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DEVELOPING ICT COMPETENCES IN BACHELORS OF ENGINEERING AND TECHNOLOGY IN A MULTILINGUAL ENVIRONMENT

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ABSTRACT

While the Republic of Kazakhstan is integrating into a global educational space, the information and communication (I&C) competence of technical personnel becomes vital. This trend is connected with the rapid development of information and communication technologies. Based on the analysis of literary sources and the conducted empirical study, the authors present and substantiate the structure of I&C competences of Bachelors in Engineering and Technology in the Republic of Kazakhstan, including user activity, substantive work, drawing-and-designing and experimental-research components. In this research, the authors aim to determine the level of I&C competences and analyze the data obtained during the experiment. The study used a specially designed questionnaire to investigate the distinctive features of user activity of future engineers and to identify the extent of their use of I&C technologies in the subject, design, experimental and research activities during university studies. The authors have successfully formed the structure of I&C competences in various fields of application. The experiment has demonstrated that currently, most students have an average level of I & C technologies competences. The development of I&C competences in the conditions of multilingualism will effectively influence the quality of professional training of future engineers.

Contribution/Originality: This study is first of its kind to examine the requirements of information and communication competences of future graduates in engineering and technology in the context of a multilingual environment. The study shows that a majority of future engineering graduates lack I&C competence required for working in a multilingual environment. The study recommends that an internship can serve as an effective form of raising the level of I &C competence.

1. INTRODUCTION

One of the fundamental indicators of professional training of future technical (engineering) graduates related to a successful functioning in the modern information society is their competence in the field of information and communication technologies (ICT) in a state of multilingualism.

The article is a response to the need for human resourcing in new economic conditions. There are currently new approaches to economic modernization based on innovative technologies and growing mutual interest of

potential employers and educational organizations in training personnel to solve practical problems of high-tech production management (Valeev *et al*., 2013).

Being the driving force of almost all aspects of modern life, information technologies have become an integral part of the process of learning a foreign language.

A future bachelor in engineering and technology should eventually have innovative knowledge, understand theory and principles holistically, possess skills necessary to solve problems in the specialized field, manage complex technical and professional projects, take responsibility for decision making, control the professional development of individuals and groups (The descriptor for the second cycle in the Framework for Qualification of the European Higher Education Area corresponds to the learning outcomes for EQR level 6, n.d.).

Globally, higher education institutions have introduced innovations and promoted the effective use of ICT, which assumes that students possess certain competences to learn in conformity with established standards (Bordas-Beltrán and Arras-Vota, 2018) while educational policies in the sphere of higher education require new competences that include ICT competences (Almerich *et al*., 2018).

Henner (2015) formulated certain elements of knowledge and skills and stated that ICT competences include activity-specific individual characteristics that determine the following abilities and skills:

- To independently search, collect, analyze, submit and transfer information;
- To model and design objects, processes and individual activities;
- To model and manage the team's work;
- To make the right decisions, solve problems arising in the process of productive activities in a creative and effective manner;
- To orientin the organizational environment based on modern ICT;
- To responsibly implement plans, and skillfully use modern means of ICT;
- To apply modern ICT in professional activities.

The acquisition of ICT competences is recognized as a very important characteristic of future ICT experts. To achieve the desired goal, a learning environment should be built in accordance with the principles of problem-based learning aimed at improving students' general competences (Mekovec *et al*., 2018).

The development of ICT requires new competences of specialists and practitioners working in this field that currently include not only knowledge of traditional informatics, but also a wide range of user interfaces focused on user interaction skills (Bolini, 2016). Kraineva and Shefer, (2017) described the identification of gaps in the bachelors' knowledge of ICT and the development of ICT-based educational programs to individualize the formation of competences defined by the principal educational program managing human capital assets.

