3D MAPPING UKRAINIAN DIGITAL EDUCATION

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Abstract

This paper seeks to report on the current state and attitudes towards digital education in Ukraine. The paper introduces the developed 3D mapping of Ukrainian digital education. Moreover, it demonstrates the necessity of profound modification aimed at improving the quality and competitiveness of education, which causes changing the role of academic and teaching staff in Ukraine in accordance with contemporary world requirements. The comprehensive analysis of the state policies and regulatory framework in the field of digital skills and competences was performed. Among those we would like to mention the UNESCO recommendations on information and communication technology competence, the digital competence framework for citizens DigComp 2.0 and the digital competence framework for educators DigCompEdu, and requirements for digital literacy in the United States, in particular the standards of the International Society of Technology in Education (ISTE). As a result of the analysis of these reports and documents, questionnaires were developed for two groups of respondents – university academic and teaching staff as well as their students. The survey was conducted in six Ukrainian universities within the framework of the international Erasmus + project MoPED. The developed 3D mapping indicates the attitude of respondents to three categories: (1) main modern educational trends, (2) use of innovative pedagogical methodologies and appraoches and (3) digital instruments of the educational process. The outcome of the survey shows the level of interest in mastering digital tools and the ability to use them effectively in the day-by-day teaching process. At the same time, it makes possible to compare the attitudes of academic staff of institutions of higher education and students to the above-mentioned categories at the present stage. The study results as well as 3D mapping could be helpful for higher education decision makers and policy makers to respond to current and future education needs.

Keywords: digital technologies; information and communication technologies; digital competency; 3D mapping; educational trends; innovative pedagogical technologies; digital instruments.

1   INTRODUCTION

Today the concept of digitalisation is becoming the holistic process of transformation across different sectors and different areas of our lives. Digitalization of education is an integral part of the digital society as a whole, where the "world of electronic digital devices, technique, systems and the electronic information communication between them"[1] takes place. The education system is significant in the process of digitalization, including "the achievement of the digital reforms of existing and the creation of new branches of the economy, as well as transforming the lifestyle into new, more efficient and modern" [1].

The introduction of digital technologies is important for all levels of education, namely, for the professional development of teachers, educational infrastructure, methodological (pedagogical) and didactic resources, as well as all levels management of the education system.

The national concept of the Digital Development [1] envisages that by 2020 26 digital competences based on the European Digital Competence Framework [2] will be integrated into the school curriculum, more than 50 digital careers will appear in the state register, and the number of secondary school students in the STEM subjects will increase fourfold. As planned in the above mentioned document, 95% of young people will have digital competencies and be able to build a society based on e-democracy.

The European education transformation is performed over distinct actions. The EU digital education system is implemented within the framework of the Europe 2020 Strategy [3] and its leading activities at EU and at national and regional levels: Digital Program for Europe, An Agenda for New Skills and Jobs, and the Innovation Union. In 2015, the European Digital Agenda for Education Organizations [4] was developed. In 2016 the European Platform for Digital Competence for Citizens [2] was updated. The Platform is a framework, which defines the digital competence is required by business structures

and should be provided by education institutions in context of training employees to the modern labour market and content of these training.

Digital teaching and learning is incorporated in the work programme "Education and Training 2020" [5]. It addresses to encourage teachers to create and improve their digital competence and to develop methods of stimulating this process.

All these initiatives promote equal opportunities for all to develop and improve digital competence over lifelong learning approach. Moreover, it aims to build an innovative society, an open and secure digital environment, to solve cybersecurity problems, to promote the attractiveness of investments in the educational infrastructure, and modernization of pre-service and in-service teacher education programs, to contribute to adaptation of the new legislation towards EU digital single market and data economy.

Despite of active actions in this direction, there is a gap between the development of digital society and the teachers' knowledge and skills of digital instruments implementation. Exceptionally the discrepancy between the levels of the digital competence of teachers and the digital competence of university students deserves special attention.

The aim of this paper is present the 3D mapping of digital competence in the Ukrainian education system. It includes the study of awareness (educational trends, innovative pedagogical technologies, digital instruments and willingness to develop and improve the digital competence) of three groups of respondents, namely, teachers of higher education institutions (HEI), students of the Teacher Training Institutions, as well as teachers of secondary school education sector.

