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Forming Master's Degree Students' ICT Competencies as Future Researchers and Educators: a Kazakhstan Case Study

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ABSTRACT

This article analyses the information and communications technology competencies (ICTC) of Master's degree students in Kazakhstan. It defines the ICTC. Research results suggest that the majority of Master's degree students have a low level of ICTC. Of prime importance is the fact that the level of research and educational aspects of the ICTC of Master's degree students in the study is lower than the subject matter aspect. The research shows that teachers and advisers are faced with certain difficulties in organising Master's students' scientific research and educational internship. This leads to the need to create additional tools to provide a means of controlling the ICTC-shaping process of Master's students. The research found that one the most effective tools promoting optimization while working with Master's students in scientific research, educational and research internship is blended learning technology integrated into the university's virtual and educational environment.

KEYWORDS
Master's Degree Student's ICT competency, internship, virtual and educational environment, research activity, educational activity

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1. Introduction

Today Master's program is the most important stage in training scientific manpower. According to the European Higher Education Area Qualification for

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Master's programs (the descriptor for the second cycle in the Framework for Qualifications of the European Higher Education Area corresponds to the learning outcomes for EQF level 7), a future Master has highly specialized knowledge in his/her field of study, has critical thinking skills in understanding issues in his/her study area, and has specialized skills in problem-solving in scientific research field.

Master's programs in Kazakhstan are developing in accordance with the procedures of the Bologna process; however we have our own individualities. In particular, there are two types of Master's programs in Kazakhstan: a) research and educational Master's program which trains researchers and teachers (a 2 years' course), and b) field-specific Master's program training specialists in one particular area (a 1 or 1.5 year's course).

The modernisation of the Kazakhstan system of education identified the necessity of training and linking academics to the system of school education. Thus, according to the State program of education development (2010) in Kazakhstan, the number of teachers having a Master's Degree at profession-oriented schools must reach 20% by 2020. It imposes certain requirements on the quality of teacher training of future Masters.

ICTC has an important place in a Master's degree students' professional competence as a future researcher and educator. Previous research (Rogers and Twidle, 2013; McGarr and O'Brien, 2007; Lavonen et al., 2006; Lapchik, 2007; Gutiérrez and Serrano Sánchez, 2016; Keijo, 2014) address various aspects of shaping an educator's ICTC.

The scientific aspect of a Master's student's competency is examined in many studies (Kehm and Teichler, 2006; Lub et al., 2003; Pombo and Costa, 2009; Bailey and Sorensen, 2013; Harrison and Edwards, 2012; O'Reilly, 1996; Brooks et al., 012; Bourke and Holbrook, 2013). Rowland suggests that a close interrelation of 'teaching' and 'scientific research' can improve the quality of teaching at university (1996). Twalib points out that ICTC is necessary for proper research activity (2012). Verhoeven connects the level of interest in conducting scientific research with the knowing and using a students' ICT level (2016). However, some researchers (Roberts and Wilson, 2002) suggest that the role of computer software is limited in a qualitative analysis of scientific data.

It is important to note that the number of integrative research studies describing ICTC of a Master's Degree student as a future researcher and educator is quite small. For the most part, the research literature deals with only one aspect of ICTC. Thus, Gerova examines various approaches of lifelong learning in forming information competency of Bachelor and Master's Degree Students (2014).

Research literature emphasizes the necessity of using ICT in research and educational activity, or describing educators' and researchers' ICTC, although the structure of the ICTC of a Master's Degree Student as a researcher and educator has not been fully examined yet. In the educational Master's program of Kazakhstan a lot of time is allocated to research, educational internships and thesis supervision. Research results to date (Castle et al., 2013; Keys, 2015; Brown, 2002) demonstrate the importance of internships for developing students' practical skills. Agreeing that organising a Master's Degree Student's internship and scientific research work allows formation of competencies in pedagogy and didactics, as well as in the field of research, can we assume that

organising this educational work effectively will also enable the formation of Master's Degree Student's ICTC?

This research is aimed at studying the anticipated problems in forming a Master's students' ICTC. In particular, the following questions and issues are addressed: 1) What is the ICTC structure of a Kazakhstan Master's Degree? 2) What is the ICTC status of Master's students? 3) What difficulties occur in forming a Master's Student's ICTC? 4) What are the solutions?

