

Interoperable Digital Skills for Foreign Languages Education in the COVID-19 Paradigm

Rusudan MAKHACHASHVILI

Borys Grinchenko Kyiv Metropolitan University,
Bulvarno-Kudryavska-st., 18/2,
Kyiv, Ukraine

Ivan SEMENIST

Borys Grinchenko Kyiv Metropolitan University,
Bulvarno-Kudryavska-st., 18/2,
Kyiv, Ukraine

Iryna VOROTNYKOVA

Borys Grinchenko Kyiv Metropolitan University,
Bulvarno-Kudryavska-st., 18/2,
Kyiv, Ukraine

ABSTRACT¹

Transformative potential of the knowledge economy of the XXI century, establishment of networked society, emergency digitization due to the pandemic and wartime measures have imposed elaborate interdisciplinary and interoperable demands on the marketability of Liberal Arts skills and competences, upon entering the workforce. The study results disclose the comprehensive review of dynamics of the digital skills development and application to construe interdisciplinary, AI-interoperable competencies of students and educators in Ukraine through the span of educational activities in the time-frame of COVID-19 emergency digitization measures of 2020-2021 and wartime emergency digitization measures of 2022-2024 in Ukraine (including AI-enhanced communication as a staple of transdisciplinary education as of 2023). The study introduces a model of AI-interoperable digital skills for education and professional application in different social spheres. The survey analysis is used to evaluate the dimensions of interdisciplinarity, informed by the interoperability of soft skills, professional communication skills, and digital across contrasting frameworks of e-competence, professional digital communication and pre/in-service teacher training.

Keywords: Interoperability, Interdisciplinarity, Foreign Languages Education (FLE), AI-enhanced Communication; AI-literacy; Digital literacy, Digital skills

1. INTRODUCTION

Transformative shifts in the knowledge economy of the XXI century, Industry 4.0 development and elaboration of networked society, emergency digitization due to wartime measures and the establishment of the AI Age have imposed pressing revisions onto interdisciplinary and cross-sectorial job market demands of Liberal Arts university graduates' skillsets, upon entering the workforce. This, in turn, stipulates reevaluation of the

interdisciplinary approaches to comprehensive professional competences in education and application.

The pandemic induced amplified digitalization measures in the higher education sphere, informed by the need to take quick comprehensive action in order to achieve the overarching result to transform educational scenarios into interdisciplinary digital, blended, and hybrid frameworks. Taking into account the context of the erupted military intervention on Ukraine in February 2022, and the ensuing information warfare in various digital environments (social media, news coverage, digital communications), the specific value of the learning outcomes and outputs is allocated to the digitally enhanced educational communication as a tool of the internationally broadcast strife of Ukraine for freedom and sovereignty.

The study **objective** is to introduce a unique, comprehensive national perspective and data-corroborated research on multi-disciplinary, digital and AI literacies for pre/in-service teachers in Ukraine.

The **study design** includes the following steps:

- 1) The modelling of interoperability between various competency principles, derivative of twenty-first-century skills [4; 7; 9] and projected digital and AI literacy requirements for education across core digital literacy frameworks (European e-Competence Framework [13], UNESCO revised ICT Competence framework for educators [29] and European Commission Digital Competence Framework: DigComp 2.2 [12]);
- 2) The survey method application for diagnostic analysis of different digital literacy components and dimensions, as well as digital skills implementation, used to assess the parameters of efficiency of transforming real-life linguistic education practices into the digital and hybrid format.
- 3) The identification of the interoperability between various groups of applied digital/AI skills and soft skills, instrumental to develop interdisciplinary professional competence.

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The study employs the combination of mixed methods (Almalki 2016) – a proportional arrangement of quantitative and qualitative inquiry to assess in-depth aspects of subjective and individual quality estimation of digital distant, hybrid and AI-enhanced learning.

The survey structure comprised of 16 complex diagnostic questions (multiple choice, criteria comparison and Likert scale score types), divided into the *following categories*: 1) questions on overall assessment of digital and AI literacy level in the framework of wartime emergency; 2) questions on diagnostics of specialists according to the established frameworks of digital/AI competencies and e-skills in the professional field; 3) questions on diagnostics of interoperability of linguistic / communicative / soft professional and digital skills for pre/in-service teachers.

The inquiry is conducted through the consistent study of digitization measures and outcomes for Arts and Sciences education programs in Ukraine, beginning with the timespan of the Covid-19 pandemic and transcending into the crisis paradigm of active warfare in different regions of Ukraine, across different education levels.

