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## NEW ROLES AND COMPETENCIES OF TEACHERS IN THE ICT-MEDIATED LEARNING ENVIRONMENT OF RUSSIAN UNIVERSITIES

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**Abstract.** *Introduction.* The research considers organisational and functional changes in the learning environment of Russian universities mediated by the spread of ICTs in education. ICTs affect the structure and content of curriculum and the relationship of participants in the educational process, which actualises the need to revise a place, roles, knowledge and competencies of humanities teachers. External and internal factors induce teachers to change approaches, methods and teaching technologies in accordance with the social request for high quality training of future professionals in the ICT-mediated realities and improve their ICT proficiency to meet the demands of the day. The best model of ICT-mediated learning environment will function on the basis of technologisation, interdisciplinarity, practice orientation, student focus and multicultural diversity.

*Aim.* The purpose of this study was to identify, analyse and assess the determining factors that accompany, actualise and influence the process of transformation of the place, roles, skills and competencies of teachers in the ICT-mediated learning environment of universities in Russia.

*Methodology and research methods.* The study was conducted within a framework of social, pedagogical, integrative, contextual, competency-based and comparative approaches, covering all aspects of academic activities of teachers and students in the ICT-mediated learning environment. Both qualitative and quantitative research methods were used to collect and analyse the relevant data. Analysis, synthesis and comparison were used to study and summarise scientific information; observations, questionnaires and survey were carried out within the experimental section, followed by a subsequent statistical analysis. A holistic approach

allowed to create a classification of the ICT-based roles and skills of teachers and to develop the authors' scale of gradation of ICT proficiency.

**Results.** The conceptual apparatus is concretised; conditions for the ICTs inclusion in education are defined; the authors' classification of the roles, skills and competencies of teachers for ICT-based professional activity, growth and development is given; the authors' diagnostic scale (toolkit) for rating and grading humanities teachers' level of ICT proficiency is designed and presented.

**Scientific novelty.** The scientific novelty of the work lies in the definition and description of the systemic integrity of educational content based on knowledge and technology, the appropriate conditions for integration of ICT in the curriculum, the level of teachers' ICT proficiency sufficient for the learning needs of their students and the expected learning outcomes.

**Practical significance.** The authors' classification of the roles, skills and competencies and the diagnostic scale (toolkit) for rating and grading the level of ICT-proficiency can be used in refresher courses for humanities teachers for their professional training, growth and development.

**Keywords:** learning environment, ICT-literacy, ICT-competency, ICT-mediated learning environment, ICT trends, roles and competencies of teachers

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## **НОВЫЕ РОЛИ И КОМПЕТЕНЦИИ ПРЕПОДАВАТЕЛЕЙ В ОБРАЗОВАТЕЛЬНОЙ СРЕДЕ УНИВЕРСИТЕТОВ РОССИИ, ОПОСРЕДОВАННОЙ ВНЕДРЕНИЕМ ИКТ**

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**Аннотация.** *Введение.* В исследовании рассматриваются изменения в организации и функционировании учебной среды российских вузов, обусловленные распространением ИКТ в образовании. ИКТ влияют на структуру и содержание учебных программ и взаимоотношения участников образовательного процесса, что актуализирует необходимость пересмотра места, ролей, знаний и компетенций преподавателей гуманитарного профиля. Внешние и внутренние факторы побуждают преподавателей менять свои подходы, методы и технологии обучения в соответствии с запросом общества на высокое качество подготовки будущих специалистов в контексте реалий ИКТ и повышать уровень владения ИКТ в соответствии с требованиями дня. Лучшая модель учебной среды на базе ИКТ включает технологизацию, междисциплинарность, практическую направленность, ориентацию на студентов и мультикультурное разнообразие.

*Цель.* Исследование направлено на выявление, анализ и оценку детерминирующих факторов, сопровождающих, актуализующих процесс трансформации места, ролей и компетенций преподавателей в ИКТ-опосредованной учебной среде вузов России и влияющих на него.

*Методология и методы исследования.* Работа проводилась в рамках социального, педагогического, интегративного, контекстного, компетентностного и сравнительного подходов, охватывающих все аспекты академической деятельности преподавателей и студентов в ИКТ-опосредованной учебной среде вуза. Для сбора и анализа релевантных данных применялись качественные и количественные методы исследования. Анализ, синтез и сравнение использовались для изучения и обобщения научной информации; наблюдения, ан-

кетирование и опрос проводились в рамках экспериментальной части с последующим статистическим анализом. Целостный подход позволил создать классификацию ИКТ-ролей и ИКТ-навыков преподавателей и разработать авторскую шкалу градации владения ими ИКТ.

*Результаты и научная новизна.* Авторами был конкретизирован понятийный аппарат; определены условия внедрения ИКТ в образование; дана авторская классификация ролей, навыков и компетенций преподавателей-гуманитариев в сфере ИКТ для их профессиональной деятельности, роста и развития; разработан авторский инструментарий (шкала) диагностики и оценки уровня владения ИКТ преподавателями. Научная новизна заключается в установлении и описании системной целостности, основанной на единстве учебного контента, сформированного на знаниях и технологиях; педагогических условий внедрения ИКТ в программы обучения; уровней владения преподавателями ИКТ, достаточных для реализации образовательных потребностей студентов и ожидаемых результатов их обучения в ИКТ-опосредованной среде.

*Практическое значение.* Авторская классификация ролей, навыков и компетенций, а также диагностический инструментарий (шкала) для оценки и градации уровней достижений в области владения ИКТ могут быть использованы на курсах повышения квалификации преподавателей в сфере гуманитарных наук для их профессионального роста и развития.

**Ключевые слова:** образовательная среда, ИКТ-грамотность, ИКТ-компетенция, ИКТ-опосредованная учебная среда, тренды в ИКТ, роли и компетенции преподавателей.

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## Introduction

The information revolution that started in the last decades of the 20<sup>th</sup> century on a global scale has led to transition of human civilisation from its industrial phase to the technologically enhanced stage of development [1]. This led to the emergence of a new reality, mediated by technology and fueled by the concepts of “post-industrial society” [2] and “information age” [2], which later received a more accurate name, known as “information society” [3]. Daniel Bell, an American sociologist, is often credited with creating and developing these concepts [4]. Bell’s “information society” is best described through a synthesis of three interrelated elements, namely: a post-industrial information workforce, information flows of

mainly scientific knowledge, and computers (technologies) as the pinnacle of the information revolution [5]. According to Bell, theoretical knowledge, technology, and information are essential for the growth and expansion of a newly formed information society, in which various important human activities start to substantially depend on certain competencies, skills and experience of its members for effective access, search, retrieval and sharing of all sorts of information by using technologically mediated means of communication [5, 6].