2. Theory

2.1. On Master's Student's Professional Activity in Kazakhstan

Master's programs are formally differentiated into the academic Master's program (with the emphasis on scientific research work) and the field-specific Master's program enabling a deliberate change of one's major field or a continuation of one's basic education (Kehm et al., 2006; Lub et al., 2003). In Kazakhstan, a Master, having completed a scientific and educational Master's program, and having defended a thesis, can teach at any educational institution. The field-oriented Master's program only gives specialized in-depth knowledge, and such a Master cannot teach.

Masters who follow the scientific and educational route are the future academic staffs who have the requisite all-round training. Thus, a Master of Engineering receives humanities/sociological knowledge in the sphere of didactics and education. According to the literature (Pombo and Costa, 2009; Bailey and Sorensen, 2013; Harrison and Edwards, 2012; O'Reilly, 1996; Brooks et al., 2012, Bourke and Holbrook, 2013; Suleimenov and Kulevskaya, 2007) there are three main types of a Master's student's activity as a researcher and educator, regardless of the field: a) activity in the subject area, b) scientific research activity, and c) research and educational activity.

The correlation of these types of activity is comprehensive: educational activity is based on the fundamentals of the subject area and scientific research activity as illustrated with the Euler diagram below (Figure 1).

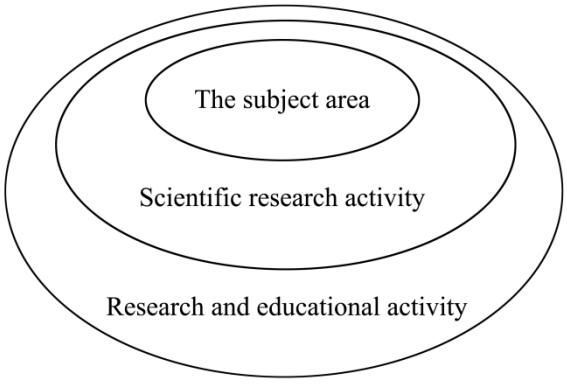

Figure 1. The structure of a Master's Degree Student's professional activity.

Needless to say, a Master's student must have fundamental knowledge in his/her subject area. Apart from the basic knowledge received at the Bachelor level, a Master's student studies additional in-depth knowledge connected with his/her scientific research activity. As scientific research activity is applicable to any area of knowledge, it is the most complex one and includes the fundamentals and activities directly related to the subject area. Any research and educational activity is based on the knowledge from the subject area, education science and teaching methodology, as well as on the competencies in the area of research and educational activity, as a teacher in the classroom also has to demonstrate the epistemic (research) logic of the subject matter.

2.2. The structure of a Master's Degree Student's ICTC

ICTC, as many authors suggest (Rogers and Twidle, 2013; McGarr and O'Brien, 2007, Lavonen et al.; 2006, Lapchik, 2007), is one of the key professional competencies of a teacher. The authors' works conclude that the ICT competencies penetrate all the components of a Master's Degree Student's professional competencies. It is explained by the fact that ICTs are applied to any type of a Master's Degree Student's activity as a researcher and educator.

Studying the international practices of training Master's students has identified various approaches towards defining the structure and contents of a Master's degree student's ICTC as a researcher and educator. Thus, Rogers and Twidle examine a teacher in ICTC as an architect and a manger who studies information technologies for searching new ways of organising and managing education (2013). Larsen et al. state that it is necessary to develop ICTC in four directions: assistance to ICT; control; coaching; and co-operation (Larsen et al., 2008). Other researchers (Lavonen et al., 2006) have included a Master's degree student's virtual learning skills into ICTC.

Lapchik has identified the invariant structure of a competency which includes key, basic, and special competency (2007). In accordance with this, we define ICTC of a Master's student as a researcher and educator in Table 1 (Appendix A). The familiarity with such components of the ICTC in research and educational activity, and ICTC in scientific research activity, by default suggests the Master's student's computer competence. Based on analysis of academic literature, and taking teaching activity at higher and other education levels into account, and given the development of modern teaching techniques, we were able to define a Master's student's ICTC broadly as a researcher and educator. This profile consists of three components: ICT in the subject area, ICT in research and educational activity area, and ICT in scientific research activity area.

The development of the Kazakhstan educational system, and the improvements in computer processing in scientific and technical information, lead to the premise that the contents of ICT competencies can be changed and adjusted as required.

