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**INCORPORATING TECHNICAL WRITING IN ESP CLASSROOM
IN RUSSIAN HIGHER EDUCATION SETTINGS**

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Abstract

Professional competitiveness of tertiary education graduates is of top priority for English for Specific Purposes (ESP) curricular at technical universities. The article justifies the process-genre approach as an effective systematic synthetic method of teaching technical writing at Bauman Moscow State Technical University (BMSTU). The goal of the study is to analyze its implementation in the ESP courses at BMSTU and describe the second language (L2) students' proficiency in technical writing. Four-stage technical writing teaching model is introduced aiming at writing skills development: clarity, conciseness, accessibility, recognizing the audience, and accuracy. The findings of blending instructions and feedback by means of apprenticeship models in encouraging collaborative learning process are traced. The results of the study demonstrate improvements in 108 students' writing scores after they were involved in the experimental teaching program. BMSTU students reveal high proficiency in observing the clarity of a technical document (93.5%), its accessibility (100%), and recognizing the audience (100%). 17.6% of unsatisfactory points received for conciseness and 51% - for accuracy can be explained by still insufficient knowledge of the English language functioning in professional and academic discourses. The collected data help reveal and measure the most problematic features of L2 communicative competence in order to further improve ESP course syllabus.

1. Introduction

Students are currently at the center of the Russian tertiary education system. The system needs designing for the rapidly changing economic environment and rising generations. They are meaningfully different from the previous ones as their frequent use of technology and distinct values influence their expectations of education providers. These students expect to acquire such skills and knowledge that will help them quickly enter the job market as well as remain relevant and competitive in this ever-changing market. The academic staff of Bauman Moscow State Technical University conduct research into the correlation between career-oriented students' demands and the content of degree programs. They state the necessity of reshaping the university degree programs in a way that suits the job expectations perfectly (Karpov, 2015; Gil, Borovikov, & Toktomambet, 2016; Stanevsky & Khrapylina, 2017; Suzdalova, Lizunkov, & Malushko, 2017). That is why, we face an urgent demand to change the ESP curriculum at Russian technical universities to make it more focused on identifying the practical communication requirements and challenges faced by technical students.

2. Problem Statement

ESP and its implementation into the L2 courses at universities has evolved over the past decades, but the emphasis on developing professional writing skills still remains its key feature. The challenging issue is what types of writing are the most necessary ones for technical students and what approaches are relevant to develop ESP writing skills. As there are multiple views on the ESP writing content, teaching techniques, learning materials, assessment tools, and evaluation processes (Connor-Linton & Polio, 2014; Hutchinson & Waters, 1993; Myles, 2002; Storch, 2013), we have to develop our own approach to teaching technical writing and incorporating it in the university L2 course. It is evident that for L2 students technical writing is hard to learn. They have to go through a complicated process of developing their professional and academic communicative skills in English, in particular, learning how to write in professional discourse, recognizing its communicative purpose, structures and linguistic rules. ESP teachers have to guide them through that process. So, we as the ESP teachers have an important and challenging mission to help second language students build the knowledge and acquire the skills necessary to perform technical writing effectively.

3. Research Questions

In order to perform the mission, we have to answer the following research questions: to define the ESP writing content including the term 'technical writing', specify the types of technical writing relevant for developing ESP communicative competence, analyze technical writing skills, employ the most appropriate methods to develop them, present training materials and assessment techniques, consider students' feedback, discuss findings on students' progress in mastering technical writing, work out some recommendations on further investigation.

4. Purpose of the Study

The purpose of the study is to develop the systematic approach to teaching technical writing, implement it at ESP classes at Bauman Moscow State Technical University (BMSTU), analyze the students' feedback and discuss the findings of the research aiming at further investigations.

5. Research Methods

5.1. The Process-Genre Approach to Teaching Technical Writing

Multiple methods and approaches applied by ESP writing teachers have different focus and emphasis. After analyzing the methodological background and key literature related to ESP writing (Badger & White, 2000; Bitchener & Ferris, 2012; Carson, 2001; Kroll, 2003; Manchón 2011; Smirnova, Samarev, & Willmot, 2015), we have chosen "the process-genre approach to teaching writing" (Badger & White, 2000, p. 154) as a synthesis of two main approaches: the process approach and the genre approach. Through the process approach, recursive writing process such as prewriting, drafting, revision and editing is implemented while through the genre-based approach, the ideas such as knowledge of the context, the purpose of writing and certain text features are adopted. We consider this approach to teaching technical writing to be an analytical framework which reveals not only the utilizable form-function correlations but also contributes significantly to students' understanding of the cognitive structuring of information in specific language areas. The process genre-based approach to teaching writing justifies the relevance of feedback. Sufficient feedback along with individual attention results in improving technical writing. Extensive modeling, a scaffold of prompts and explanations, active reflection and participation, in-process support encourage technical writing skills development.