According to Lapchik, (2013) teachers' ICT competences are core components of their professional competences in modern conditions. Teachers' ICT competences are focused on the practical use of ICT in their professional activities and are not limited to mastering computer literacy. The use of three languages (Kazakh, Russian and English) in the course of professional activities is characterized by some features associated with specific ICT-based educational materials. Since technical texts are difficult to understand without the knowledge of English, we assume that proficiency in the English language should be an essential part of ICT competences common to Bachelors in Engineering and Technology.

Sidorenko and Rybushkina, (2015) have asserted that foreign language competences and linguistic communications are of particular importance for the personal and professional self-realization of a specialist and the globalization of world knowledge and economy. Their analysis clarified the existing goals of language education and determined the didactic toolkit for distributing available resources and obtaining the desired results.

2. PROBLEM STATEMENT

According to the prerequisite standards of higher education in the state of Kazakhstan, students pursuing the degree

program of Bachelors in Engineering and Technology should have certain key competences including a knowledge of foreign languages, computer training, basic communication skills in English, the ability to use modern techniques of information technologies and communication and msut possess the skills to use a computer to restore, evaluate, storage, produce, present and exchange information through online networks as their professional activity (The State Educational Standard of Higher Education No 1080 August 23, 2012).

According to the state program of the development and functioning of languages in the Republic of Kazakhstan for 2011-2020, "one of the key components of the lexical capital of Kazakhs is proficiency in foreign languages as a means of business and international communication" (The Decree of the President of the Republic of Kazakhstan No 110 June 29, 2011).

To implement state policies in the field of education, S. Toraighyrov Pavlodar State University has developed the concept of multilingual education. The introduction of this new form of education aims at contributing to the improvement of versatile knowledge and development of graduates who should professionally speak three languages (The concept of multilanguage education in S. Toraighyrov Pavlodar State University (2014-2020, 2014).

In conformity with requirements for the Bachelor's Degree in Engineering and Technology, I&C competences play a key role as professional competences. The purpose of this research was to substantiate the structure and the need to form and develop the ICT competence of future bachelors (graduates) of engineering and technology in the Republic of Kazakhstan. The goal of this empirical study is also to determine the level of information and communication technologies (ICT) competences (in sophomore and junior years) in a state of a multilingual environment. This task was accomplished by analyzing the data obtained during the experiment.

In Kazakhstan, a bachelor's degree program involves many educational internships and practical placements. The objective of such internship programs is to help students acquire competences in the field of engineering and technology.. It is hoped that this study will provide adequate guidelines for graduates to develop ICT competences.

3. LITERATURE REVIEW

Numerous studies by both Kazakh and foreign researchers have examined the formation and development of I&C competences of future technical specialists (engineering graduates).

Dyshko and Zubekhina, (2017).analyzed the introduction of ICT and revealed that bachelors prefer using e-learning platforms, different websites, multimedia presentations, Skype and Viber. Toporkova, (2017) considered main requirements for Bachelor's degree in Engineering and Technology in Canada and the United States and concluded that both countries have similar requirements for their graduates. A scientific study by Bazarova and Soloveva, (2017) is concerned with the development of students' ICT competences that depend on the elaboration of information educational environment in any given university. There are certain challenges connected with the use of information technologies and electronic educational resources, the variability of educational opportunities and the consideration of students' preferences (Noskova *et al*., 2018).

These two scientists also proposed a structural-informative model of forming ICT competences of bachelors and studied the effectiveness of its implementation in the educational process (Petrov and Sabitova, 2015). Lyaginova (2014) examined the content of disciplines forming ICT competences stipulated by the federal state educational standards of higher professional education for Bachelors program in Engineering and Technology. The study of Dedu *et al*., (2018) emphasized the effectiveness of ICT as a didactic method of teaching and evaluating that can improve the educational process in institutions of higher education.Minin *et al*., (2013) substantiated organizational and pedagogical conditions that ensure the effective training for future drawing-and-designing activities.

Wächter, (2012) analyzed international and national requirements for professional competences of Bachelors in Engineering and Technology, and formed the structure of key competences necessary for conducting successful

drawing-and-designing activities, and determined organizational and pedagogical conditions influencing the efficient training for drawing-and-designing activities.