2   SPECIFIC CHALLENGE

Proficient training of academia, teacher staff and students of all levels of education will guarantee integration of contemporary digital technologies into educational process.

Digital competence is a new concept that describes technology-related knowledge and skills. Several terms have been used to describe the skills and competencies associated with the implementation of digital technologies, such as ICT skills, technological skills, 21st century skills, information literacy, and digital literacy skills. These terms are also often used as synonyms, including digital competency and digital literacy [6], [7].

There are different definitions of digital competence. Researchers from Finland define the digital competence more widely than the ICT competence concept. It includes basic ICT skills and understanding the process of using digital devices and applications in new and complex situations [8].

In Spain under digital competence they understand the use of computers to receive, evaluate, store, create, submit and share information, including communication and participation in virtual networks. This requires from citizen a critical and reflexive attitude to the available information as well as responsible use of interactive media [9].

The Digital Competency Framework (DigComp) is a conceptual reference model for the development of digital citizenship competence in Europe [10]. It describes what competencies today are needed to use digital technologies in a safe, critical, confident, collaborative and creative ways to achieve sustainable development goals.

"Digital" literacy (or "digital competence") is one out eight EU key competences for high-quality life and work. In 2016, the conceptual reference model of DigComp 2.0 was updated specifying individual areas of digital competence and descriptors relevant to the field [2].

In 2017, the Digital Competence Framework for Citizens was published. Based on the reference conceptual model introduced in DigComp 2.0, eight proficiency levels and examples of use applied to the learning and employment field were presented. Digital competence for citizen includes skills in the digital information and communication environment, understanding and critical assessment of digital and media content, effective and safe use of digital technologies for solving various professional tasks. Therefore, it is responsibility of educators of all education levels from early childhood to higher and adult education, including general and vocational education and training, special needs education, and non-formal learning contexts to prepare citizens with sufficient digital competence. In order to perform such task, every teacher must have digital competence at the highest "highly specialized" level for DigComp 2.1 [10].

DigCompEdu's Framework [11] focuses on educators of all levels. It defines 22 competencies required for modern educators and organized in six areas.

Contents of DigCompEdu are defined by area 2-5 (Fig. 1). Together they form a Educators' pedagogic competence. The pedagogic core of this framework is complemented by areas 1 (Educators' professional competences) and 6 (Learners' competences). The area 1 is aimed at a wider professional environment, i.e., use by educators of digital technology in the professional interaction with colleagues, students, parents and other stakeholders. It involves innovation introduction to society, communication and cooperation, and own professional development. Area 6 is devoted to the specific pedagogical competencies necessary to ficilitate the student's digital competence.
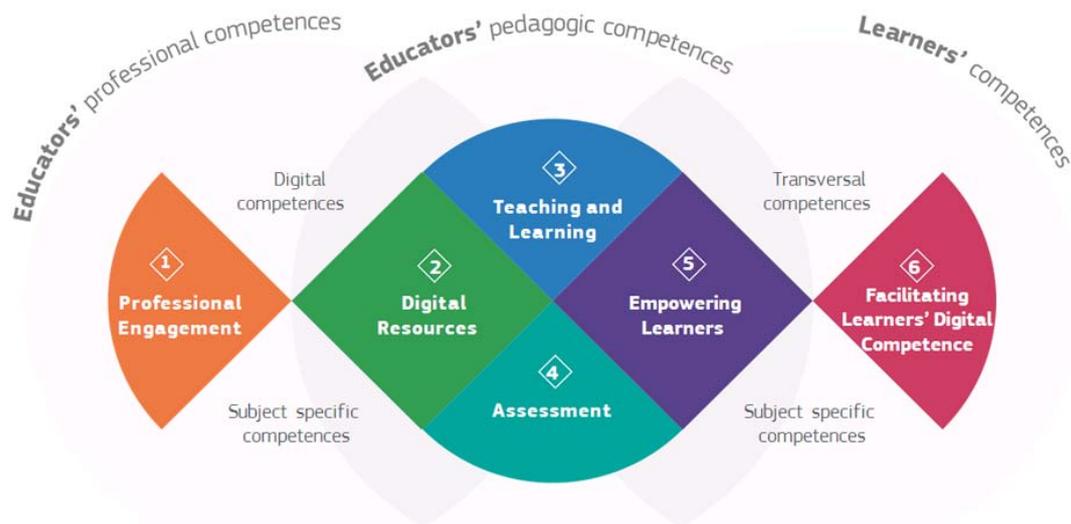

Figure 1. DigCompEdu: 22 educators' competences organized in six areas.