5.2. Methodology

The study used classroom action research. The participants involved were English teachers and 108 second-and-third-year undergraduates at BMSTU with intermediate and upper intermediate English language levels. To collect the data, three instruments such as observation sheet, writing assessments and questionnaire were employed. Observation sheet and writing assessments were used during the implementation of the process-genre approach. Meanwhile, questionnaire was distributed at the end of each module. The data were analyzed both qualitatively and quantitatively. Qualitative data were gathered from the observation sheet, students' task performance on writing technical documents, and students' feedback commentaries while quantitative data were gathered from students' writing scores and their answers to questions in the questionnaire. The data from observation sheets were analyzed and interpreted to describe the activities during the implementation of the process-genre approach.

5.3. Framework for Application. Proposed Model for the Development of Technical Writing Skills

To implement our approach, we adopted the model proposed by Hammond et al. (1992) to developing the ability of writing technical documents. The model has four stages. The first stage called

Building Knowledge of the Field where teachers and students build the cognitive framework of professionally appropriate context, share experiences, discuss vocabulary, grammatical patterns, organizational structures based on relevant models from different types of technical writing. They drill the writing skills on a variety of exercises. Teachers provide their students with suitable technical documents, teaching materials, and clear linguistic information. The goal of this stage is to elaborate real documents that permit students to understand and write professional texts. This will reinforce and consolidate the different sub-competences of which communicative competence is composed (linguistic, sociolinguistic and pragmatic). Students will learn the most common structures and main features of the area on focus.

At the second stage called *Modeling of Text*, students are exposed to different types of sample written text, i.e. technical documentations, such as memos, e-mail, letters, reports, instructions, brochures, newsletters, fliers, PowerPoint presentations, graphics, the job search, and web pages. At this stage, students "develop reading skills followed by joint construction in writing texts" (Abbaszadeh, 2013, p. 1883). The teacher shows some models of the genre and present the typical language that characterizes each genre including grammar, vocabulary, expressions, and idioms, as well as the moves and steps, extension, or format. Students read "short functional texts and procedural texts, and then they write texts similar to what they have read" (Abbaszadeh, 2013, p. 1882).

At the third stage called *Joint Construction of Text* they try to develop written texts together with their peers and with the teachers' help. Students are the main protagonists at this stage. They are responsible for applying the theoretical knowledge and write a suitable sample. The goal of this stage is that the students write samples of the target genre following the model of the genre presented by the teacher.

The process-genre approach applied in this study guides students to see how different texts are written in accordance with their clarity, conciseness, accessibility, and accuracy. Students are guided through multiple-drafts process. They are asked for multiple drafts of their writing. Rewriting and revision are important elements in this study.

After collaborating with peers, students enter stage four called *Independent Construction of Text and Feedback*. At this stage, students are expected to be able to write independently and be ready to provide a feedback. Feedback in this study is defined as input from the audience in order to improve the text. With step-by-step guidance, students are required to provide their comments on the written texts by answering the questions (see Tables 01 and 02). The checklist helps to guide learners on providing appropriate and relevant responses. It focuses both on the general traits of any technical document (clarity, conciseness, accessibility, recognizing the audience, and accuracy) and on certain features of a particular type of documentation. Explicit instruction is given on the kind of language used when giving feedback and the kinds of expressions the learners may use to compliment, criticize or suggest improvements.

5.4. Assessment

The assessment is based on three main principles, despite it may vary according to the teachers' criteria, interests and needs. Firstly, students follow the teachers' instructions and the data provided, creating a piece of work according to the instructions. Secondly, the information given by the student contains the information relevant to the topic and avoids deviating this towards irrelevant ideas. And last, the students adapt their written texts adequately to the five traits of technical writing.