Higher education develops within the framework of the competence-oriented approach, i.e. students must not only acquire certain skills and abilities but also apply them in their professional life. Their development should correspond to a certain logic, therefore it is necessary to study stages of the students' work (Gladkova *et al.*, 2018).

Mobile electronic devices and Web 2.0 tools are popular among students and are widely used for communication and entertainment, as well as educational purposes. One of the main conclusions made in the course of this research is the enormous potential of Web 2.0 tools and possibilities for its integration with mobile devices (Nagata *et al.*, 2014).

Ostylovskaya and Shershneva, (2016) studied principles of formation of bachelors' research competences and chose an interdisciplinary module as a teaching medium. According to them, research activities help individuals realize their cognitive and intellectual needs, as well as help them produce new knowledge. Professional research activities likewise aim to obtain new scientific knowledge and help in the process of learning in order to pursue educational objectives and develop the students' research aptitude. Pantoya *et al.*, (2013) argued that the development of bachelors' research skills contributes to a deeper understanding of basic concepts and helps them better deal with sectoral problems.

The research paper compiled by Simas *et al.*, (2016) presents the results obtained in the course of an educational project. It demonstrated that the students participating in this project improved their technical knowledge and became more motivated to continue in-depth studies in the sphere of engineering and technology. According to Ocampo *et al.*, (2017) multinational projects introduce global professional skills to bachelors while exposing them to project-based interaction activities. This educational activity faces many challenges, including cultural and academic differences, various languages and time zones, as well as problems connected with communication tools.

Kruchinina and Mikhailova, (2012) described the didactic system for forming professional foreign-language competences of engineering students through the use of ICT. They also provided the results of an experimental study of the formation of professional foreign-language competences of engineering students in new educational and cognitive activities. The use of the latest achievements in the field of ICT and telecommunications helps to prepare highly qualified specialists who will fully meet all the requirements of the rapidly growing ICT industry (Barabanova *et al.*, 2016). The data obtained by Igwe and Issa, (2017) show that the most available information resources for students are libraries (75.5%) and the Internet (60.7%). Future bachelors also use educational videos (35.5%), Web 2.0 tools (31.7%), ICT labs (39.8%) and PowerPoint presentations (30.8%). Their study demonstrates that a large number of students use the Internet to find the information necessary for completing university tasks (78%), conduct academic activities and analyze data on academic and professional problems (63%) (Pascual *et al.*, 2017).

A study conducted in Nigeria has proved that only 25% of bachelors studying in public universities developed ICT competences, while students of federal universities have an average qualification in the field ICT. To improve ICT literacy, universities should introduce ICT courses for all students (especially first-year students) and encourage all lecturers to use ICT tools in their teaching process (Adetimirin, 2012). One of the ways to ensure the efficient training of future specialists in engineering universities is to support multilingual education through ICT tools, projects and online conferences (Chmelíková and Hurajová, 2017).

Trivodalie *et al.*, (2017) believed that the rapid development of information technologies has caused different changes and helped qualified graduates meet the growing needs of the ICT industry. Thus, the development of the most effective approach to teaching programming languages and its further choice have become of vital importance. In addition, the results obtained have proved that it was necessary to reorganize the existing educational programs in order to satisfy the needs and preferences of modern students. Korchemny, (2016) explored the structure of ICT competences and psychological mechanisms of their formation.

An attempt has been made to gather viewpoints of prominent engineers and academicians to clearly define what it means to be a competent graduate of technical universities. Studies have shown that five most important aspects of global competences are as follows: the ability to communicate in different cultural environments and appreciate them; the ability to work in a team and manage teams of different ethnicities and cultures; the ability to effectively resolve ethical issues caused by cultural or national differences; the understanding of cultural differences in the designing, production and use of products; and, the understanding of cultural consequences that can solve some engineering problems (Klein-Gardner *et al*., 2012).