The framework of the teacher's ICT competence based on UNESCO's recommendations encompasses six modules [12]: understanding the role of ICT in education, curriculum and evaluation, pedagogical practices, ICT technical and software tools, organization and management of the learning process, and professional development. These modules covers the types of teacher activity.

Teacher profession requirements update constantly and require new, more sophisticated sets of competences to meet the rapid changes in the information society. The rapid spread of digital devices, their variety and improvement, and the tremendous popularity among students lead to the necessity of revise and modernization of the digital competence of an educator.

3   METHODOLOGY AND RESULTS

The research was organized within the frame of the international project Erasmus + MoPED Modernization of Pedagogical Higher Education on the Use of Innovative Teaching Tools.

For the 3D mapping of digital competence in the education system of Ukraine the analysis of literature and normative documents were performed. Based on this analysis the questionnaires were developed for three groups of respondents: teachers of secondary school education, university teaching staff and students of higher education institutions. Teaching staff and students from six Ukrainian partner universities of the MoPED project as well as teachers of secondary schools from six regions were asked to participate in the created survey. Overall, 769 university teachers, 413 school teachers, and 2055 university students responded. The survey was contacted in different regions of Ukraine, in particular, Kyiv, Ivano-Frankivsk, Luhansk, Odesa, Uman, Pereyaslav–Khmelnitsk, and Cherkasy regions.

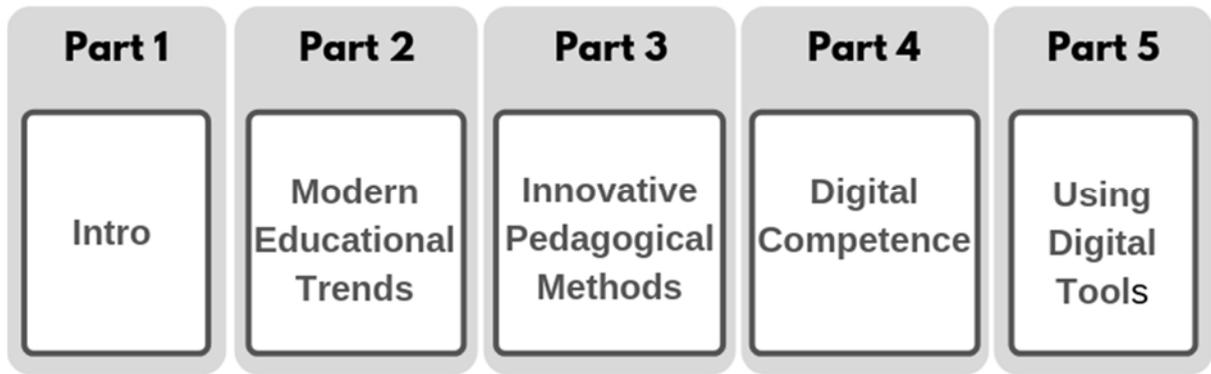The structure of the survey is presented on Fig. 2

Fig.2 Structure of the survey

At the beginning of the 21st century, the socio-cultural development of society determined the consolidation of complex digital transformation trends in the system of university education.

Today, the term "educational trend" has not defined scientifically substantiated. In the study, the concept of "educational trend" interprets as changing the direction of development of educational technologies. Educational trends, consecutively, have a direct impact on educational technologies development as the contemporary learning tools and a set of actions to achieve educational goals.

