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DEVELOPING EDUCATIONAL COMPETENCIES IN HIGHER EDUCATION: ALGORITHM AND INSIGHTS FROM INTERNATIONAL PRACTICE

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Summary. The evolution of higher education increasingly emphasizes the importance of equipping students with core competencies for personal and professional success. This paper explores an algorithm for fostering educational competencies in higher education learners, leveraging both historical insights and contemporary pedagogical advancements, with a particular focus on the practices of UK institutions. By integrating diverse educational methodologies, we propose a systematic approach to developing effective competencies and present a visual representation of the algorithm. Additionally, this paper examines the Ukrainian higher education system's efforts in competency formation and incorporates analyses of educational practices in Japan and the United States, focusing on how their experiences can inform competency development in Ukraine, especially under the challenges of distance learning due to ongoing conflict. Furthermore, the potential of artificial intelligence (AI) in enhancing the quality of competency formation is evaluated, with recommendations for its integration into the proposed algorithm. The findings offer actionable insights for institutions striving to enhance student outcomes in today's dynamic educational landscape.

Keywords: educational competencies, higher education, pedagogical methodologies, algorithm, distance learning, artificial intelligence.

Introduction. The rapid transformations in global education necessitate a re-evaluation of pedagogical strategies to ensure learners acquire competencies that extend beyond academic knowledge. In an era defined by technological advancements, globalization, and evolving job markets, traditional education models that focus solely on theoretical instruction are no longer sufficient. Instead, a more holistic approach is required—one that fosters essential skills such as critical thinking, problem-solving, communication, creativity, digital literacy, and adaptability. These competencies are increasingly vital in preparing students for complex societal and professional challenges, equipping them to navigate an unpredictable future with confidence and resilience.

This study investigates a structured algorithm for cultivating such competencies, informed by historical

and modern educational practices, particularly those employed in leading UK universities. The UK higher education system has long been recognized for its emphasis on independent research, analytical rigor, and interdisciplinary learning. Institutions such as Oxford and Cambridge employ tutorial-based learning, fostering direct engagement between students and educators, which enhances critical analysis and intellectual curiosity. Additionally, project-based learning (PBL) and problem-based learning approaches, widely implemented in UK universities, encourage students to apply theoretical knowledge to real-world scenarios, thereby strengthening their problem-solving abilities.

Furthermore, this study integrates insights from the Ukrainian higher education system, which has undertaken significant reforms to align with European standards and global trends. In recent years, Ukraine has focused on improving the quality of higher education through competency-based curricula, digital transformation, and international collaborations. The adoption of the Bologna Process framework has facilitated greater student mobility, standardized qualifications, and the promotion of lifelong learning. Despite these advancements, challenges such as bureaucratic constraints, insufficient technological infrastructure, and the need for enhanced practical training remain. Addressing these issues is crucial to ensuring that Ukrainian graduates can compete effectively in the global labor market.

A key component of this research involves analyzing effective pedagogical techniques for competency development. Active learning strategies, such as flipped classrooms, case studies, and experiential learning, have demonstrated their efficacy in fostering deeper understanding and engagement. The integration of digital tools, including virtual simulations, artificial intelligence-driven personalized learning platforms, and online collaborative spaces, further enhances student interaction and adaptability to new learning environments.

Moreover, the role of educators in this transformative process cannot be overstated. Faculty development programs focused on innovative teaching methodologies, interdisciplinary collaboration, and student-centered approaches are essential for fostering a culture of continuous improvement in higher education. Encouraging academic institutions to invest in teacher training, mentorship programs, and pedagogical research will contribute to the overall enhancement of educational outcomes.

The Ukrainian education system's focus on competency formation emerged prominently after its integration into the Bologna Process, emphasizing learner-centered approaches and measurable outcomes. Additionally, the experiences of Japan and the United States offer valuable lessons, particularly in addressing challenges like large-scale distance learning during crises. This paper positions these efforts within a broader framework, showcasing the synergy between historical practices, contemporary advancements, and emerging technologies such as artificial intelligence.