Although the number of students with advanced ICT competences is increasing and nations are applying their best efforts to improve ICT competences as the main source of talent (Husing *et al*., 2016) the concepts of expert knowledge and competence are interpreted in different ways for instance a scientist would emphasize educational practices of higher education. For this reason, the bachelor's competence-based model involves the parity participation of higher education institutions and employers in the formation of professionally-oriented educational programs (Pak *et al*., 2014). The results have confirmed a strong effect of the age factor on the students' attitude towards the use of technology, its application and potentially beneficial impact on learning, as well as its motivational potential in the context of learning (Grabar and Glavash, 2016).

A program has been developed for students specializing in various fields of engineering and striving to obtain an additional qualification of interpreter/translator, as well as to improve their communicative competences in English as a foreign language (Veber *et al*., 2017). The study of Raisova and Lazarenko, (2014) aims to theoretically substantiate and practically implement pedagogical support that helps graduates in Bachelors in Engineering and Technology to achieve B2 level – the standard foreign language competence in a multilingual educational environment (according to the European system of foreign language skills).

An analysis of professional competences used by technical specialists in modern society has proved that ICT competences are an important component of professional competences (Kuanysheva, 2015).

ICT can really facilitate learning. However, many ICT-based solutions require a detailed study to select an appropriate electronic environment that ensures the acceptance, evaluation and accreditation of intercultural competences. It is also possible to create special ICT-based competences to promote intercultural competences (Caruana, 2015). If programmers are fluent in technical English, it gives them a certain advantage and forms their professional competences. Life-long learning and self-improvement are impossible without proficiency in the main language in the sphere of programming (the English language). The scientific work above highlights the need for English in the sphere of programming and discusses methods for improving the programmers' English language skills (Shakirova, 2014).

The formation and development of the bachelors' ICT competences can be achieved within specialized disciplines that use modern information technologies and build an educational path with due regard to professional activities and personal characteristics (Shmelev *et al*., 2015).At the same time, the formation and development of ICT competence of a future specialist are significantly influenced by personal user activity in the field of ICT, as well as the use of ICT in subject, design, experimental and research activities. The present study is devoted to the solution of these issues.

4. MATERIALS AND METHODS

This study is based on a specially designed survey questionnaire. This survey aimed to study the students pursuing Bachelors program in Engineering and Technology, observe their user activity, and identify the degree of ICT competences displayed by them in their practical work like drawing-and-designing and experimental-research activities during their studies (including educational internships and practical placements). A special attention was paid to different types of ICT proficiency levels required in ICT enabled relevant activities. The questionnaire used

in this research included four series of questions. Questions were concerned with studying various aspects of ICT and Internet resources. The questionnaire employed an estimated scale of 1-4 (yes, no, partially, cannot say).

The study involved 93 future graduates from the Bachelors program in Engineering and Technology sampled from the Faculty of Physics, Mathematics and Information Technology of S. Toraighyrov Pavlodar State University (Pavlodar, the Republic of Kazakhstan) to determine the level of their ICT competences. Most of the surveyed bachelors were male (71%), their average age was 20 years old. All respondents had passed their examinations in the disciplines related to ICT.

The survey was conducted in the second semester of the 2017/2018 academic year. As a result of this experiment, it was required to identify levels of user activity in the field of ICT, the use of ICT in substantive work, drawing-and-designing and experimental-research activities of these future technical specialists. The results were analyzed using percentage, frequency and descriptive analysis in the STATISTICA program.

5. RESULTS

The user activity of students was estimated through the use of ICT and Internet resources in their everyday life. The results of the survey concerning user activity are presented in Table 1.

Research question 1: What is the user activity of future bachelors in engineering and technology? Does ICT affect the educational process in higher education institutions in Kazakhstan?

Table-1. The Bachelors' user activity.