Taking into account global trends and trends, which are discussed in the framework of education modernization in Ukraine [13], the following trends for study were identified:

1. STEAM (Science, Technology, Engineering, Art and Mathematics),
2. Formation of competences,
3. Personalized learning and adaptive learning,
4. Practical-oriented training aimed at concrete results;
5. Development of research, entrepreneurial and critical thinking,
6. Gamification/game-based learning,
7. Open and inclusive education in formal, non-formal and informal settings,
8. Mobile learning and
9. Modernization of a role of educators

Three groups of respondents were asked to evaluate the 'Levels of Importance' of these trends using the "1 – 10" interval scale (1 - not at all important, 10 - very important). The average mark for each trend is presented on Fig. 3.
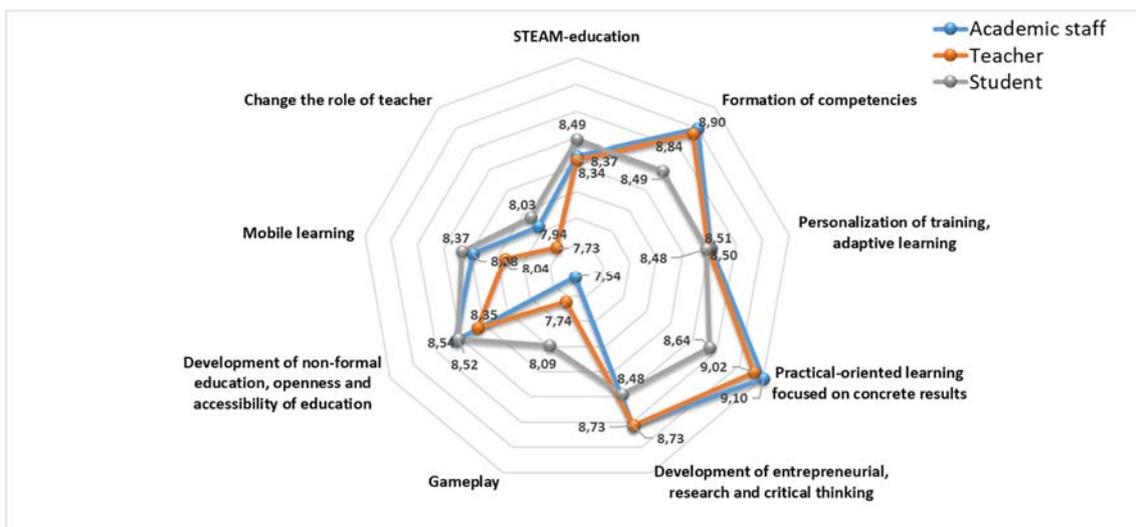

Fig. 3. Significance of educational trends

As a result of a selection of three most significant trends, all three groups of respondents allocated "Practical-oriented learning aimed at concrete results" and "Formation of competencies" (Fig. 4). However, there is a definite gap between the evaluation of some trends by teachers and students, in particular, trends such as open and inclusive education, gamification, personalized learning, and mobile learning are considered by students to be more significant than by educators.
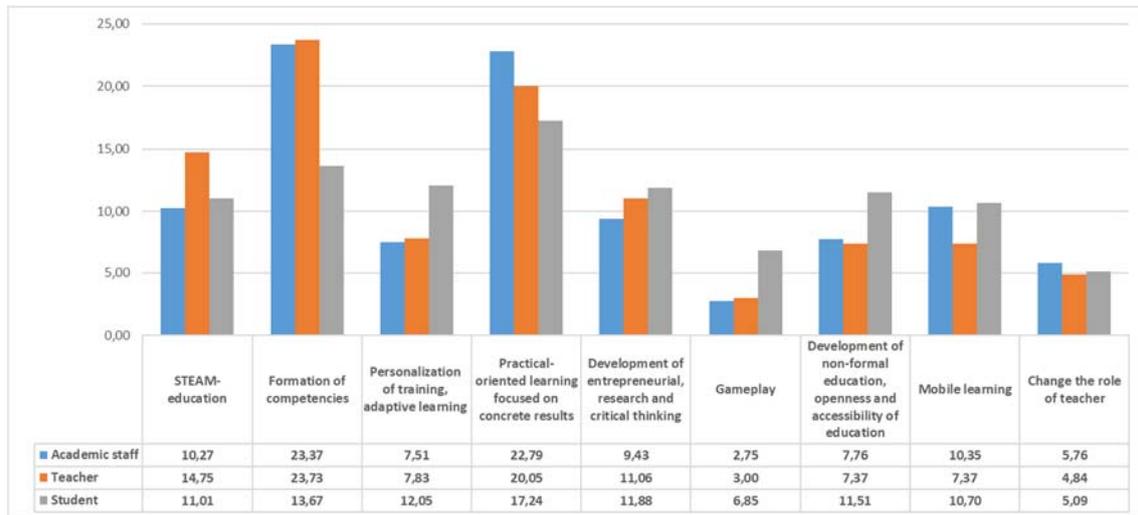

