



VALIDATING A MODEL FOR DEVELOPING IT SPECIALISTS' READINESS FOR PROFESSIONAL FOREIGN-LANGUAGE WRITTEN COMMUNICATION: AN EXPERIMENTAL STUDY

Olesia Sribna¹

National Technical University of Ukraine,
"Igor Sikorsky Kyiv Polytechnic Institute",
Department of English for Humanities No. 3,
Kyiv, Ukraine

orcid.org/0000-0002-2226-0300

Abstract:

The article presents an experimental validation of the effectiveness of a model designed to develop IT specialists' readiness to perform professional foreign-language written communication. The relevance of the study arises from the increased requirements for graduates of higher education institutions that train IT specialists. One of the key requirements is the ability to effectively use foreign-language instrumental resources, which, according to professional standards, are primarily represented through technical documentation, interfaces, specifications, and communication in global teams. The aim of the article is to validate the effectiveness of the proposed model for developing IT specialists' readiness to engage in professional foreign-language written communication through an experimental study. The preparation, organization and implementation of the experiment were grounded in theoretical principles of conducting pedagogical experiments, understood as a specific method of scientific inquiry in pedagogy and reflected in the works of various scholars. The study further develops the concept of readiness formation and highlights the importance of feedback in IT specialists' professional foreign-language written communication. Furthermore, it substantiates the selection of forms, methods and means aimed at effectively developing IT specialists' readiness for such communication.

Keywords: ESP, IT specialists, professional foreign-language written communication, readiness formation, pedagogical model

1. Introduction

In the context of a digitized information era, developing IT specialists' readiness for professional foreign-language written communication (PFLWC) is becoming

¹ Correspondence: email olesiasribna-fl@lil.kpi.ua

increasingly important and relevant. The labor market requires specialists who not only possess technical knowledge but are also able to produce professional documents, reports, and software documentation in English. Therefore, the main purpose of the study is to determine the effective development of readiness among future IT specialists for PFLWC is possible under the condition of the targeted implementation of a set of interconnected pedagogical conditions. First, this involves ensuring the holistic nature of training, in which foreign-language written communication is integrated into the professional context and considered as a tool for performing professional activities.

It is also important to prioritize instructional tasks that simulate real professional situations, guiding students to produce practically relevant written texts in English, as well as to develop their systematic knowledge of the principles and patterns of PFLWC. Special attention is given to directing the process of professional training toward the development of sustained professional interest in achieving communicatively significant outcomes, which involves fostering a positive attitude toward foreign-language written communication as an integral component of professional activity. The combination of these conditions enhances the effectiveness of training future IT specialists within the modern educational environment.

The article aims to experimentally validate a model designed to develop IT specialists' readiness for PFLWC and assess its effectiveness.

To achieve the goal, the following tasks are planned:

- 1) analysis of the current state of IT specialists' readiness to perform PFLWC;
- 2) study of the linguistic principles of IT specialists' training and the structure of IT specialists' readiness to practice PFLWC, to meet pedagogical conditions;
- 3) theoretical substantiation of the developed model of IT specialists' readiness to engage in PFLWC;
- 4) validation of the model effectiveness of IT specialists' readiness to perform PFLWC.

2. Literature Review

Analysis of recent research and publications illustrates that modern science has a large number of works on the theory of conducting a methodological experiment (Gurvykh, 1980; Ingenkamp & Lissmann, 2008; McElreath, 2015; Michie *et al.*, 2011; Moodebely & Onnyali, 2014), in which the importance of planning, organizing, and conducting an experiment is beyond doubt. Researchers conventionally divide the experiment into three stages: preparatory, organizational, and final (Gurvykh, 1980; Ingenkamp & Lissmann, 2008).