These processes are equally important in different contexts be they social, economic, political or cultural. In his research, Bell emphasised the role of technology-mediated information and knowledge in human progress and wrote the following in one of his works: “By information I mean data processing in the broadest sense; the storage, retrieval, and processing of data becomes the essential resource for all economic and social exchanges (...) By knowledge, I mean an organized set of statements of facts or ideas, presenting a reasoned judgment or an experimental result, which is transmitted to others through some communication medium in some systematic form” [3].

Though it is difficult to find a universally accepted definition of what can exactly be termed as “information society”, most of the authors tend to characterise it as one in which there is a general appreciation of the importance of technologically mediated information and knowledge serving as defining features of the modern world [4, 6]. The crucial point is that knowledge and information become the strategic and transforming resources of the information society [3]. Moreover, the society itself provides strong support for knowledge discovery strategies, knowledge retention, and knowledge networking [7]. The invention of computers, growth in information transmission via telecommunications and availability of the broadband Internet enhanced the concept and enriched it by such new and closely related notions as “digital society”, “network society”, etc. [1]. But no matter how we call it, the information society is seen as a reality today where all advances and developments are generating new demands for information and knowledge, which in their turn are gradually affecting and changing all aspects of social life and its organisation, including the economy, governments, employment, science, education, etc.

The “residents” of the information society are sometimes called digital citizens. These are *inter alia* university teachers and their students, the latter are often referred to as Generation Z [8, 9]. One of the key features of this Z cohort is their propensity to use the Internet and digital gadgets from an early age [9] for both peer-to-peer and multi-party communication via VoP and other messaging apps, such as Facebook, Instagram, Snapchat, Skype, Telegram, Vine, WhatsApp, TikTok, etc. [9, 10]. There is a clear tendency to transfer such online interaction to educational environment as well [10]. Since Gen Z students

value time and digital freedom, it is no surprise that they regularly use their smartphones, tablets, and laptops to quickly and easily access, search, store, and share various types of information. Admittedly, digital devices are having a huge impact on Gen Z students in terms of communication. Besides, they also affect Gen Z's digital lifestyles and day-to-day experiences, including their learning styles and educational needs [9]. These digital features and communication habits of Gen Z can cause generational conflict between teachers and students [8], so teachers must first of all improve their ICT competencies to bridge the gap [10].

The importance of integrating information and communication technologies (ICTs) into the educational environment of universities has long been recognised. Back in 2000, the “World Communication and Information Report”<sup>1</sup>, submitted by UNESCO, emphasised that the new technologies should contribute to “creating a better world in which everyone will benefit from the achievements of education, science, culture and communication”. The results of the report confirmed that although ICTs affect all areas of our lives, they have the most positive impact on the education sector, as “they open up opportunities for completely new methods of teaching and learning”<sup>1</sup>.

At the same time, heated academic debates and discussions about the role and place of teachers in the ICT-mediated learning environment continue to this day, and various experts, educators and practitioners offer reasoned arguments in defense of their position (Castells, Duff, Moore, Kulikov, etc.) [11]. Some opponents of ICTs find compelling arguments to describe learning spaces filled with technology, where there is no place for teachers because they are becoming useless and redundant [12]. This assumption seems rather strange and more like a myth. In fact, ICTs do not diminish the need for teachers, but require a rethinking of their profession and skills [11, 13].

Given the challenges of the time, teachers must expand their knowledge and acquire new competencies in such professional areas as pedagogical, methodological, scientific-theoretical, constructive-technical (normative), correctional, management, etc. [14]. *The research hypothesis* implies a correlation between the determining factors of ICTs spread, the level of ICT proficiency (including ICT-literacy and ICT-competencies) of humanities teachers and the effectiveness of ICT-mediated learning environment of university, which allows the use of various ICT-based educational methodologies and strategies for students' better learning outcomes.

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<sup>1</sup>World communication and information report, 1999-2000. In: Tawfik M., Bartagnon G., Courrier Y., Clayson A. (Eds.). Paris, France: Imprimerie Jouve, UNESCO publishing; 2000. 302 p.

## **Methodological Framework**

### ***Approaches and Methods***

The study was conducted within a variety of approaches. A comprehensive approach allowed to study and analyse all aspects of teachers' activities in the ICT-mediated learning environment. Social, integrative and pedagogical approaches helped to define the appropriate conditions for integration of ICTs in education and find a certain correlation between the determinants of ICT spread, teachers' ICT proficiency, interdisciplinarity, student focus and their learning outcomes. A contextual approach linked global processes of integration, informatisation and technologisation with the sphere of education. A competency-based approach made it possible to select and classify the required ICT-based roles, skills and competencies of teachers for successful pedagogical activity. An integration approach allowed to develop a diagnostic toolkit (scale) for assessing and grading teachers' level of achievements in ICT-literacy and ICT-competency for best practice in the new educational settings.

For the purposes of this study, both qualitative and quantitative research methods were used. Analysis, synthesis and comparison were employed to study and summarise relevant scientific information; observations and survey were carried out within the experimental section, followed by a subsequent statistical analysis of the data obtained. This strategy helped to answer a research question about correlation between external and internal determinants as well as the explicit and hidden variables and their impact on teachers' effective use of ICT in the educational process. The holistic pedagogical approach also allowed for the identification and review of best practices and experiences of university teachers around the world, whose roles have changed dramatically and continue to change from "instructors" to "facilitators", "guides", "constructors", or "creators" of rich ICT-based learning environments [11].

### ***Related publications on the ICT-mediated learning environment***

Castells [1] in his book "The rise of the network society" paid great attention to the economic and social dynamics of the information age and showed how the network society has gradually risen on a global scale in recent years. Based on in-depth research from different parts of the world including the USA, Asia, Latin America and Europe, the author described the accelerating pace of innovation in the net-economy and the apparent impact of social transformation on other spheres of society, especially education, due to data circulation over the Internet and other ICT-based resources.

Kulikov et al. [11] provided a thorough analysis of the key indicators of professional growth and development of teachers in the context of the growing



informatisation and digitalisation of modern Russian society, including the importance of a sufficient level of ICT-literacy and ICT-competency of teachers [11].

Brown & Lippincott [12] discussed how technology can change our perception of traditional classrooms and turn them into learning spaces, which can range to virtual spaces and various ancillary services such as computing centers, teaching and learning tech-based labs, libraries, etc. The authors propose an integrated approach to the technology-mediated learning spaces where not only specific hardware and software will be essential for the proper functioning of the learning infrastructure but they also believe that a well-trained staff of teachers and a team of technical support specialists will be in great demand [12]. King et al. [13] further develop the concept of “learning spaces” and their impact on a smooth, flexible and technology-mediated teaching and learning process. King shows how to integrate “state-of-the-art technology” [13] into the learning spaces and motivate teachers/students to use technical means in practice and make the most of these new tools and resources for the benefit of pedagogy.