2.3 The role of a Master's Degree Student's internship and ICTC

The level of ICTC in a Master's student's research and educational activity depends on the system of professional training involved. In Kazakhstan any Master's educational program includes internship. It is a powerful tool for

forming and developing a Master's student's competencies in education science, methodology and research work. A large number of internship hours (22% out of the total credit number of the educational program) allowed us to emphasize its importance in forming a student's ICTC in the areas of his/her educational and research activities. Research in the area of Master's students' professional training demonstrates the importance of an internship for developing the practical skills of the trainees (Castle et al., 2013; Keys, 2015; Brown, 2002).

The analysis of the Master's educational programs in Kazakhstan (State Obligatory Standard of Postgraduate Education, 2012) shows that internship takes up about 10.1% of the total training time. It is a specially designated time for organising the focused effort in forming both practical skills and teaching methodology during the pedagogical internship, and research skills through familiarising oneself with the most advanced theoretical, methodological and technological scientific achievements, with the contemporary methods of scientific research, processing and interpreting experimental data (research internship). 11.9% of time is allocated for scientific research work. The normative documents state that scientific research work is guided by a thesis supervisor and is directed to the support of a student. It gives the opportunity to carry out independent research in relevant theoretical and practical issues, as well as an opportunity to master research methodology.

Thus, the internship is aimed directly at forming a Master's degree student's educational and research competencies, and teachers can use this kind of training activity to form a student's ICTC. In order to assess the degree to which the internship time of a Master's degree student and his/her supervisor's collaborative scientific research work were useful, we carried out research to identify the development level of a Master's degree students' ICTC in Kazakhstan, the results of which are presented in this article.

3. Research Methodology

The research for this article was carried out on the basis of specially designed surveys and practical tasks with Master's degree students and a survey with their teaching and supervisory staff.

The aim of the survey of Master's degree students was to studying their user activity, revealing their ICT usage in the subject area, and in educational and scientific research activities during their postgraduate studies, in particular, during their educational and scientific research internships. The differences between their ICTC levels, depending on their ICT usage in the corresponding activity, were of interest to us. The survey included several sets of questions designed to study various aspects of using ICTs and Internet resources. The survey included a 1-4 Likert rating scale. The four sets of questions were as follows:

1. A set of questions to study the characteristic properties of user activity. The questions included self-assessing ICTC level, the devices being used, substantive aspects of online activity, the frequency and intensity of using the Internet, the learning methods related to the ICT, independent creation of their own Internet resources, using Web 2.0 services.
2. A set of questions to study the characteristic properties of using ICT in the subject area during the training process. It includes questions about using ICT and specialised programs in the subject area activity, about their awareness

of modern innovative advances, about using means of communication and online services in their professional activity, about preparing presentations for project reports.

3. A set of questions to study the characteristic properties of using ICT in a Master's degree student's educational activity during the training internship. The question here include the ICT usage during the training internship, off-campus support resources and using social networks in the learning process, the information products and educational media resources for educational activity, using mobile devices for educational purposes, choosing software tools for particular learning aims.

4. A set of questions to study the characteristic properties of using ICT in scientific research activity during the scientific research internship. Here one can find the questions concerning ICT usage the scientific research internship; using software in one's research; undertaking scientific research internship using distance learning technologies; their familiarity with the software tools for statistical processing and working with bibliography and Web-resources that can be used with scientometric materials; an independent choice of a journal with an impact factor for publishing an article and an independent experimental data processing of a research work using special programs for statistical analysis.

A total of 147 Master's degree students of scientific and educational majors at L.N. Gumilyov Eurasian National University, Astana, Kazakhstan, and at S. Toraighyrov Pavlodar State University, Kazakhstan participated in the research. The majority of the respondents are women (69.23%), the average age is 24 years. All have taken courses related to ICT in their subject areas, e.g. 'Information Technology in Science and Education', 'Internet Technologies', 'Innovative Technologies in Subject Area', 'Modern Computer Technology', Modern Technologies in Teaching Special Disciplines'.

The survey was conducted online on the university web site psu.kz during the second semester of the 2015-2016 academic year. Our aim was identifying the levels of user activity in the ICT area, the ICTC in a Master's degree student's subject area, and in educational and scientific research activities. The findings were processed using SPSS percentage and descriptive analyses.

