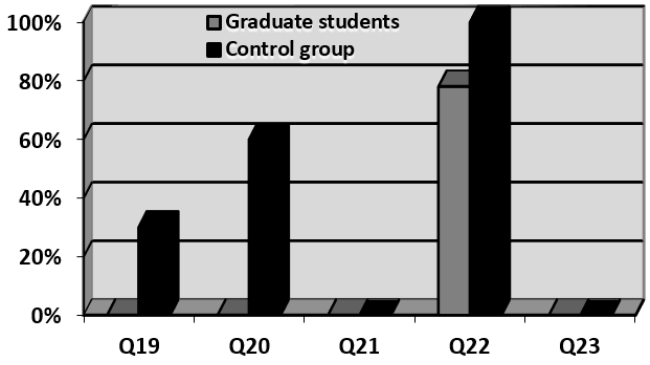

Fig.4. Percentage of correct answers for aspects of diagrams and graphs description

Comparing the results of all four groups of aspects, we can see that the most common grammar rules covered by curriculums give the highest results among graduate students. Punctuation rules present more difficulty than other aspects due to language interference and peculiarities of some English punctuation rules that are completely different in the Russian language. A worse situation among graduate students can be observed in the aspects concerning formal style of papers (half of the questions gave zero result) and specific grammar and vocabulary aspects connected with commenting graphs and tables (4 out of 5 questions were not answered at all).

IV. Discussion

The results of the questionnaire survey showed that the Master's ESP program based on the Standard of Generation 3 was not able to cover all the language skills necessary for effective writing of papers in English. However, it gave some essential background to quickly develop the necessary skills, which can be seen from the comparison with the control group of post-graduate students who have completed a basic-level ERPP course.

Below we will discuss the requirements of the old Standard and compare them with the requirements of the Standard 3++ to see if it puts more emphasis on the development of some specific skills in this area.

According to the Standard of Generation 3, after ESP course completion, graduate students should gain such competencies as to easily use Russian and foreign languages as a means of professional communication and to carry out oral and written communication for solving professional tasks. Besides language competences, the Standard defines general cultural ones, such as the readiness to develop oneself and to be creative.

Such goals within 5 credit hours allocated for ESP (64 hours of classroom studies and 80 hours of self-study for EMC graduates) mainly reduce to just teaching ESP on a content-based syllabus, which means adopting any relevant themes from the students' fields to provide assistance to their transition into a new community [13]. The main aims of language learning are: increase of vocabulary, grammar revision, and pronunciation practice. These well enough improve reading, understanding and, to some extent, speaking skills. However, writing (in particular, academic writing) still remains a dream for enthusiastic practitioners due to the time limitations. Only some of them occasionally include academic writing elements and tasks in their courses, with only motivated students performing them. The questionnaire results clearly demonstrate the weakness of such view on the language education.

The new Standard (Generation 3++), which took force in September, 2019, though only for some number of majors including EMC programs, defines the following competencies, common for ESP and EAP programs: the ability to use communication technologies in both languages for academic and professional interaction, the ability to analyze and respect cultural diversity in the intercultural interaction, and the ability to define and realize the priorities of personal activity and the ways to improve it on the basis of self-esteem. As we can see, the new Standard introduces the concept of academic interaction besides professional interaction, which may imply more emphasis on academic writing skills development.

The new curriculum based on this standard includes the ESP program of 8 credit hours (108 hours of classroom studies and 144 hours of self-study) in semesters 1, 2 and 3, as well as an EAP elective course of 3 credit hours (36 hours of classroom studies and 72 hours of self-study) in semester 3, which allows allocating enough time for teaching paper writing skills.

Based on the questionnaire results and our proofreading experience, we assume that Master's level is the best time to start purposeful work on improving writing skills, as students start their research and publication activities in L1 and L2. However, our survey indicated a low number of publications of research papers in English among graduate students. We suppose it may result from various reasons: the students' level of English proficiency is so low that they feel timid and doubtful to start writing in English; some students lack motivation in doing research and, therefore, in publishing activity even in Russian, etc.

The elective character of the EAP course will allow teaching only those graduates who are highly-motivated and involved into publishing. According to our survey results, 66.7 % of graduates would like to do a specialized course on writing a scientific paper. Moreover, the elective character allows practicing the skill in a small group of students, which could increase the efficiency of the class.

An EAP course for Master students will be aimed at developing proper understanding of peculiarities of English academic style and practicing writing first papers without making mistakes in the language of basic and threshold levels. Our analysis demonstrated that it is possible to increase the academic writing literacy to at least 60% without using any online studies. However, we expect the results to be higher if we use a complementary online course on the basis of the blended learning technology. The online ERPP course under development is meant for students' self-study, in parallel with the classwork. The course will be based on in-house materials [14] to meet the needs of particular contexts of the target audience.

High interference of the Russian language style and conventions determines the necessity to use comparative approach and build the teaching process on a bilingual platform. Special attention should be paid to punctuation rules, grammar and vocabulary used to comment visual data, and stylistic aspects of a scientific article in English.

Our further study will be focused on defining the range and profile of samples from Russian and English corpuses of articles on radioengineering, in general, and EMI/EMC, in particular, to be used as didactic units in ERPP and EAP courses; classifying them according to grammatical, lexical, punctuation, stylistic, discourse, etc. character; and analyzing their concordance with the publishing requirements of the target international journals for the radioengineering area.

The EAP course is expected to provide a proper foundation for developing more advanced skills in academic writing which could be covered in an EAP course for postgraduate students, with deeper immersion into peculiarities of academic literacy in the English language.

V. Conclusions

Summarizing the abovementioned, we can make some conclusions. First, the analysis results showed a very low level of academic writing skills of graduate students, which stretch from punctuation mistakes to discourse ones. Second, the comparative analysis of graduate and postgraduate answers demonstrated that even a short dedicated course develops academic writing skills, especially if students are highly motivated. Moreover, it is shown that the new curriculum allows implementing an ERPP e-course under development within the Master's EAP program, which will increase the efficiency of the study. We also suggest that the introduced EAP course together with the encouragement from TUSUR departments and various R&D institutions will expand the number of the university researchers publishing in high-impact international journals.

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