Question	Options	Number	Percentage
How would you assess your level of ICT competences?	Basic	6	6.4 %
	Inter	60	64.5 %
	Advanced	27	29 %
What digital devices do you have?	Smartphone	93	100 %
	Tablet	12	12.9 %
	Laptop	82	88.1 %
	PC	51	54.8 %
How many hours per day do you spend on the Internet?	< 1 hour	0	
	2-3 hours	18	19.3 %
	4-5 hours	45	48.3 %
	6-7 hours	21	22.5 %
	> 8 hours	9	9.6 %
Why do you use the Internet?	To play games	21	22.5 %
	To search for information	81	87 %
	To watch video and listen to music	75	80.6 %
	To study	75	80.6 %
	To communicate	69	74.1 %
What ICT tools do you use?	Educational resources	63	67.7 %
	Simulators	12	12.9 %
	Reference and information retrieval resources	69	74.1 %
	Demonstration resources	18	19.3 %
	Imitation resources	6	6.4 %
	Laboratory resources	3	3.2 %
	Modeling resources	12	12.9 %
	Calculating resources	15	16.1 %
	Educational games	9	9.6 %
What is the language of websites you usually browse?	Kazakh	21	22.5 %
	Russian	87	93.5 %
	English	33	35.4 %

Table 1 shows specially designed questions and survey results, demonstrating that 93% of students use smartphones and 51% – computers. Consequently, this means that user activity among students is high and the necessary conditions are created for the use of ICT in higher education institutions of Kazakhstan. The results are

confirmed by the average level of ICT competence of 60%, compared with 81% of information retrieval on the Internet.

Future graduates in the Bachelors program in Engineering and Technology evaluated their level of ICT competences as intermediate (64.5%), advanced (29%) and basic (6.4%).

In terms of the frequency of using the Internet, the students responded that they used the Internet on a daily basis (100%).

The students' ability to use the Internet is connected with the availability of a gadget with Internet capability. The frequent use of the Internet is provided by smartphones, laptops and computers. Most students used their laptops and tablets. Only 23% of the surveyed stated that they used university computers to access the Internet. Smartphones were revealed as the most popular devices used by the respondents. The fact that students have a means of personal access to the Internet increases the possibility of professional training with ICT tools.

Most surveyed (87%) used the Internet to search for information. The second most popular activity was learning (80.6%) and watching videos/listening to music (80.6%). 74.1% of the respondents used the Internet for communication, while 22.5% utilized it to play online games. Analyzing the obtained results and the user activity of students, we have concluded that bachelors actively used Internet resources and Internet-connected devices for various purposes.Most bachelors noted that they usually browsed websites in Russian (93.5%), English (35.4%) and Kazakh languages (22.5%). These conditions are favorable for the implementation of ICT-powered education.

ICT use in substantive work was determined during the course of the survey by examining the ICT tools used in educational activities. The results of the survey on ICT use in substantive work are presented in Table 2.

Research question 2: Is it necessary to use ICT in subject activities?

Table-2. ICT use in substantive work.

Questions	Aggregate figure	Standard deviation
Do you prepare presentations using text, graphs, diagrams, audio and video to make reports during your classes?	1.70	0.85
Do you use open educational resources, including INTUIT, Universarium, Lectorii, IT-Akademia, HTML-Akademia?	1.74	0.84
Do you use open educational resources, including Coursera, EDX, Udacity and Xuetangs?	2.00	0.36
Do you use specialized software in your substantive work?	1.64	0.93
Do you know anything about modern innovative achievements in your professional field?	1.80	0.96
Do you use communication tools and online services in your substantive work?	1.87	0.98
Did you attend computer technology courses?	1.80	0.74
Do you create your own online resources?	2.03	0.59
Do you use Web 2.0 services?	2.09	0.82

Table 2 shows the specially developed questions and the results of the processed questionnaires. It has been established that the use of ICT in the subject activities is a necessary component of the ICT competence of a bachelor in engineering and technology.

38.7% of the students attended computer studies, and 64.5% applied specialized programs in their substantive work. 32.2% of the respondents had partial knowledge of modern innovative achievements related to their professional field. 48.3% of the surveyed used communication tools and online servers in their substantive work. 51.6% of the respondents prepared educational presentations using text, graphs, diagrams, audio and video. 16.1% of them created their own Internet resources, while 19.3% of the surveyed also used Web 2.0 servers.