4. Results

4.1 The user activity of the Master's Degree Students

The user activity of the Master's degree students was assessed through defining the time and use of ICT and internet resources in their daily life. All the Master's degree students evaluate their ICTC level as medium (51%) and high (49%). As for the frequency of the Internet use, the Master's degree students responded that they use the Internet daily (100%). The results of the survey of user activity are presented in Table 2.

Table 2. Master's degree students' user activity.

Question	Variants	Numerical	Percentage
Assess your ICT competency level	Low	0	
	Medium	73	49%

	High	74	51%
How many hours a day do you use the Internet?	Less than an hour	2	1.43%
	1-2 hours	4	21.43%
	3-4 hours	64	42.86%
	5-6 hours	28	18.57%
	More than 7 hours	24	15.71%
What kind of digital device do you have?	None	2	1.43%
	PC	65	44.29%
	Laptop	98	65.71%
	Tablet	4	25.71%
	Smartphone	124	84.29%
What do you use the Internet for?	To communicate with friends in social networks and messengers	113	77.14%
	To study	110	74.29%
	To watch videos and listen to audio files	73	48.57%
	To search for necessary information	128	87.14%
	To play games	11	7.14%
	Other	9	5.71%

In order to interpret the results it is necessary to point out that the frequency of Internet use by students is not always connected with their ICTC. The frequency of Internet use is directly related to their ownership of a device which is Internet enabled. The high frequency of the Internet use by the Master's students is further supported by the fact that they have personal computers and gadgets. The majority of the respondents use their own computers, laptops, or gadgets. Only 15% responded that they use the university computers to access the Internet.

The most popular devices among the Master's degree students are the smartphone and the laptop. Personal devices with Internet access increase the opportunities to learn using ICT, namely distance learning can be used in teaching. Another important factor for distance learning is the university's technical capacity. The university's capacity of data transmission channels has

increased exponentially in recent years. This allows the universities to carry out distance learning educational process at a quality level. However, Master's degree students prefer studying in class (77.14%), but when choosing the learning methods, they prefer a mixed type of training, i.e. both in class and remotely (55.71%).

The majority of the Master's degree students (87.14%) use the Internet to search for necessary information. The second popular activity in the Internet (77.14%) is communicating with friends in social networks and messengers. 74.29% of the Master's degree students use the Internet in order to study, 48.57% – watch videos and listen to audio files, 7.14% – for games. Only 5.71% of the Master's degree students responded that they use the Internet for other reasons. The other reasons include reading news, e-books, and online shopping.

Analyzing the results of students' user activity, we arrive at the following conclusion: The Master's degree students actively use Internet resources for various reasons and devices for Internet access. It creates favorable conditions for teaching using the ICT, including distance learning technologies.

4.2 Using ICT in the subject area

Using ICT in the subject area was identified through the survey on using ICT in the professional field. The results of the survey are presented in Table 3.

Table 3. Using ICT in the subject area.

Question	Medium	Standard Deviation
Do you use the ICT in your substantive work?	1.20	0.596
Do you use special programs in your substantive work?	1.48	0.805
Do you know about modern innovative achievements in the area of your professional activity?	1.62	0.840
Do you use any means of communication, online services in your professional activity?	1.62	0.917
Do you prepare presentations using text, graphs, diagrams, audio and video files for your report in class?	1.63	0.901
Do you create your own Internet resources?	1.90	0.900
Do you use Web 2.0 services?	2.20	1.162

70.1% of the Master's degree students use ICT in their subject area activity. On the average only 59.2% of the Master's degree students use special programs, know about modern innovative advances, use new means of communication, online services and prepare presentations.

4.3 Using ICT in educational activity

The survey results of the Master's degree student's next ICT component – using ICT in educational activity – are presented in Table 4.

Table 4. Using ICT in educational activity.