Ainoutdinova [14, 15], Khuziakhmetov et al. [16] identified and classified most recent trends in higher education actualised by integration of the Internet, ICT and other tech-based innovative tools, techniques and resources. The authors also researched and described the scope of applicable ICT- and web-based approaches, methods and technologies that allow effective teaching/learning at university with an emphasis on ICT proficiency, interdisciplinarity, student focus and learning outcomes.

Facer & Owen [17] outlined key areas for ICT application in education and summarised most optimal ICT-based teaching and learning materials and activities that can increase motivation, support learning for all students and across all ages, and offer opportunities for maximal progress in knowledge acquisition through responsive diagnostic and feedback systems. In addition, they broadened the list of potential and updated roles of teachers in the ICT-mediated learning environment by enabling them to create and share their own resources and good practices.

Ghasemi & Hashemi [18] also agree that new avenues and challenges of the information age have dramatically changed the place and roles of teachers and their students. The use of ICT is frequently linked with the students’ autonomy, which, according to the authors, is associated with “greater freedom and flexibility to learn at one’s own pace and convenience” [18] within or beyond the context of a particular course or discipline. This shift to autonomy including students’ responsibility for learning outcomes enables their teachers to focus on the teaching methodology and strategies of deciding what information is best needed. Thus, the roles of teachers, from the point of view of the authors, should be extended to mentors, guides, motivators or facilitators in order to help students acquire the basic knowledge and skills.



Groff [19], Klimova & Poulouva [20], McInerney & Day [21], Rokenes & Krumsvik [22], Scarino & Liddicoat [23], Tregubova [24] and many other researchers agree that the rich array of new visions and strategies for ICT-based education around the world can only be produced and implemented in a duly organised ICT-mediated learning environment. Taking into account regional peculiarities and pitfalls of national legislations, there are, however, several common driving forces that are pushing ICT as a key component of change in educational systems in most of the countries.

Firstly, ICT offers a wide range of opportunities to improve teaching and learning by adapting it to individual learner's needs; secondly, it allows to acquire, develop and master various skills for adult life including technological literacy that enables to effectively operate, interact and thrive in the new knowledge economy; thirdly, ICT is integral to bridging digital divide and accessing higher-order skills and competencies of the 21<sup>st</sup> century (critical thinking, decision making, problem solving, etc.) essential for lifelong learning and productive work in today's society [19]. Based on this, the ICT-mediated learning environment must be designed to align all of these components to achieve the desired results, while ICT can serve as one of the elements enabling to manage vast amounts of data and contributing to the demands of digital reality [18]. According to some authors [24], most issues related to ICT in education including the benefits and potential problems can be better explored through comparative research.

Warschauer et al. [25, 26] in his scholarly papers presented the findings in the field of theory and practice of the network-based teaching and learning of foreign languages, although the results of his study can be used equally by researchers in other fields and disciplines. Warschauer is known as the education researcher who sees "the potential of technologies" [27] in promoting learning opportunities, literacy development and social inclusion. Along with popularisation of various ICT-based tools and devices (computers, laptops, etc.) and educational technologies (Computer assisted learning (CAL), Web-based learning (WBL), Network-based teaching (NBT), Internet for teaching, Virtual connections, Telecollaboration in learning, etc.) Warschauer articulates a vision of global citizenship and agency through online communication and research [26]. His sociocultural approach to collaboration and interaction in the networked multimedia and audiovisual learning environments deserves attention in the context of this research.

Garmise & Rodriguez [28], Helmold [29] and Miller [30] revealed the subtleties of teachers' perception of the importance of forming and developing not only ICT-literacy and ICT-competency in their students as the core 21<sup>st</sup> century skills, but also encouraging students' career readiness skills applicable to professional development, growth and transforming leadership in the new ICT-mediated reality.

The analysis of the UNESCO report, 1999-2000<sup>1</sup> and ICT CFT, 2011<sup>2</sup> allowed to distinguish certain reasons why the roles of teachers must change in the ICT-based classroom and beyond. Firstly, ICTs render some resources obsolete if all students have access to shared network resources; secondly, ICTs replace some traditional assessment methods with interactive procedures; thirdly, ICTs stimulate teachers not only to transfer knowledge, but also to encourage students to master higher-order cognitive and communication skills, ICT proficiency, critical thinking and teamwork [31]; fourthly, ICTs enable any technically competent teacher to use computers and basic software in teaching/learning practice [21], and, finally, ICTs allow technologically competent teachers to evaluate educational software and tools and keep abreast of all innovative educational methods and technologies for the benefit of their students [25].

The analysis and synthesis of the relevant literature has proven the need for teachers to acquire, master and develop a wide range of ICT-based roles, skills and competencies as they open up greater opportunities and help create a new ICT-mediated learning environment, which, in turn, enables to dynamically transfer knowledge, explore contrasts, make comparisons and establish connections [18]. According to Blau & Peled [32], Kale & Goh [33], teachers should continue to improve their ICT proficiency in professional practice and pay close attention to pedagogy, education, didactics, curriculum, staff development, support systems, etc.

It was found that ICT in education significantly enlarges prospects for effective pedagogy and didactics. However, a comprehensive analysis has not yet been provided to identify a due correlation between the determinants of ICT spread, the level of ICT proficiency among humanities teachers and the ICT-mediated learning environment.

### ***Sampling, Data Collection and Data Analysis***

#### *Sampling and socio-demographic profile*

Based on the empirical approach, we carried out a survey and interviewed 60 humanities teachers working in Russian universities, namely Kazan Federal University (KFU) and Kazan National Research Technical University named after A. N. Tupolev (KAI). We aimed to identify the needs, beliefs, values and attitudes of teachers in a changing ICT-mediated environment and measure how different variables (arising from either the external environment or the internal/personal characteristics of teachers) relate to their use of ICT in classroom activities. We

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<sup>1</sup>World communication and information report, 1999-2000. In: Tawfik M., Bartagnon G., Courrier Y., Clayson A. (Eds.). Paris, France: Imprimerie Jouve, UNESCO publishing; 2000. 302 p

<sup>2</sup>UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 2.0. In: Paul Hine (ed.). Paris, France: UNESCO publishing & Microsoft; 2011. 95 p.

support the position of Player-Koro [34] that careful examination of teachers' use of technology both in and outside the classroom reveals a complex structure of interrelated factors that, collectively, are considered critical to the successful integration of ICTs into education.