2.1 Experiential Learning

In pedagogy, the experiment functions not only as a means of understanding processes but also as a tool through which innovative practices are implemented to ensure the effective professional training of future specialists. An experiment can be understood as

a means of acquiring knowledge through which phenomena of reality are studied under controlled and managed conditions (Kolb, 1984). The experiment can be considered as a core component in various studies that employ Kolb's (1984) experiential learning theory as a theoretical framework for examining the effectiveness of pedagogical conditions or models integrated into the educational process. For instance, Lai *et al.* (2007) used experiential learning theory as a framework to investigate the contribution of technology to experiential learning. They explored the potential of technology to facilitate and support experiential learning. Typically, experimental findings demonstrate that modifying or reproducing a phenomenon to study it under the most favourable pedagogical conditions helps students improve their knowledge, gain meaningful experience, and enables them to reflect on the outcomes of their own activities.

According to McLeod's (2017) interpretation of Kolb's theory (1984), experiential learning theory identifies four interrelated components: experience, reflection, thinking, and action based on acquired experience. Applying this theory within the framework of the experimental study, which aims to develop future IT specialists' readiness for PFLWC, allows for a coherent description of the logic underlying the organisation of the educational process.

At the first stage, future IT specialists are engaged in specially designed pedagogical conditions and acquire new learning and professional experience. They are then given the opportunity to reflect on the experience, which corresponds to the reflection stage. The next step is the thinking stage, during which students analyse and discuss the results obtained throughout the experimental study under the defined pedagogical conditions. The final stage is action based on acquired experience, at which point future IT specialists continue to engage in similar professional activities, now drawing on their consolidated experience. In the context of the present study, this is manifested in the performance of PFLWC at a qualitatively higher level, which will indicate a higher degree of developed readiness for professional foreign-language written communication.

3. Material and Methods

3.1 Procedure

The experimental study was conducted in two stages: the exploratory stage and experimental stage (Ingenkamp & Lissmann, 2008). The exploratory stage of the experiment began with a retrospective analysis of IT specialists' readiness to perform PFLWC; professional profile of an IT specialist and modern requirements for professional training were studied. The linguistic and stylistic features of instructional technical texts were examined and the concept of a scientific and technical style of the text was clarified; an analysis of scientific literature on the problems of PFLWC was conducted, which enabled to reveal the content of the concept of a scientific and technical text and systematize the linguistic and stylistic characteristics of technical instructional texts in order to select professional, grammatical, and lexical units of modules, which were

subsequently integrated into educational components. The pedagogical conditions for the formation of the specified readiness of IT specialists were identified; a model for the formation of the readiness to perform PFLWC was designed; the goals and objectives were defined; the research hypothesis was formulated.

In general, the exploratory stage of the experiment included the following tasks:

- 1) retrospective analysis, research of the current state of IT specialists' readiness development to perform PFLWC, linguistic foundations of professional training, content and structure of readiness development;
- 2) conducting a survey of students, IT specialists and ESP teachers;
- 3) conducting a pre-experimental assessment to determine the level of readiness of IT specialists by establishing their initial level;
- 4) allocating two control groups and two experimental groups to participate in the experimental validation of the model of IT specialists' readiness development to perform PFLWC;
- 5) determining assessment criteria for defining the level of readiness formation among future IT specialists to perform PFLWC.

The experimental stage included:

- 1) conducting a preliminary interview with the experiment participants to inform them about the purpose, content, familiarize with the process of conducting an experimental study of the developed model;
- 2) conducting an experimental validation of the developed model at Igor Sikorsky Kyiv Polytechnic Institute, Vasyl Stus Donetsk National University, Zaporizhia Polytechnic National University, National Technical University "Dnipro Polytechnic" using the proposed model for the IT specialists' readiness development for PFLWC;
- 3) conducting a post-experimental section to determine the results obtained and their interpretation;
- 4) creating recommendations and guidelines for the IT specialists' readiness development for PFLWC.