Question	Medium	Standard Deviation
Do you use any software during your educational internship?	1.79	0.967
Do you know about the technologies and resources of remotely supporting the educational process?	1.61	0.954
Do you know the opportunities of using social networks in the educational process?	1.28	0.719
Can you select and create information products, choose ready information media resources, create your own products for you educational activity?	1.79	0.967
Do you use them in your educational internship?	1.65	0.926
Can you use mobile devices (smartphones and tablets) in teaching?	1.14	0.510
In your opinion, does the educational internship have a positive influence on educational activity?	1.36	0.758
Would you like to undertake the educational internship using distance learning technology?	1.80	1.011
How important is it to use the ICT during a Master's Degree Student's educational internship?	1.66	1.057
Would you like to consult the head of your internship using distance learning technology?	1.61	0.940
Do get enough information about using the ICT in your teaching as a Master's degree student?	1.64	0.953

In the survey the Master's Degree Students showed a good level of the ICTC in educational activity. They showed low results in using software during their educational internship; many know about the learning possibilities in social networks, but they do not use them. Only 65.3% of students wrote that they get enough information about using ICT in their educational activity.

In order to find how the Master's Degree Students' ICTC self-assessment corresponds to the objective level, we gave them tasks to identify their real-life skills and abilities to use their knowledge during internship. The tasks were: *select a readily available educational media resource to conduct a particular class; create a presentation for your class in Power Point and ActiveInspire; choose a testing program to assess your students' knowledge; create a selection of links to web-resources for one theme in your subject; prepare a fragment of your class using mobile means of communication.*

The Master's degree students were given limited time to do the assigned tasks. It should be noted that the students were able to do them only partially. Thus, we have found that there is a difference between the survey responses by students and their actual task results. The majority of the Master's degree students (95%) created a Power Point presentation. However not all of them included audio or video materials. Only 8% of the Master's degree students made an ActiveInspire presentation. 94% of the Master's degree students created a selection of links to web-resources in their subjects. There were problems with the tasks which required creating a ready educational media resource (11% completed the task) and selecting a testing program (11.7% of the Master's

degree students successfully selected a test), as well as preparing a fragment of a class using mobile means of communication (34% successfully completed the task).

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Thus, we can conclude that the Master's degree students overestimated their ICTC level in educational activity: they are aware of the ICT usage in educational activity, but cannot apply this knowledge in practice.

4.4 ICT in scientific research activity

The results of the Master's degree students' survey in using the ICT in scientific research activity are presented in Table 5.

Table 5. Using ICT in scientific research activity.

Question	Medium	Standard Deviation
Do you use any software to conduct a research?	1.98	1.082
In your opinion, does the scientific research internship have a positive influence on the scientific research activity?	1.35	0.799
Would you like to undertake the scientific research internship using the distance learning technologies?	1.61	0.947
How important it is to use the ICT in a Master's degree student's scientific research internship?	1.70	1.069
Are you familiar with such software tools for statistical data processing as SPSS, STATA, STATISTICA, STADIA, R, etc.?	2.37	0.845
Are you familiar with such software tools for working with bibliography as Biblioscape and BiblioExpress, Citeulike (an online service), EndNote, Scholar's Aid, Zotero and others?	2.35	0.874
Are you familiar with Web-resources enabling to work with research cited materials (books, journals, etc.) on a global level?	1.82	0.998
Can you choose a journal with a citation index to publish an article independently?	2.39	1.101
Can you conduct an independent experimental data processing of a research using special programs for statistical analysis?	2.13	1.118

Do get enough information about using the ICT in research work as a Master's degree student?	1.55	0.908

Table 5 demonstrates that the Master's degree students have poor knowledge of software tools for statistical data processing (17.7%). Only 19% of them are familiar with, and can use, software tools for working with bibliography. Half of the respondents are familiar with the Web-resources that can be used with scientometric materials, although only 30.6% of students wrote that they could choose a journal with an impact factor to publish an article on their own. Many of them (75.72%) pointed out their inability in independent experimental data processing of research data using special statistical processing software.

In order to identify the Master's degree students' ability to use ICT in their scientific research activity, they were given the following tasks: *list the programs you use in your research; carry out a statistical data analysis in any of the following programs – SPSS, STATA, STATISTICA, STADIA, R; create a bibliographical database on the theme of your thesis in any of the following programs – Biblioscape and BiblioExpress, Citeulike, EndNote, Scholar's Aid, Zotero; create a selection of links to web-resources for working with cited materials (books, journals, etc.) on a global level; choose three journals with an impact factor to publish an article on the theme of your thesis*.