The final data were collected from 56 full-time teachers of humanities, among them – 12 teachers of philosophy, 16 – of pedagogy and 28 – of foreign languages. After screening and checking the results, 4 responses from 60 were discarded due to the multiple/inconclusive/incomplete responses that did not allow an accurate data analysis. The overall sample size ( $n = 56$ ) corresponded to an effective response rate of 40% relative to the total number of the humanities teachers employed at the faculties at the time of data collection ( $n = 200$ ). The confidence level of accurate sampling was 95% ( $p < 0.05$ ); based on the total number of teachers employed of 200 and a sample size of 56, the margin of error was quantified at 5%. The gender distribution was also representative of the overall demographic data concerning the teaching profession in Russia, which is regarded as a female-dominated sphere of occupation (96,1%). In our case, from 56 participants of the experiment only 5 respondents were male teachers (9%), while 51 respondents were female teachers (91%). The selection of teachers was conducted based on the cluster sampling method. The total number of teachers surveyed was 60, all Russian citizens (different nationalities), aged from 25 to 60. The teachers were then virtually divided according to their age into the following groups of: 23–30, 31–40, 41–50, and 51 and above.

#### *Data Collection*

The cluster sampling plan was used to collect data through a self-administered online survey. The data were collected in the first quarter of 2021 at the Institute of International Relations, Department of Foreign Languages of Kazan Federal University (30 respondents) and at the Faculty of International Educational Programmes of Kazan National Research Technical University (30 respondents). Teachers of humanities working at the universities were the participants in the investigation (online survey).

The survey was conducted in the midst of the COVID-19 pandemic, when some educational institutions introduced the so-called “hybrid format” to partially replace the traditional “face-to-face” teaching/learning and avoid complete closure. This allowed for a blend of traditional and online classes and meetings in small groups, including the selected universities. The event was held outside of the teachers' working hours, all teachers were pre-instructed on the rules and aims of the survey; participation was voluntary and confidential. Each participant was offered a separate questionnaire consisting of 30 questions, divided into 4 sections.

The first section contained standard questions on the age, gender, educational level of teachers, their access to ICT at home and in the workplace

(university) to collect data on the demographic profile of the participant. The second section offered fixed alternative questions about teachers' use of ICTs outside of their profession to assess and measure teachers' self-efficacy regarding the use of ICT (“a belief in one’s own ability to successfully perform actions” [34]). We also aimed to identify in which way and how often teachers use ICTs for personal purposes. The third section had both fixed alternative and open-ended questions about teachers' use of ICT in classroom, the latter allowed teachers to add responses in their own words. We aimed to assess and measure both teachers' self-efficacy and their personal efficacy (as a “power to produce desired outcomes and forestall undesired ones” [34]) in educational settings. We also aimed to clarify in which way and how often teachers use ICT-based tools, methods and resources in teaching practice. Both approaches to efficacy (self and personal) revealed situation- and task-specific factors that can affect teachers and their appropriate behaviour in the ICT-mediated learning environment. The fourth section contained fixed questions/statements about teachers' attitudes towards the use of ICT in education. The participants were to agree or disagree, and express their opinion using the pre-coded answers, which were ranked according to a 5-point Likert-type scale [35]. Depending on the content of the questions, the following options were used: (5) Strongly satisfied; (4) Satisfied; (3) Neutral; (2) Unsatisfied; (1) Strongly unsatisfied. Similarly, some of the pre-coded responses were: (5) Extremely important; (4) Very important; (3) Somewhat important; (2) Not very important; (1) Not important at all.

#### *Data Analysis*

The survey data were examined using an open-source statistics program JASP (<https://jasp-stats.org/>), which allowed obtaining an average value (Mean), standard deviation (SD), minimum (Min) and maximum (Max) value for each item. Also, the proportion of the data (fraction of cases), the distribution of data, and the correlations between pairs of attributes were obtained. The analysis was conducted in three steps. Firstly, a “stepwise multiple regression analysis” [34] was used to investigate the most appropriate pattern of predictive variables, which allowed to eliminate poor predictors on a stepwise basis and select the best predictors based on statistical criteria. The results showed correlation between teachers' self-efficacy and positive attitudes to ICT use. These variables were also the best predictors of teachers' disposition to use ICTs in education. At the second stage, a “factor analysis” (of situation- or task-specific factors) was used to further study the structure of teachers' attitudes towards the use of ICT in education [36]. The results of regression analysis and factor analysis were compared then with the help of belief systems. As a result, a structural equation model was obtained and formulated based on the theories about self-efficacy and attitude-behaviour relations. It proved the expected correlation between explicit and hidden variables and revealed their influence on teachers' attitudes to the use of ICTs.

This survey was an attempt to collect primary information to confirm our hypotheses about the correlation between the determinants of ICT spread, the level of teachers' ICT proficiency (including ICT-literacy and ICT-competency) and the effectiveness of the ICT-mediated learning environment of university. This can be supported by proving the relevance of ICT for education and its stakeholders, including scholars, teachers, students, university administrators, etc.

## **Results**

The data-driven analysis of the results of the survey proved that participants (56 teachers from the two high-ranking Russian universities) could be divided almost equally into three groups as follows: (1) those who fully support ICT integration into educational settings and possess positive attitudes toward ICT (42%); (2) those who oppose ICT and show negative attitudes toward ICT (34%); (3) those who generally possess positive attitudes towards ICT, but feel scared when it comes to ICT integration into educational process due to various reasons (24%).

The results of our empirical research have confirmed that most of the teachers are aware of the importance and necessity of integrating ICT into higher education as a driver for its successful reform (82%); admit that ICT has totally changed the way teachers work in the classroom (77%); recognise that ICT facilitates student learning modes and styles (75%); favour ICT in education since it contributes to cooperation between colleagues (68%). Some teachers believe that true professionalism of their students is only achievable in an interdisciplinary environment, where ICTs facilitate integration of subjects and work in a more active, experiential and problem-solving atmosphere (64%). ICTs also raise students' awareness of the range of opportunities for their future profession (59%), increase students' readiness for future careers (57%) and serve as an important factor in preparing students for an active professional, social and public life (53%). Only a small part of the respondents do not see the need to integrate ICT into higher education (8%), as this takes time away from other important educational activities (10%). However, they recognise that ICT can make teaching and learning more fun and engaging for their students (12%), and, as a result, ICTs will increase students' motivation and improve learning outcomes (15%).

The survey also confirmed the position of some authors and showed that when assessing teachers' attitudes towards digital technologies, it is necessary to take into account at least four factors, namely: confidence [37, 38], knowledge of ICT [39], gender [40, 41], and age [42, 43]. Though age and gender do not have direct influence on confidence, knowledge or attitudes towards ICT, they

sometimes obstruct and limit integration of technology in academic environment of university. According to the 2013 European Commission's Survey of Schools<sup>1</sup>, the majority of teachers in Europe are women (70% – 75%), and most of them are apparently much less receptive to the use of ICT in education rather than their male colleagues. Ironically, the teaching profession in Russia is also female-dominated (96,1%).