The inquiry's main findings disclose global event horizon and paradigm shifts in the interdisciplinary trends of digital education in the Covid-19 timeframe and through the emergency of the warzone in Ukraine; transformative changes of the network society and education as an interdisciplinary, multi-lingual socio-cultural institution in the digital age; experiences, challenges, digital advances and specific national gains in quality assurance of Humanities education in the sustainable and emergency paradigms.

The study results disclose the comprehensive review of dynamics of the digital skills development and application to construe interdisciplinary, AI-interoperable competencies of students and educators in Ukraine through the span of educational activities in the time-frame of the pandemic emergency digitization measures of 2020-2021 and wartime emergency digitization measures of 2022-2024 in Ukraine (including AI-enhanced communication as a staple of transdisciplinary education as of 2023).

2. FINDINGS

Conceptual Grid of the Study

The following grid of groundwork concepts is applied to profile the Foreign Languages Education (FLE) digitization in the COVID-19 timeframe:

- INTERDISCIPLINARITY;
- INTEROPERABILITY;
- DIGITAL LITERACY;
- COMPLEX SKILLS;
- AI-INTEROPERABLE DIGITAL SKILLS.

The meaning of INTERDISCIPLINARITY is synthesized for the purpose of this study as an agglomeration of two or more fields of knowledge into one scope/goal of study, inquiry or activity [2; 6; 14; 17; 20].

The concept of INTEROPERABILITY is disclosed across different approaches [19; 26; 27] as a characteristic of an object, product or system, that allows its interface to be comprehensible, to work with other objects, products or systems.

A model of soft skills paradigms and digital AI-literacy frameworks INTEROPERABILITY in digital education is devised and corroborated through several iterations of surveys in the timespan of emergency digitization of 2022-2024:

- 1) European E-competence Framework Guideline (European Commission, 2021) [13], customized according to European

Professional Competence Framework, accommodates the following soft skills in terms of digital competence requirements for vocational activity in FLE: service orientation; attention to detail, learning strategies, leadership and social influence, cognitive creativity and flexibility, coordination and time-management; human resources management;

- 2) UNESCO AI Competence Frameworks (teachers/students) (UNESCO, 2024) [29], customized for pre-service teachers of foreign languages, accommodates the following types of soft skills in terms of digital competence requirements: collaboration, team-work, problem-solving, reasoning and ideation.
- 3) Digital Competence 2.2 framework (European Commission, 2023) [12] for general public, accommodates the following soft skills in terms of digital competence requirements for efficient digital citizenship: Communication and collaboration, creativity and adaptability, learning and innovation, trustworthiness, emotional intelligence, complex problem solving;
- 4) AI and Digital Transformation Competency Framework (UNESCO, 2024) [28] for public sector, accommodates the following soft skills in terms of digital competence requirements: service orientation; attention to detail, learning strategies, leadership and social influence, cognitive creativity and flexibility;
- 5) Skills in the Age of AI framework (WEF, 2024 [31] for workforce accommodates the following soft skills in terms of digital competence requirements: communication, critical thinking, creativity, emotional intelligence, adaptability, and decision-making;
- 6) Europe's Digital Decade policy program (Digital Decade 2030) [11] for countries accommodates the following soft skills in terms of digital competence requirements: communication; content creation; critical thinking; lifelong learning.

Interoperability for e-skills and AI skills is ensured by the communicative nature [18] of interdisciplinary skills in general. The core cross-sectorial domain that is referential for primary skills (social skills, emotional intellect, collaboration, communication, digital literacy), necessary for educational goals achievement, is estimated to be COMMUNICATION. DIGITAL LITERACY, GEN AI LITERACY in its turn is defined as the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills [5; 10; 28]. Digital literacy and e-skills assessment in the educational context has been subject to academic reevaluation due to the objective conditions of the pandemic global lockdown measures and has been approached through different lens: regional variation in digital literacy level development in education [16]; technological challenges for development of soft skills [21]; challenges and opportunities of e-learning in higher education [1].

The study premise is based on identification of various competency principles, derivative of 21st century skills [4; 7; 9; 11; 24; 31] for education stakeholders and projected digital and AI literacy requirements.