	STEAM-education	Formation of competencies	Personalization of training, adaptive learning	Practical-oriented learning focused on concrete results	Development of entrepreneurial, research and critical thinking	Gameplay	Development of non-formal education, openness and accessibility of education	Mobile learning	Change the role of teacher
Academic staff	10,27	23,37	7,51	22,79	9,43	2,75	7,76	10,35	5,76
Teacher	14,75	23,73	7,83	20,05	11,06	3,00	7,37	7,37	4,84
Student	11,01	13,67	12,05	17,24	11,88	6,85	11,51	10,70	5,09

Fig. 4. Evaluation of the trends (three most important)

For selected educational trends, innovative pedagogical approaches and methodologies have been identified. We will meet the modern requirements for the digital transformation of education taking into account the suggested pedagogical approaches and methodologies:

- Multidisciplinary learning
- Inquiry Based Learning (IBL)
- Project-Based Learning (PBL)
- Collaborative Learning
- Flipped learning
- Virtual, mixed/ hybrid and augmented reality
- 3-D printing
- Media literacy
- Computational thinking
- Problem-oriented learning
- Blended learning
- Bilingual (dual) training
- Peer-assessment
- Learning by making/doing/designing (pedagogical approach based on a creation of a product by students)
- Storytelling
- Inclusive Education
- Microlearning (approach used for skill based learning and education which deals with small learning units)
- Distance/Online/Virtual Education
- Critical thinking approach
- Bring Your Own Device (BYOD)
- Formative assessment
- Serious games and gamification

Three groups of respondents were asked to evaluate the 'Levels of Importance' of the suggested pedagogical approaches and methodologies using the "1 – 10" interval scale (1 - not at all important, 10 - very important). The average mark for each above-mentioned pedagogical approach is presented on Fig. 5.
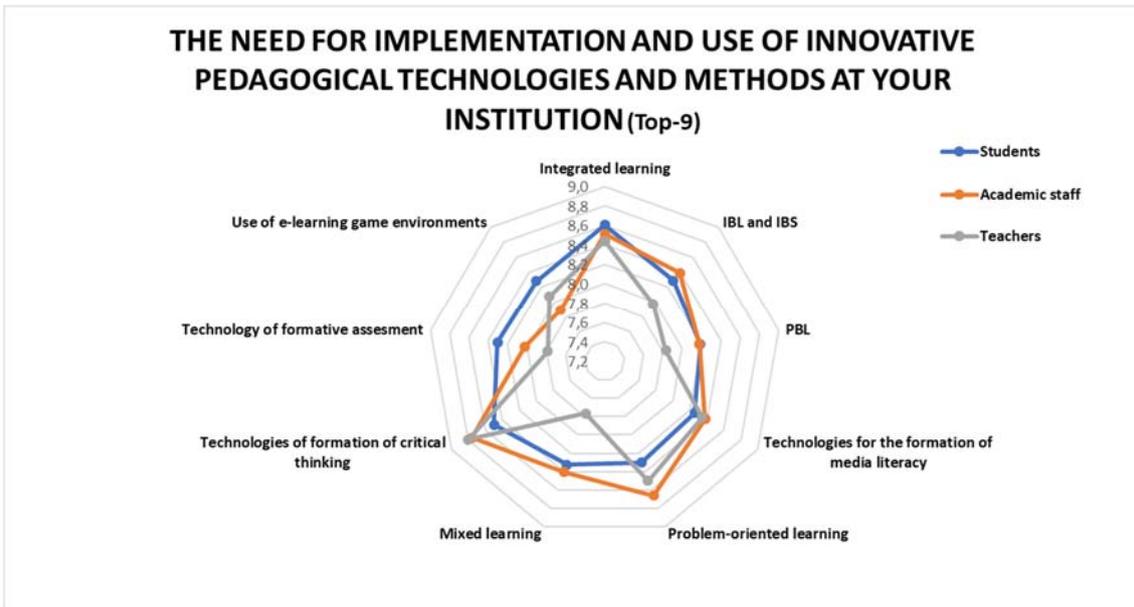
Fig. 5. Importance of modern innovative pedagogical approaches and methodologies

It is worth mention the steady interest of students in employing the proposed methodologies. At the same time, the interest of participated educators is much lower than that of students in the use such as collaborative learning, flipped learning, virtual, mixed and augmented reality, 3D printing, peer assessment, learning by doing, and storytelling. This may be due both (1) the lack of infrastructural and technical resources for the use of technologies such as mixed and augmented reality, 3D printing, and (2) insufficient knowledge and skills to apply these methods and methodologies in the learning process.