3.2 Participants

Within the framework of the exploratory stage, students majoring in Information Systems and Technologies (speciality 126), Computer Engineering (speciality 123), and Software Engineering (speciality 121) participated in the survey at Igor Sikorsky Kyiv Polytechnic Institute to determine their level of readiness for PFLWC; a survey of IT specialists was conducted in order to define the subject content of the modules integrated into the educational components; ESP teachers took part in questionnaires; the educational process and work of students while studying the discipline "Practical Course in Foreign Language", "Practical Course in English for Specific Purposes", "Practical Course in Business English Communication" were observed.

Thus, the experimental validation of the model of IT specialists' readiness development for PFLWC was conducted in four experimental groups: two control groups

and two experimental groups. The experiment involved 60 future IT specialists majoring in “software engineering (F2)”, “computer science (F3)”, “computer engineering (F7)” at the faculty of informatics and computer engineering, Igor Sikorsky Kyiv Polytechnic Institute.

The total number of students involved in the implementation of the model of IT specialists' readiness development for PFLWC in higher education institutions of Ukraine: Igor Sikorsky Kyiv Polytechnic Institute, Vasyl Stus Donetsk National University, Zaporizhia Polytechnic National University, National Technical University “Dnipro Polytechnic” was 260 people. According to the results of the pre-experimental assessment, students of two control and experimental groups had approximately the same indicators in terms of the level of readiness to perform PFLWC.

3.3 Data Collection & Analysis

According to the classification of Gurvych (1980), the experiment had a natural vertical and horizontal open system. The aim of the experiment is to specify pedagogical conditions for the IT specialists' readiness development for PFLWC.

The control conditions are as follows:

- 1) the composition of the experimental and control groups of 15 people in each group;
- 2) the list of courses during which the IT specialists' readiness for PFLWC was developed;
- 3) the content of professional training for PFLWC;
- 4) the criteria for assessing the level of IT specialists' readiness for PFLWC;
- 5) people who conducted the experiment: the author of the study and the teachers who conducted the classes.

The experimental condition was the pedagogical conditions for developing the IT specialists' readiness for PFLWC.

The structure of the experimental study of the model of IT specialists' readiness for PFLWC is presented in Table 3.3.1.

Table 3.3.1: Structure of the Experimental Study

Stages of the experiment	Activities during the experiment	Period	Number of participants	Sub-stage objectives
Exploratory Stage	Analysis of academic literature, surveying, questionnaires	2013–2016	20 lecturers and 30 IT specialists	To determine the current state of IT specialists' readiness for PFLWC
	Pre-experimental assessment	2024	60 IT specialists	To identify the initial level of future IT specialists' readiness for PFLWC
	Experiential learning	2024–2025	60 students	To validate the effectiveness of the developed model for future IT specialists' readiness for PFLWC
Experimental Stage	Post-experimental assessment	2025	60 students	To identify the level of developed readiness of future IT specialists for PFLWC
	Implementation of the model in educational process	2025-2026		To ensure future IT specialists' professional readiness for PFLWC

Note: PFLWC = Professional Foreign-Language Written Communication

Phase 1. Exploratory Stage

Within the framework of the experimental study, the criteria were identified according to the specific components included in the readiness structure – *cognitive, motivational and operational components*, each of which included criteria for determining the level of formation of the corresponding component. The key competencies are designed to meet the need to ensure holistic and sustainable development, strengthen social cohesion and further establish a democratic culture. To determine the level of formation of the *cognitive component* of the IT specialists' readiness for PFLWC, knowledge of the principles of PFLWC, knowledge of communicative strategies and knowledge of the professional situational context were selected (Johnson-Sheehan, 2015; Littlemore, 2003).

