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On the Question of Pedagogical Digital Competence

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Abstract. Educational institutions develop professional training programs for teachers so they could bring technology into the classroom and take the quality of education to a new level. However, despite the measures being adopted, a number of researchers report unsatisfying results. One of the root causes of this situation seems to be the absence of clear understanding of what the notions of digital competence and pedagogical digital competence are supposed to include. This problem is tightly connected with the problem of creating a framework for the development of digital skills of an instructor. On one hand, there is a demand for universal models that would include a wide range of pedagogical digital skills. There is a demand for universal models, which would include the widest possible range of digital competences of a teacher. Among them there are such existing frameworks as DigiCompEdu, ICT CFT, TETCs, which cover numerous aspects of instructors' work. Meanwhile, there is the lack of models that would structurize the professional practice of a teacher at the micro level of using a digital instrument. There is a necessity for the framework comprising a limited set of primary basic skills which would be universal enough to be applicable to operating any kind of technology. In the article, we propose a version of this type of a framework.

Keywords: digitalization, pedagogical digital competence, teacher development, digital tools, information communication technology, digital skills, professional continuing education

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The educational digital transformation is pervading countries both in the developed and developing world as the result of the globalization process and the Fourth Industrial Revolution [1–3]. There is a growing body of literature on traditional and innovative strategies being applied for promoting digital literacy and accelerating the implementation of information and communication technology (ICT) in educational institutions: stand-alone technology courses, mini-workshops, integration of technology in all courses, collaboration and peer-learning, mentoring and communication with role-models, practicing technology in the field, feed-

back and reflection activities, improving access to software and technical support, establishing technology consulting centers [4–9].

However, despite the abundance of methods employed for the development of professional digital skills of the pedagogic staff at schools and universities, the evidence suggests that teachers' digital proficiency does not change as fast and evenly as it could be expected.

Among the most commonly cited problems associated with the professional development in the field of educational technologies are the lack of the systematic approach to the organization of continuing professional education for teachers [10–11]; the lack of basic ICT skills [12–13]; the prevalence of general technology courses over customized and situated training for teachers of different specializations [14]; the focus of the traditional programs of development for teachers on a limited list of services and applications, which is getting obsolete over time [15–16]; the lack of access to hardware and software at educational institutions [10; 11; 17].

We believe that some of the aforementioned problems can be attributed to the lack of clear understanding what the notion of pedagogical digital competence should constitute and the absence of a practically oriented framework for the development of digital skills.

Definition of pedagogical digital competence

There is a considerable amount of research proving that the term "digital competence" is not well-defined due to a number of reasons: the ever-changing nature of the concept which has been evolving in line with the technological progress; abundance of synonyms and related terms; different interpretations in research and policy documents across countries [18–24].

Here is an example of the definition of digital competence encapsulated in the recommendations of the European Union on key competences for lifelong learning[1]:

"Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competencies related to cybersecurity), intellectual property related questions, problem-solving and critical thinking".

Some observers assume that the term "digital competence" has replaced previous terms like "information literacy" and "media literacy" [13]. Conversely, we hold the view that these are different concepts, and it is necessary to distinguish between digital competence (or literacy) and such related terms as "information literacy" and "media literacy". Following T. Koltay's discussion of digital, information, and media literacies, we tend to believe that despite its complex nature and overlap with information and media literacies, the focus of digital competence is primarily on the effective engagement with digital tools; while the concept of information literacy is built around the ability to perform different operations with information; and the core of media literacy is the ability to work with media and media content [22].

If we finally move on to existing definitions of pedagogical digital competence, we may find out that most of them embody the contemporary understanding of the term "digital competence" in its broader meaning. The shortest and the most general formula is offered by E. Instefjord and E. Munthe, who refer to pedagogical digital competence as a combination of "hard skill" and "soft skill" components: "the ability to integrate and use technology for educational purposes as well as having more generic skills suitable for all situations, both personal and professional" [25, p. 21].

A number of definitions follow the same pattern as they contain an instrumental component (use of digital tools for information search, con-

[1] See Council Recommendation of 22 May 2018 on Key Competences for Lifelong Learning. p. 9. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018H0604(01)&from=EN (Retrieved, April 27, 2020)

tent creation, and communication) complemented by generic competencies, which is supposed to ensure the effective integration of a digital tool into the educational process: critical thinking skills for evaluation of information and selection of appropriate digital tools and teaching methods; the knowledge of psychological and pedagogical basics of digital teaching and learning; positive attitude towards technology [11; 12; 26–28].

By *pedagogical digital competence* we understand a complex of knowledge, skills, and attitudes that enable an instructor to make informed and appropriate choices regarding usage of digital tools and related teaching methods and strategies in a certain educational context, which leads to the improvement of the learning process and satisfaction of learners' and instructor's needs.