Literature Review. The foundation of competency-based education dates back to early industrialization when universities began aligning curricula with the needs of the labor market. Institutions like the University of Cambridge and the University of Oxford pioneered tutorial systems, emphasizing critical thinking, analytical skills, and personalized learning experiences. These methods fostered independent inquiry and rigorous academic engagement, laying a foundation for modern competency-based education [1; 3; 5].

In Ukraine, the historical development of higher education was closely tied to its cultural and socio-economic context. The 19th century saw the establishment of notable institutions like Taras Shevchenko National University of Kyiv, which prioritized classical education while gradually incorporating practical and professional training. These early efforts underscore the enduring relevance of balancing theoretical knowledge with practical skills [2; 4].

UK universities continue to lead in fostering educational competencies through innovative pedagogical methods. The inclusion of experiential learning, interdisciplinary modules, and robust assessment strategies are hallmarks of their approaches. These practices align with the Competency-Based Education (CBE) framework, which emphasizes measurable outcomes, flexible learning pathways, and active student participation [4; 5].

Similarly, Ukrainian universities have adopted competency-focused reforms. Programs are increasingly incorporating project-based learning, digital literacy, and cross-disciplinary approaches. For example, the Ministry of Education and Science of Ukraine has introduced standards emphasizing key competencies such as lifelong learning, civic engagement, and entrepreneurial skills, reflecting broader European Union educational goals [7; 8].

Artificial intelligence (AI) has emerged as a transformative tool in higher education, offering numerous applications that enhance competency formation. AI-powered adaptive learning platforms personalize the educational experience by analyzing individual learner data to provide tailored content and feedback. Tools such as intelligent tutoring systems can support students in developing specific competencies, such as problem-solving or technical skills, through interactive, real-time guidance.

AI also facilitates improved assessment methods by automating the evaluation of both objective and subjective criteria, such as essays or projects. Advanced analytics enable educators to track progress and identify competency gaps, allow-

ing timely interventions. For distance learning, AI ensures continuity and quality by simulating interactive classroom environments through virtual assistants and collaborative platforms [7].

Despite these advantages, challenges remain in integrating AI into educational frameworks. Ethical considerations, data privacy, and the digital divide are significant barriers that must be addressed to ensure equitable access and use.

While significant progress has been made in understanding and implementing competency-based education, several gaps remain unexplored. These include [3; 8]:

1. Integration of AI in Education: Limited research explores the comprehensive integration of AI tools into competency-based frameworks.

2. Cultural Contexts in Competency Formation: Studies often overlook how cultural nuances influence the development and implementation of educational competencies.

3. Assessment of Soft Skills: Measuring competencies such as adaptability, leadership, and teamwork remains a challenge, with existing methods often criticized for their subjectivity.

4. Sustainability of Competency Frameworks: There is a lack of longitudinal studies assessing the sustainability and adaptability of competency-based frameworks in rapidly changing educational landscapes.

Addressing these gaps would enhance our understanding of competency-based education and contribute to its effective implementation globally.

Methodology. The study employs a mixed-methods approach, integrating qualitative analyses of pedagogical strategies in UK, Ukrainian, Japanese, and U.S. higher education systems and quantitative assessments of their effectiveness. Data sources include academic publications, institutional reports, government directives, and surveys from students and educators in these contexts. The qualitative component of the study involves a comparative analysis of teaching methodologies, instructional design, and curriculum structures across these diverse educational systems. Interviews with educators and policy-makers provide further insights into the challenges and successes of implementing competency-based learning.

On the quantitative side, the study gathers statistical data on student performance, engagement levels, and employability outcomes. Surveys and structured questionnaires are distributed to students and faculty members to assess perceptions of various pedagogical strategies. Additionally, standardized assessment tools are used to measure skill development in areas such as problem-solving, adaptability, and digital literacy. Data triangulation ensures the reliability and validity of the findings, allowing for a comprehensive evaluation of educational methodologies.