The *operational component* includes the following criteria: "correspondence to the professional situation", "lexical and grammatical correctness", "information richness", "clarity of compositional and semantic structure", "use of specific speech means of technical instructional texts". The criterion "correspondence to the professional situation" is one of the leading ones. According to Bramfit (1981), the correspondence to the professional situation can be characterized as the implementation of communicative intentions and communicative tasks in a certain professional context. The criterion of "information richness" is key in foreign-language written communication, ensuring the transmission of the maximum amount of important, relevant and up-to-date information (Hubert, 2011). This criterion determines the ability of future IT specialists to meet the needs of the customer, combining cognitive knowledge, reflective and regulatory components. The criterion of "clarity of compositional and semantic structure" is important because structured messages are more effective, allowing the target audience to understand the main idea of the message. The use of cohesive compositional blocks

and logical connections helps to track the logic of the message more quickly (Robinson & Burton, 2009). The criterion “the use of linguistic means specific to technical instructional texts” assumes that students have the skills to select and use speech means (clichés, terms, etc.) inherent in technical instructional texts in sufficient quantity and adequately to the professional context. That is, this criterion is an indicator of students’ knowledge of the features of PFLWC (*Framework for Success*, 2011).

The *motivational component* was assessed using the criteria “positive attitude towards implementing PFLWC” and “professional interest in implementing PFLWC”, both criteria are somewhat difficult to measure due to subjectivity. Therefore, the level of formation according to these criteria was measured based on the feedback of IT specialists. The criterion “professional interest in the implementation of foreign-language written communication” is assessed through the prism of the effectiveness of conducting foreign-language written communication, the ability for professional development, motivation (Menabò *et al.*, 2021).

Students completed an online survey on the WorkTango website at <https://www.worktango.com/resources/articles/positive-feedback-examples>. A reflective report on the results could be downloaded automatically or sent to an email address (Worktango, n.d.). The survey included 100 different statements to which students were required to respond “agree” or “disagree”. Having analyzed the works of scientists (Andrews *et al.*, 2018; Ho, 2017; Singh, 2019; Scaccia *et al.*, 2015; McElreath, 2015) to determine the indicators according to the criteria of the level of IT specialists’ readiness for PFLWC, a five-point analytical scale assessment was used (see Table 3.3.2).

Table 3.3.2: Assessment scale for the criteria for IT specialists’ readiness for PFLWC

Five-point analytical scale	Indicator description	Readiness level
5	The indicator for the given criterion shows clearly expressed features	High level of readiness
4	The indicator for the given criterion shows sufficient features	
3	The indicator for the given criterion shows certain features	Intermediate level of readiness
2	The indicator for the given criterion shows weak features	Sufficient level of readiness
1	The indicator for the given criterion shows very weak features	Low level of readiness
0	The indicator for the given criterion is absent	

Thus, the overall level of IT specialists’ readiness for PFLWC is demonstrated by the total number of indicators available according to the criteria of the *cognitive, motivational and operational components* (see Fig. 3.3.1). The maximum number of points (score) to determine the level of IT specialists’ readiness for PFLWC for each student is: $R_{\text{readiness}} = R_{\text{cognitive}} + R_{\text{motivational}} + R_{\text{operational}} = 50$ points. Where *50-40 points* - a high level of IT specialists’ readiness for PFLWC, it means that IT specialists managed to create

lexically and grammatically correct, information-rich technical instructional texts with a clear compositional and semantic structure and specific speech means of such texts. 39-30 points - the average level of IT specialists' readiness for PFLWC, it means that IT specialists managed to create relatively (75%) lexically and grammatically correct, partially information-rich technical instructional texts with a vaguely expressed compositional and semantic structure and a small (25%) number of specific language means of such texts for performing PFLWC. 29-20 points - a low level of IT specialists' readiness for PFLWC. That indicates that IT specialists managed to create technical instructional texts with lexical and grammatical errors for PFLWC, which lack a compositional and semantic structure and lack specific language means of such texts. IT specialists whose overall score fell below 20 points were considered unable to produce technical instructional texts.