The level of interest of survey participants in the possession of and ability of effectively use of digital tools and pedagogical instruments in the educational process is shown on Fig. 6.
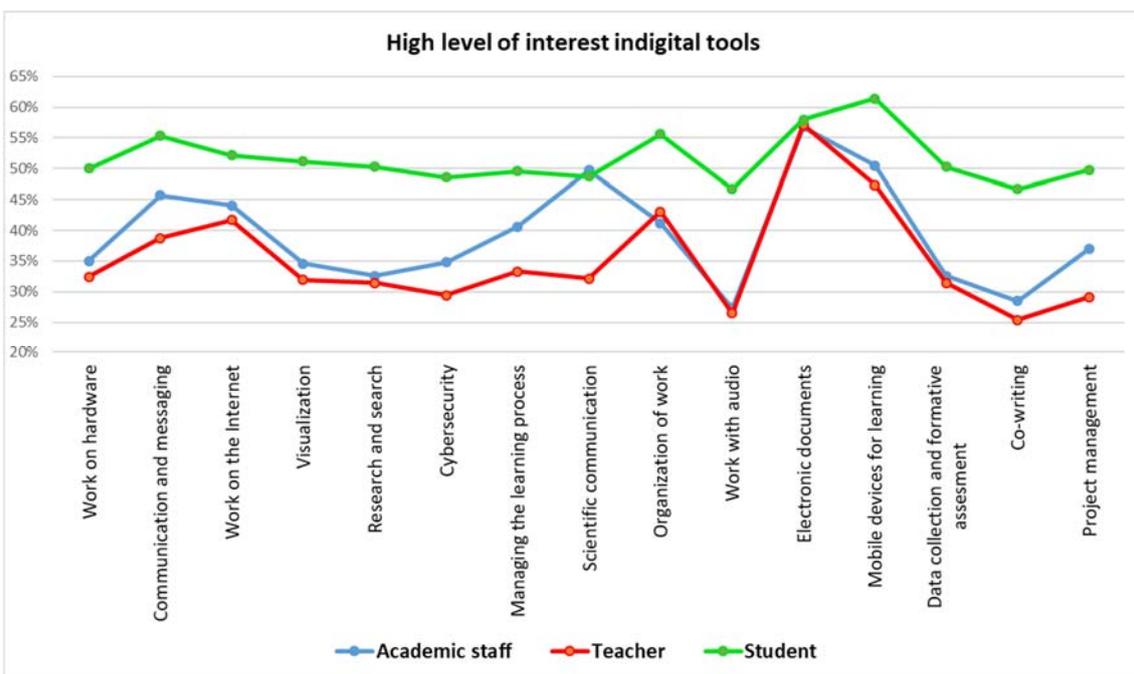

Fig. 6. Interest in using digital instruments

The results show the students great interest to mastering modern digital tools in comparison with their teachers. Therefore, students need to implement and apply the open education resources and ICT instruments to improve the quality of their learning. Moreover, for all survey respondents the mobile

learning is a top attraction for teaching and learning. In contrast to the students, Ukrainian educators show the strong interest in mastering the tools devoted to e-management, i.e., e-documents, e-administration, e-service, etc. In addition, attention is also drawn to a lack of interest of educators to collaborative writing, research & search and communication tools.

4   CONCLUSIONS AND FURTHER RESEARCH

This study demonstrate a gap between *students' interest* in using innovative pedagogical methods, digital technologies, and digital tools in their preparation and formation as professionals, and the *willingness of* participated in survey *educators* to use most of discussed methodologies and tools in their professional activities. Therefore, the results of the study encourage the discover the ways to motivate school and university teaching staff to develop their digital competence proposed in [14], and can serve as a benchmark for the design, development and implementation pre-service and in-service teacher training programs.

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