The table above demonstrates the calculation of the standard deviation resulted in heterogeneous data. The standard deviation is often used in descriptive statistics and shows the distribution of indicators in relation to the aggregate figure in the experimental selection.

The results obtained during the survey of the next component of ICT competences (ICT use in drawing-and-designing activities) are presented in Table 3.

Research question 3: Is the use of ICT beneficial in design and engineering?

Table-3. ICT use in drawing-and-designing activities.

Questions	Aggregate figure	Standard deviation
Did you use any software during your educational internship?	1.19	0.53
Do you know about the possibilities of using social networks in the educational process?	1.38	0.87
Do you use Microsoft Visual Studio, NetBeans or Eclipse to create projects?	1.41	0.75
Do you know how to select and create information products, select ready-made educational media resources, create your own products?	1.90	0.89
Did you use them during your practical placement?	1.93	0.91
Are you capable of using movable communications (smartphones and tablets) for educational purposes?	1.22	0.66
Does a practical placement influence the high-quality implementation of drawing-and-designing activities?	1.45	0.87
Would you like to consult with your practice manager before using Skype, Viber, TeamViewer, DropBox and other software/social networks?	1.74	1.02

Table 3 shows the specially developed questions and the results of the survey on the use of ICT in design and engineering activities. From the results, it follows that the skills acquired during internship strengthen theoretical knowledge.

The survey has revealed a high level of software use during educational internships (87%). 83% of future bachelors did not use open educational resources in the English language, many of them (54.8%) preferred open educational resources in the Russian language. 80.6% of the students enjoyed the possibilities of social networks in university studies. Only 51.6% of the respondents claimed that they were able to choose information products and ready-made educational media resources, as well as create their own products.

Most respondents (83.8%) used mobile devices for educational purposes, and 70.9% of students believed that practical placements improved the quality of their drawing-and-designing activities.

Thus, we have concluded that future bachelors use ICT in their drawing-and-designing activities.

Table 4 presents the results of a survey on ICT use in future bachelors' experimental-research activities.

Research question 4: Are ICT competences used in experimental-research activities?

Table-4. ICT use in experimental-research activities.

Questions	Aggregate figure	Standard deviation
Do you use any software for scientific research?	2.12	1.04
Do you use Internet search engines in experimental-research activities?	1.45	0.71
Are you familiar with such bibliography software as Billioscape, BiblioExpress or EndNote?	2.03	0.17
Do you know such programs for statistical processing of experimental data as STATISTICA, STATA, R, SPSS, etc.?	1.87	0.42
Will you be able to independently analyze experimental-research data using statistical data processing programs?	2.22	0.70
Are you familiar with web resources that allow you to work with scientific cited materials (books, journals) at the global level?	1.83	0.81
Will you be able to independently find an SSCI scientific journal to publish an article?	2.54	1.01

Table 4 reflects the specially developed questions and indicators provided by students who are engaged in experimental-research activities. 81% do not own and do not actively use programs intended for experimental-

research activities. Original data was processed based on the questionnaires of students engaged in experimental-research activities

Table 4 proves that few respondents had known how to use proper programs for conducting scientific research, but many of them were also not familiar with bibliography software or tools for statistical data processing. Many bachelors (64.5%) acknowledged that it was impossible to independently process scientific research data using statistical data processing programs. Only 9.6% of the respondents indicated that they would be able to independently select an SSCI scientific for publishing their article.

While analyzing the data obtained during the survey, we have revealed that software for statistical processing of experimental data was used by 19.3% of bachelors who did not search for literature sources in the corresponding bibliographic databases. The respondents (48.3%) showed better results when working with web resources containing cited scientific materials.

Therefore, there are certain difficulties in organizing the education of future bachelors in the course of experimental-research activities.