Analyzing the results of the performed tasks, we arrive at the following conclusion: The most popular program for research is MS Office Suite. 5% of the Master's degree students did statistical data processing in the programs SPSS, STATA, STATISTICA, STADIA, and R. 11% created a bibliographical database on the theme of their thesis in programs Biblioscape and BiblioExpress, Citeulike, EndNote, Scholar's Aid, Zotero. They showed better results in selecting links to web-resources of cited materials: the figure amounted for 40%. Unfortunately, many performed the task of presenting journals without the citation index. It indicates that they do not have the skills of selecting a journal and checking whether it has a citation index or not, although it is considered an important element in a Master's degree student's scientific work as a researcher and educator.

4.5 Supervising the Master's degree students'

Along with the research exercise with the Master's degree students, we carried out a survey with the teachers supervising their research work (thesis supervisors) and their educational internship (heads of the internship). 25 teachers in various disciplines of the Master's program were involved.

This is the general analysis of the survey results. To the question 'Do you use ICT in preparing Master's degree students for research work? What kind of technologies do you use?' most replied that they teach how to use MS Office (MS Excel) in statistical data processing; they do not use online resources. In searching for foreign bibliography and articles in English, the catalogues scholar.google.com, tandfonline.com, link.springer.com, elsevier.com. are mostly used. 12 teachers do not teach to use ICT in preparing Master's degree students for research work. 25 teachers responded that they teach Master's degree students to use ICT in their educational activity when searching for and using electronic textbooks and the key scientists' video lectures, using an interactive whiteboard and presentations for class demonstrations.

Practically all the teachers noted the difficulties in organising internship and research work, as the Master's students do not always do their assignments properly and on time. There is no clear plan to monitor the process of mastering competencies during internship. Nazira said, '*I hold consultations once a week. I give recommendations. I answer the students' questions. There is an information system at university that allows organizing all the teaching processes. In my opinion, the system does not have the tools necessary to organize educational and scientific research activities. It is a drawback that needs to be taken into consideration.*'

It is necessary to note that none of the teachers teach their Master's Degree Students to use modern tools of data processing such as SPSS, STATA, STATISTICA, STADIA, compiling a bibliographical database on the theme of their thesis in programs such as Biblioscape and BiblioExpress, Citeulike, EndNote, Scholar's Aid, Zotero. Only 5 teachers make reference to these resources for self-study.

To the question 'How do you control a Master's degree student's process of educational and scientific research activities?', all the respondents answered that such control is reduced to one-time consultations (Dinara, '*In my opinion, it gives a Master's degree student certain freedom. As a result, the quality of the educational and scientific research activities declines.*')

Thus, there are problems in organizing Master's degree students' learning using ICT in their educational and scientific research activities: most of the teachers cannot organize internship effectively and do not use ICT as an effective means of implementing scientific research work and educational activity.

In addition, practically all the teachers point out the necessity of a tool that would be able to organize systematic work in scientific research and educational activity, digital educational resources or distance learning courses in using ICT in research and educational activity, systematization of online resources catalogue in experimental statistical data processing, as well as other tools.

5. Discussion and Findings

As a result of the Master's degree students' ICTC analysis, we arrived at the following conclusions:

– Master's degree students are highly active in using the Internet.

– High results were demonstrated by the respondents in the subject area ICTC, which shows the formed knowledge, skills and abilities in using ICT in the subject area and professional activity.

– In the Master's degree students' educational activity during the educational internship active use of ICT was noted. For the most part the Master's degree students prefer using mobile means of communication for educational purposes. Although there is a certain difference in knowing the particular ICT and using them as necessary. For instance, the Master's degree students know about technologies and resources of remotely supporting the educational process, about information products and using mobile means of communication, but they cannot apply them to their own educational activity.

– In scientific research activity the Master's degree students use ICT partially. Only a small part of the Master's degree students can carry out a statistical analysis of an experiment results using software, use programs for

working with bibliography and orientate themselves in web-resources of scientometric materials.

It is necessary to note that the survey instruments and practical tasks implemented for the research outlined in this article were not fully comprehensive and do not reveal the whole picture of Master's degree students' ICTC development level. However these data do demonstrate that despite the high level of the ICTC in the subject area, the Master's degree students are not able to use ICTs successfully in their scientific research and educational activity.

It should be noted that although the surveys and test tasks was carried out in two large universities of the Republic of Kazakhstan – L.N. Gumilyov Eurasian National University and S. Toraighyrov Pavlodar State University – it is our opinion that the research results broadly reflect the situation regarding training of Master's students at any university in Kazakhstan.