The definition of pedagogical digital competence presented above reflects the modern understanding of this term which combines the technical focus with broader perspectives. We have tried to emphasize the necessity of pedagogical, critical and sustainable approaches to the implementation of digital tools in the educational process when teachers need not only to learn how to use a digital instrument but also how to integrate it seamlessly into their professional practice taking into account opportunities and limitations within their specific educational situation.

Pedagogical digital competence frameworks

The aim of the current section is to examine the *six most prominent frameworks* of pedagogical digital competence.

DigiCompEdu appears to be one of the most comprehensive skill-based models outlining the structure of pedagogical digital competence [29]. This is a common European framework for teachers grounded in the analysis of national and international instruments designed for the development of pedagogical digital competence. The model is aimed at a diversity of educational contexts and is supposed "to provide a general reference frame for developers of Digital Competence models" [29, p. 4].

DigiCompEdu consists of six groups of skills: 1) professional engagement; 2) digital resources; 3) teaching and learning; 4) assessment; 5) empowering learners; 6) facilitating learners' digital competence [29]. Groups 2, 3, 4 make the core of the framework, which includes both instrumental and soft skills needed for the creation and usage of digital resources, management of the learning process, and performing the assessment. Groups 1 and 5 include organizational skills for collaboration with different actors of the educational process (learners, colleagues, parents, and other interested parties), personalization of the learning process in the digital environment, improvement of accessibility (including learners with special needs) and learners' active engagement with a subject matter. The sixth group of skills is learner-oriented as it implies that a digitally competent instructor is supposed to provide activities for learners to acquire such digital skills as information search and critical evaluation of information, online communication and collaboration, content creation, troubleshooting, responsible and creative use of technologies. As it is stated in the report, *DigiCompEdu* is supposed to be an open framework, which is subject to further development and not intended to limit or prescribe teaching practices in different countries or institutions.

Another example of a comprehensive pedagogical digital competence framework is *UNESCO's* ***ICT Competency Framework for Teachers*** *(ICT CFT)* [30]. Similarly, this is a skill-based framework that takes the form of six groups of skills: 1) understanding ICT in education policy; 2) curriculum and assessment; 3) pedagogy; 4) application of digital skills; 5) organization and administration; 6) teacher professional learning. Unlike *DigiCompEdu*, *ICT CFT* is more concerned with the educational change, transformation and leadership. Therefore, this framework seems to have a broader focus.

The advantage of these two models appears to be their inclusiveness, which enables teachers and other actors of the educational process to get a systematic vision of pedagogical digital competence and concentrate on those aspects of

their practice that they find interesting or underdeveloped.

The TPACK framework *(Technological Pedagogical Content Knowledge)* developed by P. Mishra and M. J. Koehler is a skill-based model, which accentuates the need for the integration of all the components of pedagogical digital competence: knowledge of a discipline (*content knowledge*); knowledge of the methodology of teaching (*pedagogical knowledge*); and knowledge of hardware and software (*technological knowledge*) [31]. The authors of the model argue that the meaningful application of technologies in the educational context is impossible without developing the competencies at the intersection of these three areas. Teachers need to learn which technologies are suitable for their subject (*technological and content knowledge*); the basic principles, methods, and techniques for utilizing technologies in the educational setting (*technological and pedagogical knowledge*); methodology of using technologies for teaching a particular discipline (*technological, pedagogical, and content knowledge*).

The TETCs *(Teacher Educator Technology Competencies)* has been designed specifically for the specialists in an educational institution who are responsible for professional teacher development [32]. However, if modified, it can be considered resourceful for developing teachers' digital skills. This skill-based framework appears to be premised both on the comprehensive models mentioned above and the *TPACK* because apart from the similar components (design of content, communication and collaboration, assessment, continuous professional development, etc.), the authors of the framework point out more directly to the necessity for teachers to develop their competencies at the intersection of the three knowledge areas and be able to select and use content-specific technologies as well as appropriate pedagogical methods and strategies.

In their model of pedagogical digital competence, R. Krumsvik and L. Jones tried to present teachers' digital skills as a hierarchy and establish the correlation between the levels of digital proficiency (practical dimension) and the levels of experience (mental dimension) [12]. According to R. Krumsvik and L. Jones, a teacher is supposed to complete the following steps towards digital proficiency: 1) basic ICT-skills; 2) pedagogical knowledge of ICT usage; 3) using digital learning strategies for professional self-development and teaching ICT to students; 4) developing ethical considerations regarding the use of ICT in education. It is apparent that the proposed model should be perceived as an abstract representation of the pedagogical digital competence structure because the steps enumerated above may overlap and happen parallelly and unevenly in practice. Another point is that each of these steps may not necessarily correlate with the "mental" stages described by R. Krumsvik and L. Jones: *adoption, adaptation, appropriation,* and *innovation.* For instance, a person might appear to be more innovative at some middle proficiency level than a more advanced individual because his or her vision is not filtered with acquired knowledge, stereotypes, and habits.