Though gender is regarded in this study as one of the ICT limitations, no direct relationships between gender and teachers' attitudes towards ICT were statistically proven. The fact that gender might affect teachers' attitudes towards ICT was also rejected earlier in Chen's study [40]. At the same time, the results revealed a gap in the frequency of ICT use by male and female humanities teachers for classroom and personal purposes. Two-thirds (75%) of male teachers and only 24% of female teachers used the Internet regularly in the workplace. In addition, while almost 100% of male teachers typically used computers in their teaching practice, only 50% of female teachers regularly taught their disciplines using computers and other ICT-based tools and resources. Moreover, 50% of male teachers and only 7% of female teachers have successfully completed additional ICT training courses. Conversely, for personal use at home, both categories showed the same regularity of Internet use with different digital gadgets. The results of the survey showed that the gender factor had practically no effect on teachers' willingness to use ICTs in the educational process.

Age and experience were the next factors whose effect on teachers' attitudes towards ICT integration into education we aimed to measure and compare. The survey results showed little or no difference in ICT usage habits between different groups of teachers, depending on their age or experience. If younger teachers (23–30, 31–40) were focused on various ICT innovations, such as new high-tech brands of smartphones, tablets, laptops, etc., then their mature colleagues (41–50, 51 and above) were more interested in ICT-based teaching methods, technologies and resources. However, most teachers recognised the need to improve their ICT proficiency (86%) and expand their learning up to "continuity" (76%), including further regular training of ICT-related knowledge and competencies within a lifelong learning paradigm [44].

Although we found that teachers of all age groups demonstrated much better computer behaviour and ICT skills than in previous years, the proportion of teachers with a good command of computers that enable to use the Internet may negatively correlate with their age. While nearly 70% of humanities teachers, aged 25 and under, reported a good command of the Internet, its search engines and various applications, only 30% of teachers, aged 51 and older, demonstrated

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<sup>1</sup> Survey of Schools: ICT in Education. Benchmarking Access, Use and Attitudes to Technology in Europe's Schools: Final Study Report. Internal identification SMART-Nr 2010/0039. Belgium: Publications Office of the European Union; 2013. 163 p. DOI: 10.2759/94499



the same level of proficiency. Almost the same negative age share was found in relation to the use of the Internet and its resources in teaching practice; almost 65% of teachers, aged 25 and under, rate this positively compared with only 35% of teachers, aged 51 and over.

The data obtained practically coincided with the conclusions of other scientists (Mustafina, Eickelmann, Drudy, Kubiatio, Elsaadani, etc.) and the results of a special “ad hoc” thematic telephone interview conducted by Flash Eurobarometer (FEB)<sup>1</sup> at the request of the European Commission. The latter has confirmed that younger teachers are more computer and Internet literate than their older colleagues. However, this gap between age groups in ICT-related behaviour is not a critical trend; rather, it shows an indirect correlation between these variables. Age and gender are more likely to influence teachers’ self-confidence and self-efficacy, which, in turn, affect their achievements of the required level of ICT-literacy and ICT-competency.

The empirical research has helped to identify new and updated roles and skills that any competent teacher is expected to demonstrate in the ICT-mediated learning environment of university. The study has also allowed proposing a classification of the roles, skills and competencies of humanities teachers that correlate with their functions in the ICT-mediated realities. Considering that ICT develops teachers’ pedagogical abilities (67% of the respondents agreed with that statement), helps them in curriculum development (63%), provides meaningful strategies necessary to incorporate technologies into the curriculum (57%), offers activities for staff development (55%) and support systems (42%), some new and updated roles of teachers can be presented as follows: a facilitator and guide; integrator of media; collaborator with other colleagues; mediator; designer of complex teaching/learning scenarios; orchestra leader of technology, students, and curriculum; researcher; evaluator; and learner. We will further examine these teachers’ roles and skills in the context of integration of ICT in education and their impact on the stakeholders.

## **Discussions**

### ***What is ICT?***

ICT is a widely used term in education. In the course of our research, we came to the need to clarify its meaning. And although there are many definitions of the term “ICT” coined by different authors, for the purposes of our study, we have chosen Stevenson’s interpretation of this concept. According to him, ICT can be explained if we add “communications” to the more familiar “information technology” [45]; the latter processes data in a faster and more accurate way and allows it

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<sup>1</sup> European Commission. European citizens’ digital health literacy. Flash Eurobarometer 404: Summary. Brussels, Belgium: Publications Office of the European Union; 2014. 37 p.



to be transmitted using technological means such as telecommunications and multimedia based on “sound, vision, text and numeric data” [45, 46]. On this basis, ICT can be attributed to the earlier existed technology that has helped individuals, institutions, organisations, etc. to communicate information duly and effectively [1, 14]. This interpretation of ICT applies equally to their daily use as well as to their specific mission in education [45, 47], which implies supporting, expanding and improving delivery of knowledge and information. ICTs are changing educational approaches, teaching/learning modes, methods and technologies, especially in higher education [20]; thus, many universities strive to create competitive learning environments so as to offer their students a variety of options that range from “what and how to learn” to “when and where to learn” [48].

### ***New ICT trends in education***

In recent years, academic researchers, educators and practicing teachers have turned attention to the prospects of creating ICT-mediated learning environments to improve the quality of university education [14]. Preference is given to the ICT-based curriculum that enhances academic performance, competency and productivity [48], which, in turn, foster student engagement and abilities.

The analysis of the topical literature has led us to assume that some of the most common ICT-based trends in training of modern humanities students include: e-Learning (fixed, adaptive, linear); computer managed learning (CML); computer assisted instruction (CAI); web-based learning (WBL) [15, 16]; mobile learning (M-learning); various types of online learning (synchronous, asynchronous, interactive, individual, collaborative); real world applications [49]; gamification [49]; Open Source Textbooks and Massive Open Online Courses (MOOCs and their derivatives, such as SPOC, VOOC, etc.); crowdsourcing based on networking, cooperation and collaboration [50]; blended and flipped learning [14, 26], etc. In addition, mixed or hybrid modes of teaching/learning are becoming popular today where Learning Management Systems (LMS) and Content Management Systems (CMS) are used to educate and deliver online content over the telecommunication channels [10].