5.1 Master's degree students' internship

Such low results of the Master's students ICTC in Kazakhstan show that internship and the process of scientific research work in universities have not been effectively organized. Research results (Vesterinen, Toom, and Krokfors 2014) demonstrate that the development of students' practical knowledge in the process of supervising internships should be done systematically and it is necessary to increase the levels of supervision during internship. An internship in the form of coaching (Castle 2013) is an important element in structuring the supervision during internship.

It is worth noting that the issue of controlling educational and research internships, and carrying out research work, significantly 'falls behind' practically in the work of all the Master's degree students' supervisors, as there are no regulatory mechanisms of teacher – Master's degree student interaction. The survey of the teachers shows the necessity for preferable online tools that would guide internship and highlight the results of the Master's degree students' competencies acquisition in educational and scientific research activity.

5.2 Virtual educational environment

With the advancement of the mixed education technology in higher education in Kazakhstan the use of virtual educational environment for forming and developing students' competencies is becoming more and more urgent. As the research suggests (Bonk and Graham 2004, Alonso et al. 2005), skills acquired in virtual environments are as close to the traditional education as possible.

The research of Bianchi, Hernández-Lara, and Gualdi (2015); R. Van and Schepers (2008); Stiles (2000); Piccoli, Ahmad, and Ives (2001); Mohr, Holtbrügge, and Berg (2012); Maggi et al. (2010) demonstrates the efficiency of virtual environment and other forms of electronic teaching in forming students' competencies. The work by Suzuki (Suzuki 2009) shows the effective use of a Web portal in teaching Master's degree students.

Thus, we assume that forming Master's students' ICTC is advisably to implement through virtual educational environments. Taking into account all the stages of organizing and controlling a Master's student's internship and

scientific research activity in a university's virtual educational environment, we organized and tested the following pedagogical tools (Table 6).

Table 6. Tools of virtual educational environment for organizing Master's degree students' internship and scientific research work.

On the part of the teacher	*On the part of the Master's Degree Student*
Plan	Online reports in accordance with the plan
Journal	Online co-authoring articles together with the teacher
Digital educational resources, video instructions	Conducting introduction classes in the form of a webinar
Service catalogue	The Master's degree Student's e-resources catalogue for teaching purposes

These services were created to help teachers and Master's degree students plan and control all internship types and related scientific research work.

The plan to progress our research is to further design and develop the action items in Table 6 for a Master's student, including deadlines and result characteristics. A teacher adds tasks, including creative assignments, to the log; Master's degree students attach their reports; the grades are also given there. Digital educational resources are created in order to teach students how to use special programs for a statistical research, manage scientometric databases, create their own electronic educational resources for monitoring and measuring materials. All outcomes are then attached in a Master's degree student's user account.

A catalogue is compiled for a quick access to tools necessary in educational, subject matter, and scientific research activity.

Students' projects are collected on the portal in the form of an electronic resources catalogue so that other students could use them. There is a webinar platform on the university's portal already; now it is important for teachers to draw up a study plan. The classes on campus should be planned using mobile learning technology.

Thus, the most efficient way of organising Master's degree students' internship and scientific research activity in a form of a mixed learning, i.e. using the university's tools of the virtual learning environment.

Conclusion

In Kazakhstan a Master who has finished a research and educational Master's program has a right to teach at least at universities, can supervise and conduct research work. ICTC is the most important part of a Master's degree student's competency as a future researcher and educator. In this article we have covered the structure of a Master's degree student's ICTC in Kazakhstan, which consists of the subject matter, research and educational components; have carried out an investigational study. The analysis demonstrated that the majority of Master's degree students in Kazakhstan have a low ICTC level,

although their user activity in ICT area is high. The reason for this lies in the fact that the work aiming at training educational skills and competencies (during the educational internship) and scientific research competencies during the scientific research internship and supervising the Master's degree students' research work is not properly organized in specially allotted time.

One of the solutions that is suggested to correct the situation is using blended learning technology during Master's degree students' internship and research work. It includes designing and developing the tools of a university's virtual educational environment which allows a teacher to plan activities for various types of internship, to keep a log of performance, to create online report according to the plan, to attach digital educational resources, as well as video instructions in using the necessary ICT in educational and research activity.