Nevertheless, this framework puts forward the problem of perception of digital technologies by teachers that requires further research and consideration in terms of scaffolding, since the rejection of educational technology by instructors is not rarely cited as one of the reasons for the unsuccessful implementation of ICT in educational institutions.

The SAMR *(Substitution, Augmentation, Modification, Redefinition)* is an example of a procedure-based framework, which shows a scale of operations reflecting the extent to which a digital instrument is incorporated in the teaching practice [33; 34]. This framework illustrates how exactly instructors can incorporate digital technologies into their professional activities starting with the enhancement procedures of *substitution* and *augmentation* (e.g., simply converting some activity into an electronic form or using online exercises in addition to traditional studies) and coming to *modification* and *redefinition* (e.g., moving one's traditional course online or producing an original online course which could not be created without digital technologies).

Thus, the *SAMR* is an example of the framework which is oriented to a greater extent to structuring of the teachers' experience at the micro level (the level of the direct application of digital technologies) and, consequently, it is more convenient to use as a practical guide.

In the section that follows, we make an attempt to propose a comprehensive model of pedagogical digital competence adapted from a communicative competence framework to demonstrate what combination of instrumental and non-technical skills an instructor should have at the micro level of teaching with digital tools.

Pedagogical digital competence and a communicative competence framework

The review of the definitions and frameworks in the previous sections proves that there has been a significant shift of the focus from ICT to non-technical skills in the structure of teachers' digital competence.

In this paper, we use a communicative competence framework for the purpose of building a pedagogical digital competence model that would tell a teacher, which aspects he or she needs to take into account when learning to operate a new tool.

One can draw parallels between the debate concerning the development of communicative competence of foreign language learners and pedagogical digital competence. It was Dell Hymes who introduced the theory of communicative competence in which he explained that linguistic competence (i.e., operational knowledge of the language system) is not sufficient to speak [35]. It is important to relate one's language behavior to the social situation in which it is used. As a result, a number of communicative competence frameworks were developed, where linguistic competence is complemented by other components.

In order to offer our version of pedagogical digital competence, we draw on J. van Ek's communicative competence framework [36]. It consists of the following elements:

1) linguistic competence (knowledge of the language system);

2) socio-linguistic competence (ability to choose and interpret language forms depending on a communication situation);

3) discourse competence (ability to produce and interpret texts);

4) strategic competence (ability to use strategies to cope with communicative breakdowns);

5) socio-cultural competence (knowledge of socio-cultural implications of language forms and ability to communicate in different linguistic communities);

6) social competence (the ability to interact with other people, which involves handling social situations, empathy, motivation, attitude, and self-confidence).

In this taxonomy, linguistic competence is characterized by J. van Ek as the basis of the communicative competence [36]. Socio-linguistic, discourse, and strategic competencies are described as content-specific skills, while socio-cultural and social competences belong to the wider context of pursuing general educational aims, with all the components overlapping and developing parallelly. Socio-cultural and social skills are considered not mere additional elements but an integral part of communicative competence. With due regard to these peculiarities of J. van Ek's framework, below we present our model of pedagogical digital competence, where the links between the two models should be deemed conventional to a large extent, since the practice of speaking a language does not equal to the practice of operating a digital tool.

I. Technical dimension.

Instrumental competence (equivalent to linguistic competence). The knowledge of the structure and functions of a particular tool (e.g., knowing which features a webinar room has and how to use these features). The ability to explain to students how to use a particular tool.

Contextual competence (equivalent to socio-linguistic competence). The knowledge of pedagogical situations in which the application of a certain tool would be appropriate (e.g., knowing that chats are more suitable for a quick conversation, whereas discussion boards are better for intensive discussions).

Content competence (equivalent to discourse competence). The ability to produce content in accordance with the functionality of a tool (e.g., building an online course in an LMS or producing a script of lecture for a webinar). Being aware of ethical and legal issues in connection with content production. The ability to teach students to provide content with a given tool.

Strategic competence (equivalent to the strategic component of a communicative competence). The ability to do troubleshooting both in terms of managing a tool and using different communication strategies when interacting with learners (e.g., being able to fix audio problems during a webinar; if a student cannot join a webinar, offer a solution using other digital tools). Being aware of security issues and being able to protect oneself and promote safe behavior among learners. The ability to teach students to do troubleshooting on their side.