Moreover, this research applies longitudinal tracking methods to analyze the long-term impact of different teaching approaches on career readiness and professional success. By following cohorts of graduates over time, the study aims to identify correlations between specific pedagogical strategies and real-world competencies. The use of data visualization techniques, such as heat maps and regression analysis, further enhances the interpretation of results, providing actionable insights for educators and policymakers.

Results and Discussion. The algorithm comprises six interconnected phases [1–8]:

1. Assessment and Goal Setting

– Evaluate learners' initial skill levels using diagnostic tools tailored to their educational and cultural contexts.

– Define specific, measurable competency goals aligned with academic and career aspirations, incorporating input from educators and industry stakeholders.

2. Curriculum Design

– Incorporate interdisciplinary content to promote diverse perspectives and ensure relevance to global and local challenges.

– Embed practical and collaborative activities, including internships, simulations, and group projects, to enhance real-world applicability.

3. Implementation

– Utilize active learning techniques, such as problem-based learning (PBL), flipped classrooms, and collaborative online platforms.

– Integrate digital tools, including learning management systems and virtual simulations, to facilitate personalized and interactive learning experiences.

4. AI Integration

– Employ AI-driven adaptive learning platforms to personalize educational experiences.

– Leverage AI for advanced analytics to track learner progress, identify competency gaps, and inform instructional strategies.

5. Evaluation and Feedback

– Implement formative and summative assessments, including peer reviews, self-assessments, and AI-supported evaluations, to gauge progress and competency development.

– Provide constructive feedback through structured mentoring sessions and AI-generated insights.

6. Reflection and Iteration

– Encourage learners to reflect on their experiences, achievements, and challenges, fostering self-awareness and adaptability.

– Adjust methodologies and goals based on reflective insights, feedback, and emerging trends in both global and regional education landscapes.

A schematic representation of the algorithm is provided in Figure 1, illustrating its application across diverse educational contexts, which is visu-

alized using artificial intelligence [9]. This representation enables a deeper understanding of how the algorithm functions in practice, demonstrating its adaptability to different learning environments and pedagogical frameworks. By leveraging AI, the visualization dynamically integrates real-world data, ensuring its relevance to contemporary educational challenges and fostering a more interactive and personalized learning experience.

At the same time, this visualization is, in our opinion, a fairly presentable, creative model, but difficult to comprehend and clearly structure the essence of the algorithm. Therefore, we offer a simplified diagram, with the main phases of modeling and compiling the algorithm, in Figure 2.

This simplified representation ensures better clarity, making it easier for both educators and learners to understand the key steps involved. By breaking down the process into its core components, we aim to facilitate a more intuitive grasp of the algorithm's logical flow. Additionally, this refined model allows for greater adaptability, enabling modifications based on specific educational needs and institutional requirements.

The integration of insights from the UK, Ukraine, Japan, and the United States underscores the universal relevance of competency-based education while highlighting context-specific strategies. Incorporating AI adds a dynamic layer to this framework, enabling personalized learning, scalable assessments, and efficient competency tracking.

Conclusion. The synthesis of global practices provides a robust foundation for developing an adaptive algorithm for competency formation in higher education. By combining the discipline and technological focus of Japan, the innovative digital strategies of the U.S., the rigorous academic and reflective approaches of the UK, and the potential of AI, Ukraine can optimize its competency development framework to meet current and future challenges. Future efforts should aim to refine this integrated algorithm, address ethical concerns, and explore its applications across diverse educational landscapes. In conclusion, adapting pedagogical strategies to contemporary educational demands requires a multifaceted approach that incorporates both traditional best practices and emerging innovations. By examining the experiences of leading UK universities and