6. DISCUSSION AND CONCLUSIONS

After analyzing ICT competences of future bachelors it is concluded that:

1. Students are very active while working on the Internet.
2. High results were obtained in the field of ICT competences, which contributes to the organization of knowledge, skills and abilities necessary to use ICT in substantive work.
3. Future bachelors actively used ICT in their drawing-and-designing activities during educational internships and practical placements. Most respondents prefer using mobile devices for educational purposes.
4. Future bachelors often used ICT throughout their experimental research. However, only a small number of the respondents conducted a statistical analysis of experimental results using the software, or utilized bibliography programs to search for information. These data demonstrate that future bachelors are not able to successfully perform experimental-research activities despite the high level of user activity and the use of ICT in substantive work and drawing-and-designing activities.

These underdeveloped ICT competences of future graduates prove that practical and experimental-research activities at universities are not efficiently organized.

According to employers, all competences are obligatory for graduates, therefore the structure of competences contained in the draft standards of higher education requires more detailed consideration due to different requirements of employers. The resulting contradiction between educational approaches and professional requirements to graduates in the context of the competence-based approach can be resolved if educational standards comply with market demands (Nadvodskaya, 2010).

Table-5. The structure of ICT competences of Bachelors in Engineering and Technology.

Competence	Qualification profile
Multilingualism competence	• To carry out oral and written communication in a foreign language in all types of speech activities; • To read and understand authentic and professionally-oriented literature; • To use special terms and concepts in a foreign language.
Competence in drawing-and-designing activities	• To be able to design and use specialized software and hardware; • To be able to work with programming languages for designing applications of protected automated systems.
Experimental-research competence	• To fulfill an individual research task; • To develop software for solving professional, research and applied tasks.

Source: Result of the conducted theoretical analysis of ICT competence of bachelors in engineering and technology in a multilingual environment.

While English is gaining more popularity as a language of international integration, proficiency in Kazakh and Russian contributes to the interaction of three languages in the field of ICT. As has been indicated above, multilingualism is a mandatory skill of Bachelors program in Engineering and Technology in the field of ICT. Thus, this study examined special competences in Kazakh, Russian and English languages that were used for professional activities to express their ICT competences. The structure of ICT competences is presented in Table 5.

The analysis of undergraduate educational programs in Kazakhstan has shown that practical placements amount to about 12% of the total duration of professional bachelor's degree programs. This activity is held during a special period and is organized for the purposeful formation of a) practical programming skills in the process of educational (computing) internships; b) presenting evidence of research skills through the introduction of the latest software, technologies, scientific achievements and methods of scientific research. Practical placements cover 12.8% of the scope of educational programs. Regulatory documents prescribe that practical placements are supervised and contribute to the professional education of bachelors since they allow students to independently carry out research and solve acute theoretical and practical problems.

Therefore, practical placements aim to form professional competences and can be used by teachers to develop the ICT competences of bachelors. To evaluate the effectiveness of practical placements and joint experimental research of bachelors and their teachers, this study was conducted to determine the current development of ICT competences of bachelors in Kazakhstan.

In Kazakhstan, a student who received a Bachelor's degree is considered a Bachelor in Engineering and Technology in conformity with their branch of study. ICT competences are the most important component of professional competences needed in a Bachelor program in Engineering and Technology. This study conducted an experimental survey and examined the structure of ICT competences of Kazakh bachelors comprising substantive work, drawing-and-designing and experimental-research components. The analysis of the findings reveal that most bachelors in Kazakhstan have a basic level of ICT competences but their user activity in the field of ICT is relatively high. This situation is justified by the poor evaluation of drawing-and-designing skills and competences (during educational internships), drawing-and-designing competences during practical placements and experimental-research work.

Higher Educational institutions aim at achieving international quality standards in their teaching. The following recommendations therefore can be suggested:

- Higher education institutions should amend the current general educational standards and form new working principles that support programs of trilingual education;
- Higher education institutions should use blended learning technologies even for carrying out bachelors' internship and experimental-research work.

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