Large-scale research on ICT in education by UNESCO and the European Commission (EC) confirms that ICT and digital technologies are an integral part of today’s teaching/learning process. The EC supports many initiatives to modernise education and promote ICT-focused research and innovation activities, including Horizon 2020, ENTEP, Pro-VET, FP7, CIP, etc. Recently, the EC has adopted its new “Digital Education Action Plan 2021-2027”<sup>1</sup> as a “renewed European Union

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<sup>1</sup> European Commission. Digital Education Action Plan 2021-2027. Education and Training: Resetting education and training for the digital age [Internet]. 2019 [cited 2021 Apr 12]. Available from: [https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan\\_en](https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en)

policy initiative to support the sustainable and effective adaptation of education and training systems of EU Member States to the digital age”.

The study of the best international and European practices was very important for our vision of how to better plan and build a national policy of Russia in the field of higher education, which would make it possible to popularise and expand opportunities for the successful integration of ICT into education and the university curricula, in particular, and to create on this basis an effective ICT-mediated learning environment.

### ***New and updated ICT-mediated roles of teachers***

The results of our research led us to assume that “the successful integration of ICTs into teaching/learning process”<sup>1</sup> requires a rethinking of the place and roles of teachers in planning and using ICTs to improve and transform the entire teaching/ learning paradigm. Any education system needs regular renewal and reform, as well as the approaches to both initial and in-service teacher training, so that teachers can benefit from ICTs in their professional development and growth. The 2011 UNESCO ICT CFT, 2.0<sup>2</sup>. sought to develop teacher training policies and standards regarding their ICT literacy and competencies sufficient to integrate ICTs into curriculum and teaching practice. ICT CFT, 2.0. has an easily reproducible algorithm with a focus on technology that must support six main ICT-related areas of education, namely: ICT itself, ICT in education, “pedagogy, curriculum and assessment, organisation and administration, teacher professional learning”<sup>3</sup>. Teachers are expected to acquire the necessary ICT-based knowledge and skills in three stages, namely: “technology literacy”, “knowledge deepening” and “knowledge creation”<sup>4</sup>. Various descriptors are used to refine ICT proficiency levels from lowest to highest, depending on the individual indicator. For example, “understanding ICT in education” may develop from “policy awareness” to “policy understanding” and then to “policy innovation”<sup>5</sup>.

To keep pace with all global technological and pedagogical changes, UNESCO timely responded to the UN “2030 Agenda for Sustainable Development”<sup>6</sup>

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<sup>1</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 2.0. In: Paul Hine (ed.). Paris, France: UNESCO publishing & Microsoft; 2011. 95 p.

<sup>2</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 2.0. In: Paul Hine (ed.). Paris, France: UNESCO publishing & Microsoft; 2011. 95 p.

<sup>3</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 2.0. In: Paul Hine (ed.). Paris, France: UNESCO publishing & Microsoft; 2011. 95 p.

<sup>4</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 2.0. In: Paul Hine (ed.). Paris, France: UNESCO publishing & Microsoft; 2011. 95 p.

<sup>5</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 2.0. In: Paul Hine (ed.). Paris, France: UNESCO publishing & Microsoft; 2011. 95 p.

<sup>6</sup> UN General Assembly. Transforming our world: the 2030 Agenda for Sustainable Development. Resolution adopted on 25 September 2015 (A/RES/70/1) [Internet]. The UN publication (sustainabledevelopment.un.org); 2015 [cited 2021 Apr 12]. 35 p. Available from: [https://www.un.org/ga/search/view\\_doc.asp?symbol=A/RES/70/1&Lang=E](https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=E)

by its new ICT-CFT, 3.0.<sup>1</sup>, which can serve as a training guide for the professional development and growth of teachers using ICT. This 2018 ICT-CFT<sup>2</sup> defines 18 ICT-related competencies, which teachers should strive to master, and 64 specific tasks (objectives) to accomplish this<sup>3</sup>. As in the previous<sup>4</sup> version, ICT-CFT, 3.0<sup>5</sup>. also focuses on issues related to teachers' perception of ICT in education, specifics of ICT-based curriculum, pedagogical, assessment, organisational, administrative and management strategies but with a view of the digital technologies and services. Topics covered include the description of such competencies as the ability to apply "digital skills", "teacher professional learning" in the use of ICT, etc.<sup>6</sup>

It becomes obvious, that in a rapidly digitalising world, teachers will need a set of new pedagogical and managerial ICT-based skills allowing them to enhance the educational process and contribute to the new digital culture of students' learning. ICT-strategies are essential for developing active tech-based, student-centered, intercultural, interdisciplinary, and experiential classrooms where a structured discussion raises basic real-life issues and pursues problematic areas of thought [39]. Engaging students in case-studies, encouraging them to participate in collaborative efforts, managing complex learning scenarios, facilitating cooperation, crowdsourcing and team work are just a few options teachers must have in the arsenal of their professional techniques and methods.

Let us examine some of the new and updated ICT-mediated roles of teachers. The roles of "coordinator", "facilitator" and "guide" require a broad-minded leader, who will serve as the main source of new information and knowledge for students and who will both properly organise and manage the entire ICT-based educational process<sup>7</sup>, and fill it with activities and resources to meet the needs and expectations of Gen Z students [48]. As "integrators of multimedia and ICT-based tools, programs and resources" [11], teachers must not only know and understand the functions and purposes of ICTs, but also know exactly "when, why and in what context" is best to apply or use them [48].

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<sup>1</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 3.0. In: Neil Butcher (ed.). Paris: UNESCO publishing; 2018. 68 p.

<sup>2</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 3.0. In: Neil Butcher (ed.). Paris: UNESCO publishing; 2018. 68 p.

<sup>3</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 3.0. In: Neil Butcher (ed.). Paris: UNESCO publishing; 2018. 68 p.

<sup>4</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 2.0. In: Paul Hine (ed.). Paris, France: UNESCO publishing & Microsoft; 2011. 95 p.

<sup>5</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 3.0. In: Neil Butcher (ed.). Paris: UNESCO publishing; 2018. 68 p.

<sup>6</sup> UNESCO ICT Competency Framework for Teachers – ICT CFT. Version 3.0. In: Neil Butcher (ed.). Paris: UNESCO publishing; 2018. 68 p.

<sup>7</sup> European Commission. Digital Education Action Plan 2021-2027. Education and Training: Resetting education and training for the digital age [Internet]. 2019 [cited 2021 Apr 12]. Available from: [https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan\\_en](https://ec.europa.eu/education/education-in-the-eu/digital-education-action-plan_en)

Following the policy of university, which is *de facto* based on fundamental principles of in-depth study and dissemination of scientific knowledge, teachers in Russia must conduct both classes and research activities in a specific subject area [11, 50]. Regular work with primary sources, databases, virtual libraries, etc. for the search, selection, analysis and storage of relevant materials in their preparation and writing scientific articles or monographs will certainly develop the quality of “researchers” and “experts” among teachers in a certain area of knowledge, which will be positively reflected in their pedagogical practice [11]. In the ICT-mediated learning environment, teachers’ “scientific approach” and research skills, backed by their “expert knowledge” [11], facilitate the smooth delivery of information from teacher to student due to the teachers’ ability to use external databases and search engines for educational purposes.