A *complex skill* is generally understood as a skill requiring to process lots of information and make lots of decisions simultaneously [23; 32]. That way, a comprehensive correspondence between 21st century skills framework, Competences 2020 framework [22] and the newly introduced Global Skills 2025 framework [31] has been devised and upgraded.

The interdisciplinary integration between the corresponding

skillsets across various frameworks could be referred to the following key interdisciplinary domains of human activity [23]:

- COMMUNICATION;
- COGNITIVE ACTIVITY;
- PERSONAL INTERACTION;
- SOCIAL ACTIVITY;
- HEURISTICS;
- AI-INTERACTION

Interoperability of Soft Skills and AI Communication in Education

Interoperability for FLE skills ensured by the communicative nature of interdisciplinary skills. The core cross-sectorial domain that is referential for primary skills (social skills, emotional intellect, collaboration, communication, ICT-literacy), necessary for educational goals achievement, is COMMUNICATION.

The digital dimension of communicative interoperability of FLE stems from the structure of Noosphere [30] and content of its components:

- ANTHROPOSHERE - a set of people as living organisms, their activities and achievements;
- SOCIOSPHERE - a set of social factors characteristic of this stage of society development and its interaction with nature;
- TECHNOSPHERE - a set of artificial objects created by man, and natural objects, altered as a result of human activity.

Given the nature of increasingly digitalized context of foreign languages education and communicative application (“the Technospheric shift” [15; 23]), it is suggested to consider the different types of information source and information destination (human and machine/computer/program, accordingly) in the structure of the groundwork Communication model (Cf. Claude Shannon [25]), when communication is approached as the core factor of interoperability of source and target knowledge and application domains – both for human and machine interactive purposes (Fig. 2):

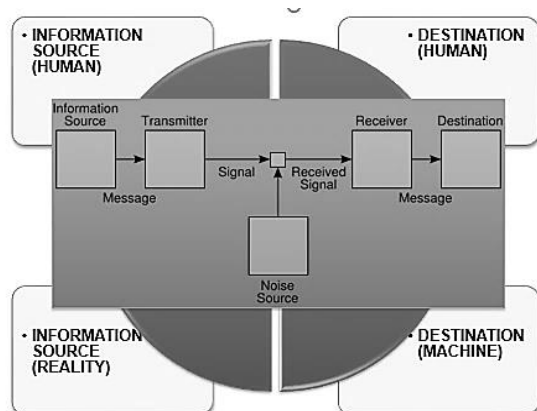


Figure 2: Adaptation of Communication Model to AI-enhanced Context of Education

Therefore, an INTEROPERABLE DIGITAL SKILL for the purpose of this study is defined as a rhisomatic (virally acquired) capability of mutually informed manipulation of digital data, tools, and communication formats, acquired institutionally, intuitively or on the peer-to-peer basis.

Subsequently, the interoperable digital skills for AI-enhanced professional activity are modeled across the knowledge domains of professional activity (as determined by the different competence frameworks) and digital domains of professional literacy (Fig. 3):

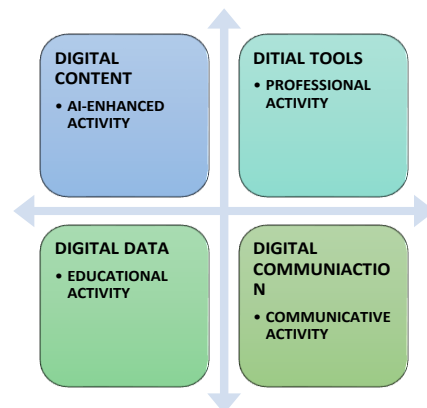


Figure 3: Interoperability Model for Digital/AI skills

The following study aims to identify, among other parameters, challenges for actual and underdeveloped cross-sectorial and interdisciplinary skills (hard, technical and soft), that participants of the foreign languages educational process encountered in programs of European and Oriental Languages through the pandemic emergency digital education measures.

Interoperable Digital and AI Skills for Education: Survey results

A sizable sample of 319 respondents total had been polled across the wartime timeframe (2022-2024).

Diagnostics of specialists in Arts and Sciences according to European e-Competence Framework and estimation of digital skills for professional application - allowed to evaluate of the professional e-competence dimensions among the following: A. PLAN, B. BUILD, C. RUN, D. ENABLE and E. MANAGE professional processes with the help of digital and AI-powered tools and services.