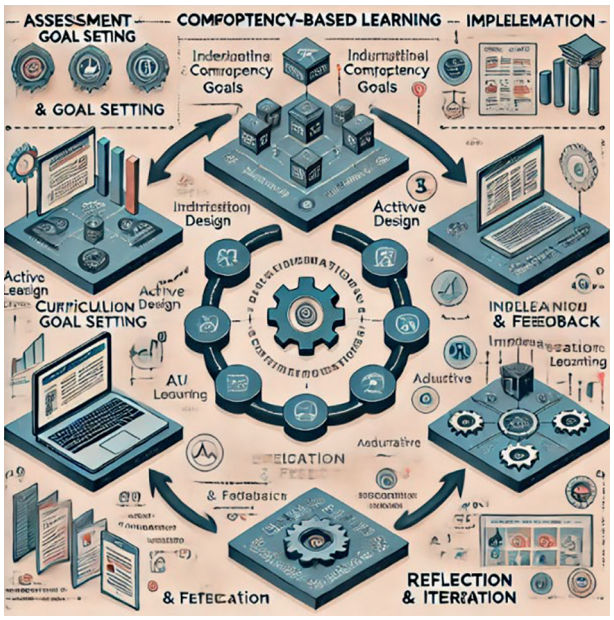

Figure 1. Developing educational competencies in higher education [9]

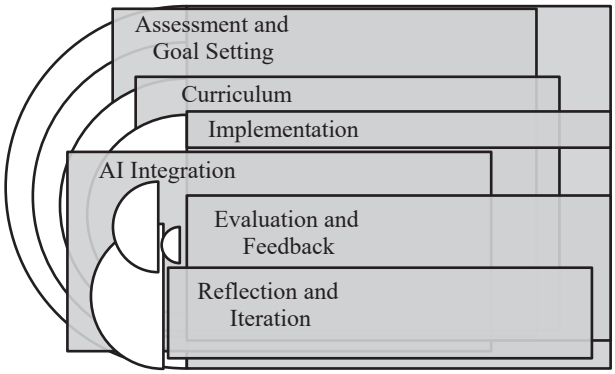

Figure 2. Algorithm comprises six interconnected phases

Source: built by the authors

the ongoing reforms in Ukraine, this study highlights the importance of a competency-based education model. Implementing structured methodologies that prioritize critical thinking, adaptability, and real-world application will not only benefit students but also contribute to the broader advancement of global education standards.

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ЕВОЛЮЦІЯ ОСВІТНІХ КОМПЕТЕНТНОСТЕЙ У ВИЩІЙ ОСВІТІ: АЛГОРИТМ ТА МІЖНАРОДНИЙ ДОСВІД

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Анотація. Еволюція вищої освіти все більше підкреслює важливість набуття студентами основних компетенцій для особистого та професійного успіху. У цьому документі досліджується алгоритм розвитку освітніх компетенцій у здобувачів вищої освіти, використовуючи як історичні знання, так і сучасні педагогічні досягнення, з особливим акцентом на практиці навчальних закладів Великобританії. Інтегруючи різноманітні освітні методики, ми пропонуємо системний підхід до розвитку ефективних компетенцій і представляємо візуальне представлення алгоритму. Крім того, у цьому документі розглядаються зусилля української системи вищої освіти у формуванні компетенцій та включає аналіз освітньої практики в Японії та Сполучених Штатах, зосереджуючись на тому, як їхній досвід може сприяти розвитку компетенцій в Україні, особливо в умовах викликів дистанційного навчання через триваючий конфлікт. Крім того, оцінено потенціал штучного інтелекту (ШІ) у підвищенні якості формування компетентності з рекомендаціями щодо його інтеграції в запропонований алгоритм. Отримані результати пропонують практичну інформацію для закладів, які прагнуть покращити результати навчання студентів у сучасному динамічному освітньому середовищі.

Ключові слова: освітні компетентності, вища освіта, педагогічні методики, алгоритм, дистанційне навчання, штучний інтелект.

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