The “developer of complex teaching/learning scenarios” [11] – is another creative role that teachers can fulfill in the ICT-mediated educational process. Here teachers focus primarily on project-based or experiential learning activities, which will enable students to gain knowledge, skills and experience applicable in real life. But in order to involve students in project work, teachers will have to pose a really interesting question or problem, clearly and concisely formulate the task and propose the plan (algorithm) for its research [15, 20].

Such activities, as a rule, require painstaking and lengthy preparation, and students usually have to go through a series of procedures, such as the deliberate planning, synthesis of information from various sources and areas of knowledge, its critical and creative application to a specific case. “Teachers as developers of complex teaching/learning scenarios” [11] can work equally professionally with both traditional didactic materials and more sophisticated methods, resources and tools mediated by ICTs and ambiguity of the tasks [39, 51].

It is becoming clear that investing time and effort will require sharing of duties, tasks and responsibilities among the teaching staff, unless there is a general rejection of technologies for some reason or in the event of a technically complex workload. Here comes another teacher’s role as a “collaborator with other teachers or colleagues” [11], which will reduce the workload and make any effort fruitful and rewarding. Also, cooperation and interaction with partner educational institutions will make any joint project more effective or efficient, be it local, national or international. ICT provides tremendous opportunities for academic and professional communication and exchange of information over the Internet with colleagues from other countries, which serves for the progress of science, research and pedagogy as it expands the target audience, introduces new interdisciplinary and intercultural topics, adds new ideas, experiences and practices to local databases. Moreover, it allows improving teacher’s professional activity, growth and development as well as individual progress [11, 32].

The teacher can also act as an “orchestra leader” [11], who can simultaneously direct, supervise and encourage three “musicians”, namely, technology, students and curriculum. To organise, balance and synchronise these different parts of a complex ICT-based teaching/learning process, teachers will need a set of integrated skills and qualities to demonstrate sufficient ICT proficiency, propensity to apply innovative pedagogical and psychological methods, management techniques, etc. [32]. To assess student academic achievement, performance and learning outcomes, the teacher must take on a role of “evaluator”. An electronic portfolio that allows to assess, record and store data on the acquired skills and competencies of students, seems to be the best way to monitor students’ progress in the ICT-mediated learning environment [38]. And finally, in a world where the flow of knowledge and information changes rapidly and regularly, any teacher can act as a “learner”. Within the lifelong learning paradigm and the learning needs and styles of today’s Gen Z students, teachers strive to learn, expand and renew their ICT literacy and competencies together with their students [11].

### ***ICT-literacy and ICT-competency***

In the course of our research we came to conclusion that “in the wake of ICT” [11] teachers need to acquire special knowledge and develop certain skills for the due implementation of their new and updated roles in the ICT-mediated learning environment of university. It is important to distinguish between ICT-literacy and ICT-competency of teachers though. If ICT-literacy involves knowledge about hardware, personal computer, software, computer networks, including the Internet, their basic functions and capabilities, ICT-competency is a broader concept that includes the ability to effectively use the potential of ICT in education and at home.

Although we often view ICT-literacy as the ability of a person to press the “right buttons” and know something about computers, websites, social networks and the Internet, we cannot talk about ICT-literacy in education from a purely mechanistic perspective. Today, it is customary to talk about a number of areas of knowledge that together create an ICT-literacy system necessary for the effective work of teachers in the new conditions [6, 11]. Scientific literacy seems to be very important for teachers to fully operate in an ICT-mediated learning environment. Generally speaking, it is the ability to think scientifically and strategically in reality, which is largely influenced by science and technology. More precisely, it is a “competent perception of basic scientific concepts, principles and theories” [11] and their due application in practice.

Other types of ICT-related types of literacy with brief explanations include: digital literacy – allows to use ICTs and communicate via digital platforms;

critical literacy – enables to assess validity and usefulness of data, analyse and discuss their relationship; linguistic literacy – provides channels and resources for proper academic and professional communication; cultural literacy – permits to observe and compare changes in one’s country and in the world. According to Hirsch’s concept<sup>1</sup>, linguistic literacy and cultural literacy in the aggregate constitute a linguocultural literacy due to their common and inextricable link to linguistic literacy and linguistic culture, which involves a sufficient level of knowledge and the ability to communicate with speakers of other languages and cultures in native and foreign languages for academic and professional purposes.

Some new and updated skills and qualities are also needed to improve teachers’ ICT proficiency so that they can work effectively in the ICT-mediated learning environment. We have identified the five most in-demand ICT-related skills, namely: technical, organisational, conceptual, managerial and mediation [11, 19]. Technical skills are the ability and knowledge that teachers need to perform specific and often practical ICT-related tasks. For example, teachers can need to determine “what, where, when and how” is best used from ICT tools or resources [48], or they may need to apply templates to design the authoring programmes, etc. The survey results showed that the technical skills of many teachers remain inadequate.

Organisational skills are often associated with time-management and, as such, contribute to the development of more effective and efficient ways of working in and outside the ICT-mediated classrooms by properly organising the teacher’s workload, optimising teaching/learning process, providing access to digital technology and data at the right time and in the right amount [19, 21], and focusing on ICT-based tasks and activities to achieve the desired results in a highly algorithmic way. Conceptual skills are higher-order abilities that allow to perceive ICTs from a broader perspective, rather than simply simulating a specific learning scenario for a specific class only. Teacher should think broadly and work with abstract ideas and not be bound by any constraints or limitations when it comes to problem solving. Practice shows that in the ICT-mediated realities, abstract or disparate ideas can be connected, which deepens their understanding and allows the creation of new ideas, knowledge and solutions [19; 21].

Management skills are integrated abilities that enable teachers to plan and set short and long term goals with the logically predetermined outcomes and far-reaching perspectives. The integrative nature of such skills lies in their ability to embrace the previously acquired technical, organisational, conceptual

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<sup>1</sup>The New Dictionary of Cultural Literacy: What Every American Needs to Know. In: Hirsch E. D., Kett J.F., Trefil J. (eds.). Houghton Mifflin Harcourt; 2002. 672 p.



skills though leaving room for development of a wider range of new teachers' qualities in such areas as interpersonal relations, academic and professional communication, decision-making, etc. Mediation skills are not new to teachers as they have always acted as patient intermediaries between knowledge and students in delivering meaningful content. In the ICT-mediated learning, however, mediation requires renewal and use of innovative strategies based on a student-centered and student-friendly environment filled with safety, transparency, trust and collaboration allowing students to engage in joint problem solving, analytical and critical thinking, and crowdsourcing through effective teachers' feedback. The roles that teachers play today in the ICT-mediated educational process of university requires having some or all of these proposed skills [19, 21].