Figure 3.3.1: Assessment Criteria for IT Specialists' Readiness for PFLWC

Cognitive Component	Knowledge of the principles of PFLWC
	Knowledge of communicative strategies
	Knowledge of professional real-life context
Operational Component	Correspondence to the professional context
	Lexical and grammatical accuracy
	Information richness
	Clarity of compositional and semantic structure
	Use of language features of technical instructional texts (TIT)
Motivational Component	Positive attitude towards engaging in PFLWC
	Professional interest in engaging in PFLWC

Note: TIT = Technical Instructional Text; PFLWC = Professional Foreign-Language Written Communication

The experimental validation was executed in appropriate pedagogical conditions and in accordance with the syllabi of each course, which indicates the natural conditions for conducting the experiment. The dual vertical and horizontal design of the experiment provided a basis for evaluating the overall effectiveness of the developed model. The application of the selected pedagogical conditions for developing IT specialists' readiness for PFLWC resulted in a high level of readiness formation, as evidenced by the development of the cognitive, motivational, and operational components.

For instance, students acquired knowledge of the principles of PFLWC and individual communicative strategies of written communication, which facilitated a deeper understanding of professional situational contexts. They further developed linguistic and communicative competences, as well as a positive attitude towards engaging in PFLWC and an increased professional interest in its implementation.

The *pedagogical conditions* influencing the level of IT specialists' readiness for PFLWC include the following:

- 1) the holistic nature of training;
- 2) the priority of instructional tasks while developing foreign-language written communication skills;
- 3) ensuring knowledge of the principles and patterns of PFLWC, as well as communicative strategies and tactics of written interaction;
- 4) the use of virtual exchange platforms as a means of practically implementing motivational attitudes and cognitive knowledge among IT specialists;
- 5) the orientation of the professional training process towards enhancing IT specialists' professional interest in achieving communicatively significant outcomes through the formation of a positive attitude towards foreign-language written communication.

Phase 2. Experimental stage

Within regression analysis, the Fisher criterion is used to determine the statistical significance of linear regression models. In particular, it serves as an important tool for stepwise regression, where it allows for substantiating the inclusion or exclusion of independent variables in the model. In analysis of variance, this criterion is employed to assess the significance of individual factors as well as their interaction (Reid *et al.*, 2006). Using Fisher's angular transformation test, it was determined whether the changes in percentage values were significant from the point of view of statistical regularities. To do this, the percentages of IT specialists in each group who had achieved a sufficient level of readiness to implement the PFLWC were compared before the experimental validation of the model with the percentages of students in each group who had achieved a sufficient level of readiness to implement the PFLWC after the experimental validation of the developed model. In accordance with the tasks of the experimental validation of the model, the effectiveness of the specified pedagogical conditions for the formation of IT specialists' readiness for PFLWC had to be proved. For this, Fisher's angular transformation test was applied to each of four groups. Considering the tasks of experimental training, the effectiveness of the developed model for the formation of IT specialists' readiness for PFLWC had to be proved. This means that the same criterion must be applied in turn to all four groups.

To conduct the analysis using Fisher's angular transformation test, the following statistical hypotheses were formulated.

- 1) **Null hypothesis (H₀):** the proportion of students who achieved a sufficient readiness level based on the results of the post-experimental assessment does not

exceed the proportion of students who achieved a sufficient readiness level based on the results of the pre-experimental assessment.

- 2) **Alternative hypothesis (H₁):** the proportion of students who achieved a sufficient readiness level based on the results of the post-experimental assessment is greater than the proportion of students who achieved a sufficient readiness level based on the results of the pre-experimental assessment.

4. Results

Analysing the results of the experiential learning vertically, it was found out that the readiness level of IT specialists for the PFLWC increased across all four groups (CG-1, CG-2, EG-1, and EG-2). Statistical analysis of the readiness formation coefficients revealed that a higher level of readiness was observed in two experimental groups (EG-1 and EG-2), where the selected pedagogical conditions were implemented throughout the training process. The mean readiness coefficient in two experimental groups was 0.8, which confirms the effectiveness of the developed model for forming IT specialists' readiness for the PFLWC. The control groups, in which readiness formation was supported solely through the developed educational materials comprising three modules, demonstrated a lower mean coefficient of 0.74.