6. Findings

6.1. Technical Writing Competence Development

This section describes the technical writing content in order to understand what we should teach to develop students' ability to identify and produce the types of documents they will write in the job. Technical writing is communication written for and about business and industry, focusing on products and services: how to manufacture them, market them, manage them, deliver them, and use them (Heather, 2013). It is the type of written communication that our students will be responsible for in the future job and it may determine their professional success. Thus, we do not consider an essay relevant in the technical writing discourse. The students, when employed, will not write essays at work. They will write technical documentation which is written in the work environment for colleagues, supervisors, subordinates, and customers. Each technical document must be precise, quantifiable, and easily understood. Technical writing consists of many different types of documentation, such as memos, e-mail, letters, reports, instructions, brochures, newsletters, fliers, PowerPoint presentations, graphics, the job search, web pages, all of which are included in the ESP course at BMSTU.

As teachers, we should first help our students by familiarizing them with common features and components of technical writing, second, by introducing particular technical documents, and third, by developing their competence in producing correct written technical texts of different genres. Thus, we consider that technical students should know particular features of five traits of technical writing: organization, style, text development, grammar and vocabulary, document design. Five components of technical writing correspond to five skills that students should develop in order to write effectively and persuasively. We think the following skills are relevant to achieve good technical writing communicative competence: clarity, conciseness, accessibility, recognizing the audience, and accuracy.

The most important skill to develop for effective technical writing is clarity. The content of the written work should contain all important points for the job to be done properly. If the text is not clearly understood, the reader will either call the writer for further clarification, or just ignore the information. In either case, the writer's and reader's time is wasted and the message is lost. Clarity achieved through considering the specificity that means avoiding vague and connotative words, undefined expressions; being as specific as possible in addressing different audiences, i.e. saying the same thing to multiple readers.

Second technical writing skill is conciseness. Successful technical writing should help the reader understand the text, not present challenges to understanding. We should teach students to use one and two syllable words. Sentence reduction can be achieved by avoiding redundancy, prepositional phrases, and passive voice. We use many assignments to help students acquire these technical writing skills, for example, *Clarity and Conciseness. Revise the italicized vague words and phrases, specifying exact information. Change the following long words to shorter words. Change the following long phrases to one word.*

The third trait of effective technical writing is accessibility. Students can make information visible on the page by making content accessible through the following highlighting techniques: graphics, headings and subheadings, different font sizes, column lines, white space, numbered lists, bullets, boldface text, italics, underlining, etc. Wall-to-wall words turn off readers. Highlighting techniques make the text open, airy, and inviting. The example of the drilling exercises may be the following. *Accessible Document Design.*

Reformat the following text by using highlighting techniques. Consider using bullets or numbers, headings, boldface or underlining, and white space.

Recognizing your audience and write exactly to it is the fourth skill of effective technical writing. Basically, our students will write to either high-tech peers, low-tech peers, or lay readers. Our students should know how to write to each audience level. When writing to a high-tech peer, one can use terminological expressions, acronyms, and abbreviations without any explanation or definition. It is always necessary to be sure that the reader is a professional one from the same scientific field and can interpret the meaning of terminological units, abbreviations, acronyms in the same way. For example, educators are familiar with ESP. But individuals in other fields would assume that ESP meant Electronic Stability Program or Exchange Stock Portfolio, not English for Specific Purposes. High-tech terms must be explained when writing to a low-tech peer. Acronyms and abbreviations should be parenthetically defined. Lay readers want to avoid the confusion completely. That is why, one should not use abbreviations or acronyms but definition or follow-up explanations. The terms need defining and/or explanations as well. There are some assignments to drill audience recognition, for example, *Acronyms and Abbreviations. Make a list of 4-6 acronyms or abbreviations from an area of interest. (Students interested in computers could list computer terms, students in art could list art terms, etc.). Read these terms to see how many of your peers understand the high-tech language.*

Fifth, effective technical writing must be accurate, i.e. correct, whether grammatically, mathematically, electronically, etc. Errors in technical writing make the company and the employee look bad. More importantly, errors can lead to damages, injuries, lawsuits, or just embarrassment and misunderstandings. Students must understand the importance of proofreading. These are some useful proofreading techniques: use the computer's spell check; let it sit - for a day or a weekend; when the document is cold, students are more objective about their own writing; use peer evaluations - others will see the errors we miss; read it aloud - sometimes we can hear errors; read it backwards - then you read words out of context.