### **Conclusion and Recommendations**

The provided study shows that causes and effects of new or updated roles, skills and competencies can be different for the adequate functioning of university teachers in the ICT-mediated environment of their institutions; this raises additional questions and debates [43, 52]. Many complex interrelated factors have been found to influence teachers' use of ICT, ranging from the external environment to the personal characteristics of teachers. To fully understand these factors on a deeper and broader level, it is necessary to examine how the social and professional reality of teachers is constructed [34]. Taking into account both social and institutional conditions, we have concluded that each teacher goes through a series of mandatory and personalised learning or training activities in order to achieve a certain required level of ICT-literacy and ICT-competencies, which takes time, efforts and/or financial costs.

The empirical part of the study allowed for a comprehensive analysis that revealed a direct correlation between external and internal factors of the spread of ICT in society and the level of ICT proficiency among humanities teachers in terms of the indicators of teachers' personal efficacy (abilities) and self-efficacy (beliefs) to actively participate in ICT-mediated learning environment. Based on this, the authors' scale of gradation of levels of ICT proficiency by humanities teachers was proposed. Taking into account both the survey results and the scale grading, the final outcome of humanities teachers usually correlates with the results obtained in the previous stages, which teachers must go through until they develop "mastery skills" or, at least, "just simply start to properly and correctly use ICTs in their teaching practice" [11].

The authors' scale of gradation of the levels of teachers' ICT proficiency covers six levels of performance, presented from the lowest acceptable to the highest/ mastery level, namely: basic (nominal), normative (standard),



instrumental, conceptual, cultural and analytical. Each level of ICT proficiency achieved over a given period of time is directly related to some new ICT-based knowledge or skills that a teacher is expected to acquire at that particular stage. The assessment of the level of ICT proficiency can be carried out both by external experts in the process of testing skills and performance of teachers in practice, and by teachers themselves in the framework of self-reflection.

The lowest achievement level (basic or nominal) will be graded from 0 to 2 on a twelve-point (12-point) scale. The second (normative or standard) level will be graded from 3 to 4; the third level (instrumental) – from 5 to 6; the fourth (conceptual) level – from 7 to 8; the fourth (cultural) level – from 9 to 10; and the final highest (analytical or “mastery”) level – from 11 up to 12 points. Using this simple 12-point scale, any teacher can rate and measure their ICT proficiency with some additional guidelines and recommendations. Awareness of ICT proficiency will identify gaps, but will also help formulate and build strategies for teacher growth and development.

The lowest level of achievements – basic or nominal – can hardly be assessed at all as teachers have not really made any progress and equally have not developed any ICT-based skills or competencies. However, we rate this level as a minimum of 0-2 points to compensate for the efforts and time of teachers, who tried to get at least the basics of ICT in special courses or on their own but failed to do so to their own detriment. We assume that the negative result could be a consequence of one of the following factors or both: a complete technical illiteracy, or lack of previous experience in using technical or digital means and devices [11, 52]. This certainly sounds a little odd in the midst of the information age, especially if we think that educators and teachers are the target group for our assessment. Other factors can be more complex in nature and depend on either technology (e.g., an “overly complex design of the semantic web technology” [11], “artificial intelligence” or object-oriented programming (OOP), etc.), psychology (e.g., ideological or cultural rejection of ICT), or both. Other limitations may arise from technically difficult instructions; technological instability caused, for instance, by lability or poor connection of the Internet; incompatibility of ICTs with teaching strategies, methods or curriculum, etc.

The second level confirms the acquisition of normative or standard proficiency in ICT, which refers to the skills and competencies necessary for the effective use of all the basic functions of ICTs. However, basic skills are not enough to make full use of ICTs, which could facilitate university education. The third level demonstrates instrumental skills, when the teacher is free to use a computer and other technologies, can download and upload software, use electronic textbooks and other manuals on disks and on the Internet, have basic skills in creating their own electronic didactic materials or other author resources

using templates and their subsequent presentation, etc. The fourth level includes conceptual skills that foster the innovative use of ICT tools and resources in a new web-based context [15]. This allows for the development of various ICT-based learning scenarios, project work, active networking through creative and interdisciplinary collaboration and teamwork [10]. In this way, conceptual skills infuse instrumental skills with new ideas, meanings, and possibilities [11].

The fifth level of achievements focuses on teachers' cultural skills in the field of ICT. Cultural skills combine best values and effectiveness in the use of instrumental and conceptual skills and give rise to the concept of "new culture of learning and teaching" [26]. This sum of individual skills enhances teachers' performance in the academic settings and permits easy transition from traditional teaching/learning modes to student-centered and ICT-based formats through greater autonomy and opportunities given to all stakeholders in the ICT-mediated learning environment of university.

At the apex of achievements in ICT proficiency are analytical skills. This is the highest level of ICT proficiency attainable among humanities teachers, though it is believed that analytical skills should be in the arsenal of every teacher by default. Teachers are expected to make quick decisions about suitability, usability and safety of ICT tools, resources and techniques in education; have wide perception of the latest trends in education mediated by ICTs and digital technologies; have basic knowledge of computer programming allowing them to design, create and implement their own author programmes, educational courses, resources, and applications, etc. Teachers with analytical skills due to their creativity shall know about intellectual property rights and their protection, peculiarities of copyright on the Internet and the alternative licenses, cybersecurity and cyberhygiene allowing protecting personal and sensitive data, etc.

The presented research can serve as a building block in the science of pedagogy, which offers a new vision of roles, skills and competencies of humanities teachers in the ICT-mediated learning environment of university in Russia. The classification of teachers' roles, skills and competencies related to ICT, the authors' diagnostic scale of gradation of levels of teachers' ICT proficiency can be considered as design models, although they can be equally applied in practice and be useful for teachers, educators and university administrators to better understand their new mission, role and place in the educational process, as an integral part of academic life. A holistic approach allowed us to identify and analyse both the external and internal factors affecting the spread of ICT in society and in education and their impact on teachers' ICT proficiency independent of their initial knowledge of ICTs, personal and self-efficacy, age, or gender. Also, the most recognised trends in education mediated by ICT common to Russia, Europe and the rest of the world were determined. Given the

interdependent link between knowledge, technology and networking, a direct correlation between the level of ICT proficiency of humanities teachers and the effectiveness of ICT-mediated learning environment of university was identified, examined, analysed and proved.

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