The implementation of the above mentioned recommendations would enable the development of the Master's student's ICTC in Kazakhstan, providing that teachers are ready to organize the educational and research internships and scientific research work using ICT. Another issue is the teachers' motivation and commitment to a positive development of Master's Degree Students' ICTC as future researchers and educators in the Kazakhstan system of education.

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Appendix A

Table 1. The structure of a Master's degree student's ICTC

Competencies	*Basic*	*General*	*Professional*
ICT competency in the subject area	basic knowledge of informatics and the modern ICT as well as skills of using the Internet	the ability to use digital technology, software tools of communication and/or networks in order to solve the problems in the subject area, creating their own Internet resources, active usage of Web 2.0 services in the subject area	the ability to use the newest developments in teaching their own subject, organize and control the interaction in a virtual educational environment, use specialized programs, means of communication, online services in a subject area, organize an effective educational information interaction on the Internet together with all the participants of the educational process
	knowledge of basic computer skills	using an interactive whiteboard, various digital equipment in the subject area the ability to change a PC settings, install and delete applications and electronic learning resources	the ability to use Internet resources, use free software for the students' interactivity, form a technically-rich subject teaching environment in order to solve substantive problems
ICT competency in research and educational activity	using technical equipment in the educational activity	the ability to use an interactive whiteboard, various digital equipment in the educational activity	the ability to give classes using an interactive whiteboard, audio devices, etc.
	knowledge about the inclusiveness of educational system into the global information processes	using an effective access to practically unlimited information content	analytical data processing, systematization, generalization and spreading methodological experience (national and foreign) in the professional area
	organizing information interaction	the ability to use the means of computer communication in solving teaching objectives (chats, forums, online boards, messengers, etc.)	the ability to acquire knowledge through a dialogue and cooperation between people using ICT
	a joint information cooperation together with all the subjects,	using social networks	the ability to promote scientific and educational ideas in social networks

	learning from scientific and social experience		
	knowledge of modern learning technologies based on ICT tools and methods	developing multimedia learning resources, collecting one's own electronic resources, knowing the methodology of implementing digital educational resources in the academic process	the ability to select and create information products, chooses ready educational media resources, develop interactive education courses and teaching programs, create one's own products (aiming at presenting, teaching, training or monitoring); give an expert assessment to the products of educational activity
	knowledge of mobile learning technologies	using mobile devises in teaching	the ability to install mobile learning applications on smartphones and tablets, exchange teaching information (links to resources, graphs, audio and video files)
ICT competency in scientific research activity	processing and analyzing information using ICT	using ICT for data processing and analysis in scientific research activity	the ability to structure information according to various criteria, form a system of key words, analyze a text selecting the necessary information 'by sight', analyze linear information sources (video, audio), other objects and collections
	basic knowledge of modeling and forecasting scientific matter, analysis and generalization of experimental results	the ability to model and forecast the research using modern software tools, conduct computer experiments and build information models of objects and processes in various fields	the ability to use software tools of modeling and forecasting a research, evaluate the authenticity and practical value of information from different perspectives, use it to solve experimental practical objectives
	knowledge of software tools for statistical data processing	the ability to conduct a scientific experiment and process statistical data using MS Excel	the ability to conduct statistical data processing using specialized programs such as SPSS, STATA, STATISTICA, STADIA, R, etc.
	basic knowledge of the work with bibliography and source citation	the ability to use software tools and online services while working with bibliography and citation	the ability to appropriately cite the sources, maintain a bibliographical research database using such software tools as Biblioscape and BiblioExpress, Citeulike (online service), EndNote, Scholar's Aid, Zotero, etc., set Internet browsers (Google Chrome, Mozilla Firefox) to optimize the work with bibliography and its integration with word processors
	using search engines for a research work, reaching for research cited materials (books, journals, etc.)	the ability to use Web-resources of research cited materials: search engines for a research work (Google Scholar, Microsoft Academic Search), a search using science citation bases (Web of Knowledge, Springer, Tandfonline, Elsevier, Scopus	the ability to search for cited materials using result filters, detailed and personalized search options, saving search results, search through citation

		and RSCI)	
	the ability to use mobile devices in a research work	install mobile applications for a research work, exchange information	the ability to install plugins for a research work on mobile devices