Analysis of the data shows that the readiness criterion indicators increased in both the control and experimental groups, corresponding to the satisfactory level according to Bespalko's formula (Bespalko, 1989).

Analysis of qualitative indicators of the level of IT specialists' readiness for the PFLWC, according to the results of the post-experimental assessment, given in Table 4.1, revealed that the indicators improved in all groups that participated in the experimental validation of the effectiveness of pedagogical conditions. The highest are the results according to the criteria of the operational component (74%), the lowest are the results according to the criteria of the motivational component (51%), the indicators of the cognitive component increased by 72%.

Table 4.1: Pre- & Post-Assessment Results: IT Specialists' Readiness for PFLWC

Cognitive Growth	Motivational Growth	Operational Growth	Overall Growth
72%	51%	74%	69%
Pre-assessment avg: 90 Post-assessment avg: 152	Pre-assessment avg: 68 Post-assessment avg: 111	Pre-assessment avg: 182 Post-assessment avg: 307	Pre-assessment avg: 339 Post-assessment avg: 582

Fisher's angular transformation test confirmed statistical significance across all four groups ($p < 0.05$). EG-1 and EG-2 (experimental groups) show consistently higher post-assessment scores across all components, confirming the effectiveness of the developed pedagogical model for IT specialists' readiness for the PFLWC.

Table 4.2: Results of Pre- & Post-Experimental Assessment: Experimental vs Control Groups

Group	Cognitive Component			Motivational Component			Operational Component			Total Score	
	Pre	Post	▲	Pre	Post	▲	Pre	Post	▲		
CG-1	90	155	+65	73	110	+37	170	297	+127	333	562
CG-2	87	148	+61	72	108	+36	173	304	+131	332	560
EG-1	90	179	+89	62	115	+53	199	311	+112	351	605
EG-2	91	174	+83	65	110	+45	184	316	+132	340	600
Growth			72%			51%			74%		69%

Overall, the implementation of the model for developing IT specialists' readiness for PFLWC resulted in significant positive dynamics across all components.

5. Conclusion

The selection of pedagogical conditions, which constitute one of the core components of the developed model, was informed by observations of the professional training process of future IT specialists. Quantitative and qualitative analysis of the experimental validation results confirms the feasibility of the proposed model: post-experimental assessment scores of students in EG-1 and EG-2 exceeded those of the control groups across all PFLWC readiness criteria, thereby validating the hypothesis regarding the effectiveness of the selected pedagogical conditions for developing future IT specialists' readiness for PFLWC.

Students in both the control and experimental groups demonstrated improved results in the post-experimental assessment; however, experimental group students consistently outperformed their counterparts across all "readiness" criteria, confirming that the formation of IT specialists' readiness for the PFLWC under the selected pedagogical conditions is effective.

Funding Statement

This research is not funded.

Authenticity Statement

This manuscript is an original work.

Artificial Intelligence Statement

The author used an AI tool solely to improve grammar, clarity, and language style. No new scientific content was generated by the AI tool, nor was the experimental study conducted with its assistance. All changes were reviewed and verified by the author, who takes full responsibility for the manuscript.

Acknowledgements

The author is thankful to students, teachers and IT specialists who participated in the surveys used in the experimental study.

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Conflict of Interest Statement

The author declares no conflicts of interest.

About the Author

Olesia Sribna is a Lecturer at the Department of English for Humanities No. 3 at the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute". She holds a CELTA qualification and is currently pursuing a PhD in Education. Her research interests include ESP writing, task-based language teaching, critical thinking in language education, and AI-driven pedagogy.

Email: olesiasribna-fl@lll.kpi.ua

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