Differentiation competence (equivalent to socio-cultural competence). The ability to adapt one's teaching to satisfy needs of different groups of students (students at different levels of education, international students, students with special needs) either by means of digital tools or in the process of using a particular tool (e.g., using a "flipped classroom" technique for international students with the low proficiency in the language of their country of studies).

II. Pedagogical dimension.

Pedagogical competence (an additional component). The knowledge of the range of tools that can be used for educational purposes both across different disciplines or within a specific subject. The ability to analyze an educational context critically and define suitable digital tools, use appropriate teaching techniques, methods, and approaches to design learning experience with the help of the tools, select relevant assessment strategies. The ability to use different learning formats, including online and blended learning, employing various scaffolding strategies, promoting learner autonomy.

III. General dimension.

Social competence (equivalent to the social component of communicative competence). The ability to collaborate with students, colleagues, and other actors in the digital environment. Demonstrating a positive attitude towards the professional practice involving educational technology, stimulating learners to adopt it, showing empathy and patience in case there are technical and communicative failures, being aware of cyber-ethics.

Study competence (an additional component). The ability to develop a set of scaffolding techniques to help oneself and students to learn new educational technology in a faster and more effective way. The orientation at the participation in professional communities for the purpose of developing new digital skills and sharing best practices. Practicing reflection on one's professional digital experience.

Thus, the proposed version of the pedagogical digital competence model consists of the three dimensions (*technical, pedagogical, general*) which include both the equivalents of communicative competence components and newly added constituents (*pedagogic and study competencies*).

We have placed the skills in the order of importance. The first group is supposed to be a "technical core" of the model, including instrumental (the very basic component), contextual, content, strategic, and differentiation competencies, which describe the knowledge and skills that are not abstract but directly attached to the application of digital tools.

Secondly, the pedagogical component highlights the professional aspect of pedagogical digital competence. Moreover, pedagogical competence is supposed to reflect the ideas embedded in the *TPACK* framework, as soon as we stress here the importance of knowledge at the intersection of content, pedagogy, and technology.

Thirdly, the general dimension of the model includes social and study competencies: social interaction, attitudes, experiences, professional self-development, and ethics.

Then, we take into account the double nature of pedagogical digital competence and include into the description of components not

only the abilities for handling digital tools but also the ability to teach students how to do this.

Thus, in our paper, we have tried to look at pedagogical digital competence through the lens of the previously constructed frameworks and the communicative competence model in order to define and demonstrate those basic skills that one needs to acquire to be able to teach with educational technology effectively.

Conclusion

In this paper, we have analyzed current views on pedagogical digital competence and proposed our definition that focuses not only on technical skills but also on the pedagogical dimension, critical attitude, and sustainable use of technology taking into consideration the educational context and needs of learners and teachers.

The structure of the framework for the development of teachers' digital competence presented in the essay correlates with this definition. We have reviewed a number of existing frameworks and offered the model which is composed of the integrated technical, pedagogical, and general dimensions covering a set of skills directly attached to the practice of implementation of digital tools.

The proposed framework is open for modifications and further research. It may serve as a base for the design of subject-specific frameworks and frameworks for different levels of education; the creation and approbation of activities for developing pedagogical digital competence; studies in the sphere of application of digital instruments for teaching different groups of students, including international students, students with special needs, and gifted students.

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Аннотация. *В учебных заведениях по всему миру предпринимаются меры для повышения квалификации преподавателей в сфере новейших образовательных технологий. Однако, несмотря на предпринимаемые усилия, уровень цифровой компетенции педагогов по-прежнему остаётся невысоким. Одной из причин этой ситуации, на наш взгляд, является отсутствие чёткого определения понятия "цифровая компетенция" и, как следствие, понятия "педагогическая цифровая компетенция". С этой проблемой тесно связана задача создания модели цифровых навыков преподавателя. Есть потребность в универсальных моделях, которые бы включали как можно более обширный список цифровых навыков педагога. К числу таких моделей, охватывающих различные аспекты педагогической практики, можно отнести рассматриваемые в данной статье модели DigiCompEdu, ICT CFT, TETCs. Однако также ощущается недостаток моделей, которые бы структурировали работу с цифровыми технологиями на микроуровне, т.е. на уровне использования того или иного инструмента для осуществления образовательного процесса. Требуется такая модель, которая бы, с одной стороны, описывала ограниченный набор первостепенных навыков, необходимых преподавателю (в особенности на начальном уровне цифровой грамотности), а с другой – была бы применима к процессу освоения любого цифрового инструмента. В статье предложен вариант такой модели.*

Ключевые слова: *цифровизация, педагогическая цифровая компетенция, повышение квалификации преподавателя, цифровые инструменты, информационно-коммуникационные технологии, цифровые навыки, дополнительное профессиональное образование*

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