So, until we tell students what we want in a technical document, they will not give it to us. The teacher encourages students to master their skills on, provided they are aware of the criteria for successful technical writing.

6.2. Technical Writing Skills Assessment

For assessing students' work, we offer them the following chart. It is based on the original source (Gerson, 2015) and adapted to our needs. This table provides the assessment of general technical writing skills. Each type of writing is evaluated by its own developed criteria, the example of which is presented in Table 01.

Table 01. Technical Writing Skills Assessment

Points	Clarity	Conciseness	Accessibility	Recognizing the audience	Accuracy
1-2	Important points are absent; Some questions do not answer; Many vague and connotative words are used.	Longer words are commonplace; sentences average is over 20 words; paragraphs often exceed six typed lines.	Highlighting is not used; information is not accessible; highlighting is overused.	Writer does not define high-tech terms; writer does not consider audience needs; writer never uses pronouns to involve audience.	Punctuation often incorrect; spelling often incorrect; excessive grammar and usage errors distort the message.
3-4	Some important points are delayed; Some questions are assumed and understood; Some vague and connotative words are used.	Longer words are used when shorter words exist; Sentences average is 15-20 words; Some paragraphs exceed six typed lines.	Some main points are highlighted; Information is usually accessible.	Writer usually defines high-tech terms; Writer usually considers audience needs; Writer often involves audience through pronouns.	Punctuation is usually correct; Spelling is usually correct; Grammar and usage are somewhat flawed.
5	Important points come first; Questions are answered; Specific, denotative words are used.	Words are generally one or two syllables; sentences average is 10-12 words; Paragraphs do not exceed six typed lines.	Highlighting techniques emphasize main points to help access; Highlighting techniques are not overused.	Writer defines all high-tech terms; Writer considers audience needs; Writer uses pronouns to involve audience.	Correct punctuation; correct spelling; Correct grammar and usage.

As an example, we present the instructions and assessment of writing a *report* as one of the most popular technical document. Reports come in all types and sizes. Whichever type of report a student writes it should have the following components: Identification lines: Date, To, From, Subject (just as with memos and e-mail); Introduction; Body; 4. Conclusion. The first step is to use sample reports for the students to read the authentic technical document and acquire its basic traits. The second step involves explanation of guidelines in writing a comprehensive report. The recommendations may be as follows. Assure that all the items in the report are easy to understand and are beneficial in terms of achieving the goal and objective on why the report was made. Assure that the report that you will create is appropriate to be used in professional settings. Be precise with the discussion. Use a language that is considered to be applicable especially in consideration to the audience who is expected to review the report.

Both the assessment and feedback are performed using Table 02.

Table 02. Peer Evaluation Checklist for Reports

№	Questions	Yes	No*
1	Does the student provide Identification lines (Date, To, From, Subject), and does the Subject line provide a topic and a focus?		
2	Does the student’s Introduction explain why he or she is writing and what he or she is writing about?		
3	Does the student’s Body explain exactly what options he or she has considered (proposal), what has been accomplished (status report), what procedures have been followed (laboratory report), or what has been seen and done on the site visit (trip report)?		
4	Does the student’s Conclusion explain what’s next, specifying when there should be a follow-up action and why that date/time is important?		
5	Does the report include First level, Second level, and/or Third level Headings to help the reader navigate the text?		
6	Is the report Clear, answering reporter’s questions and specifying?		
7	Is the report Concise, limiting word length, sentence length, and paragraph length?		
8	Does the report have an Accessible Document Design, including bulleted lists and graphics, such as a table and/or chart?		
9	Does the report achieve Audience Recognition by defining high-tech terms?		
10	Is the report Accurate, abiding by all grammatical conventions?		

* Note: If the answer is no, specify what is missing and suggest a solution.

As it can be noted from Table 02, the questions correlate to five technical writing skills from Table 01: clarity = questions 1, 2, 3, 4, 6; conciseness = 7; accessibility = 5, 8; recognizing the audience = 9; accuracy = 10. To count the results properly we use more elaborate charts which allow registering each aspect of technical writing. For example, to get 5 points for accuracy, a student may make 0 or 1 grammar, lexical, spelling or punctuation mistake; 2 mistakes reduce the points to 4, and so on. The scope of this article does not allow us to present all the tables, charts, questionnaires, sheets, and procedures determined in the study. Thus, we confine our discussion to analysing the students’ general results and feedback.