Within the given dimensions the following top scoring professional goals were estimated: 1) Planning of professional processes (with the help of AI) (A) – 61% of respondents; 2) Monitoring of professional activity (with the help of AI) (C) – 50% of respondents; 3) Provision (facilitation) of professional activity (with the help of AI) (D) – 47% of respondents. According to the prioritized professional goals, the followings dominant professional e-competence dimensions are identified: 1) to PLAN; 2) to RUN; 3) to ENABLE professional processes with the help of AI (for communication and education).

The priority types of dominant digital skills for professional application according to the European e-competence framework are estimated as 1) ICT and Gen AI user skills – 75% of respondents; 2) ICT and Gen AI practitioner skills – 74% of respondents.

According to the Likert Scale assessment ICT and Gen AI user skills get a top ranking of 4 (46% of respondents) and ICT and Gen AI practitioner skills get a top ranking of 5 (37% of respondents).

The following specific digital skills for professionals correspond to the prioritized types: 1) ICT and Gen AI PRACTITIONER SKILLS: Skills for language and communication research; Skills for strategic planning of communication; Skills for communicative management; Skills for consulting; 2) ICT and Gen AI USER SKILLS: Skills for the effective application of ICT systems and devices; Skills to apply ICT systems and GPT models as tools in support of one’s workflow; User skills to use of common software tools and of specialized AI tools supporting business functions within professional area of communicative use.

Diagnostics of digital skills for pre-service and in-service teachers according to UNESCO AI Competence Frameworks (teachers/students) – allowed to identify 1) professional activity goals for digital and AI skills application and 2) student-oriented goals of pre-service teachers for digital and AI skills application. The priority (scoring 5-4 on the evaluation scale) professional activity goals for digital and AI skills application are estimated by the stakeholders as: 1) to improve one's own teaching skills with digital tools and AI tools (65% of respondents). 2) to develop learning materials using digital and AI-powered tools (60% of respondents); 3) to understand the role of digital technologies in language generation and AI-mediated communication (59% of respondents); 4) to develop curricula using digital and AI-powered tools (53% of respondents). The priority (scoring 5-4 on the evaluation scale) student oriented goals for digital and AI skills application are estimated as: 1) to help learn independently via digital and AI tools (66% of respondents); 2) to help to become effective participants in civil society through digital and AI tools (61% of respondents); 3) to teach to solve problems with digital and AI tools (59% of respondents); 4) to teach to think critically using digital and AI tools (54% of respondents); 5) to teach to implement different types of communicative activities (oral, written, listening, dialogue, monologue) – 54% respondents; 6) to teach to work in a team / organize collaboration with AI-powered tools (53% of respondents);

It bears pointing out that the dominant students-oriented goals for digital and AI skills application correspond to the generic soft skills, identified across various frameworks: 1) Learning and innovation; 2) human resources management, social intellect; 3) adaptability and resilience; 4) problem solving and critical thinking; 5) collaboration and communication.

3. CONCLUSIONS

The warfare emergency e-learning measures and underlying shift in the digital economy towards the rise of AI informed the comprehensive modelling of interoperability between various competency principles, derivative of the soft marketable skills and projected digital literacy requirements across core digital literacy frameworks.

Digital domain, digital communication and digital, AI-empowered, literacy are assessed as interoperable parameters across different e-competence frameworks, that inform underlying interdisciplinarity of Arts and Sciences education in the timespan of the wartime emergency e-learning measures. Evaluation of digital and AI-interoperable skills for professional application allowed to determine the priority dimensions of professional e-competence as *to plan, to run and to enable* professional processes with the help of AI-powered tools and services. The types of dominant digital skills for professional application of are identified as ICT and AI *user skills* and ICT and AI *practitioner skills*. The demands of digital and knowledge economy job market are not met by the Arts and Sciences curriculum design, as the *e-business* skills are evaluated scoring lowest in priority by stakeholders.

Assessment of digital skills for pre-service and in-service teachers indicated priority professional activity goals and student-oriented goals for digital and AI skills application to be interoperable with such soft skills types as learning and innovation, cognitive flexibility and service orientation.

The dominant AI-interoperable skills acquired are: communication, emotional intellect, creativity, problem solving and innovation. Digital and AI literacy features as a prominent

interoperable skill, facilitating the application of other types of soft skills of the communicative nature.

The perspective of the study is in scaling the inquiry to estimate the dimensions of digital and AI literacy formation for different types of e-learning tools, as well as to diagnose interdisciplinary, AI-powered digitization trends of across countries of Europe.

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