6.3. Results of Study and Students’ Feedback

The final technical writing skills assessment was carried out at the final stage of technical writing teaching model based on quantitative and qualitative analyses of students’ written technical documents of different types according to five criteria: clarity, conciseness, accessibility, recognizing the audience, and accuracy. The results are presented in Table 03.

Table 03. Results of Students’ Technical Writing Skills Assessment

Points	Clarity	Conciseness	Accessibility	Recognizing the audience	Accuracy	Average, %
1-2 unsatisfactory	7 6.5%	19 17.6%	0 0 %	0 0 %	55 51 %	15%
3-4 satisfactory	20 18.5%	21 19.4%	15 13.8%	16 14.8%	36 33.3%	20%
5 well done	81 75 %	68 63%	93 86.2%	92 85.2%	17 15.7%	65 %

As we can see from the table, 85% of students acquired their technical writing skills satisfactorily or very well, which allowed them to write their technical documentations clearly and comprehensively for the target audience. This is a very good indicator of the efficiency and appropriateness of our technical writing teaching model. Moreover, BMSTU students revealed high proficiency in observing the clarity of a technical document (93.5%), its accessibility (100%), and recognizing the audience (100%). It means that they understand who the audience is, what kind of information should be included in the document and how to format it properly. 17.6% of unsatisfactory points received for conciseness can be explained by insufficient knowledge of the English language functioning in professional and academic discourses, particularly, by their poor ability to find synonyms and antonyms, paraphrase sentences or shorten long words and phrases.

L2 technical students also make many grammar mistakes (only 15.7% of students are grammatically literate). The students are very concerned about grammatical errors so the majority of them wish to produce error-free texts. They are eager to rewrite, correct and edit their texts. Spelling and punctuation mistakes are also frequent. This may indicate the necessity to pay more attention to these linguistic aspects in the course of general English.

Thus, our study showed that systematically encouraging L2 students to review their written works and reflect on what, how, and to whom they want to write helps them to make an appropriate choice of language forms. It could then be utilized in their future writing tasks and help develop eventual learner autonomy.

Moreover, students' feedback to the implementation of process-genre approach to teaching technical writing showed mostly positive responses. The students revealed that process-genre approach helped them in comprehending and creating technical documentation as well as developing necessary skills. Students had also very positive responses to critical assessment of the peers' writing. They agreed that through the assignments, they acquired deeper understanding, further improved their own technical writing, and gained confidence in their writing. Peer review activities helped to develop editing, analysing and evaluating capabilities. The findings of this study suggest that learners welcome and value feedback on grammar.

7. Conclusion

This study considers implementation of process-genre approach to teaching technical writing in the higher education settings. Four stage model for developing technical writing skills (clarity, conciseness, accessibility, recognizing the audience, accuracy) and mastering different types of technical writing (memos, e-mail, letters, reports, instructions, brochures, newsletters, fliers, PowerPoint presentations, graphics, the job search) was implemented in the ESP course at BMSTU and showed its relevancy to achieve good technical writing communicative competence. The chosen teaching content, training materials and assessment techniques presented in the article are determined by the technical students' professional demands and job expectations. The findings of this study revealed their strong interest and involvement in the process of writing. They indicated generally positive attitudes to peer feedback.

Moreover, the results showed improvements in 108 students' writing scores after they were involved in the experimental teaching program using the process-genre approach. Although L2 students' language proficiency in grammar, variability of academic and professional terminology still needs enhancing, we

should not cripple our students' interest in writing through undue stress or grammatical correctness. The influence of second language factors on writing performance is something we have to reckon with in our future studies. Essentially, we need to reveal and consider factors related to language proficiency, second language acquisition, and writing skill development when giving instructions and feedback.

In this study, students received constant peer feedback regarding their writing throughout the writing process. We found out that peer feedback helped improve writing, provided the students with authentic audiences, active discussion that lead to discovery, raised awareness of their own strengths and weaknesses, encouraged collaborative learning, and fostered ownership of text. Apprenticeship models enabled learners to resort to English as a tool in the process of becoming self-regulatory.

In general, the process genre-based approach encourages learners to develop strategies for self-correction and regulation. Using feedback in revision helps students gain deeper understanding of what is required in the assignment, confidence in their writing and finally making them better technical writers.

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