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IMPROVING THE CURRICULUM DESIGN MODEL BASED ON THE INTEGRATION OF ARTIFICIAL INTELLIGENCE AND A COMPETENCY-BASED APPROACH IN HIGHER EDUCATION

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Abstract: The rapid development of artificial intelligence has changed the logic of curriculum design in higher education. Traditional curricula usually describe subjects, credits and content, whereas modern universities are expected to design flexible learning trajectories that develop professional, digital, social and ethical competencies. This article examines the improvement of a curriculum design model through the integration of artificial intelligence and a competency-based approach. The purpose of the study is to propose a conceptual and methodological model that connects labour-market needs, AI-assisted diagnosis, competency mapping, modular outcomes, student-centred pedagogy and authentic assessment. The research is based on analytical review, comparative synthesis and pedagogical modelling of recent international studies and policy documents. The proposed model demonstrates that AI can support curriculum analysis, prediction of learning gaps, personalization of learning pathways and evidence-based decision-making, while the competency-based approach ensures measurable learning outcomes and practical performance indicators. The article argues that AI integration must remain human-centred, ethically regulated and pedagogically meaningful. The findings may be used by curriculum designers, teachers and researchers who aim to modernize educational programmes in accordance with digital transformation and future labour-market requirements.

Keywords: artificial intelligence, competency-based approach, curriculum design, higher education, learning outcomes, digital transformation, AI literacy.

INTRODUCTION

Higher education is experiencing a deep transformation caused by digital technologies, changing labour-market requirements and the rapid spread of artificial intelligence. Curriculum design is no longer limited to the distribution of subjects across semesters. It is becoming a strategic process through which universities define what graduates should know, what they should be able to do and how they should act in professional and social contexts. In this process, the integration of artificial intelligence and a competency-based approach has become one of the most promising directions for improving curriculum quality. The relevance of the topic is connected with three changes. First, AI systems are increasingly used in teaching, learning, assessment, academic support and institutional management. UNESCO emphasizes that generative AI creates opportunities for curriculum design, teaching and research, but requires human-centred policy, data protection and institutional preparedness [1]. Second, employers expect graduates to demonstrate practical competencies rather than only theoretical knowledge. Third, students need flexible and practice-oriented educational trajectories that develop professional identity, critical thinking, digital literacy, creativity and responsibility.

A competency-based approach makes curriculum design transparent because it connects educational aims with measurable learning outcomes, assessment criteria and real-life professional tasks. However, when competency-based curriculum design is implemented without digital support, it

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may remain formal. Learning outcomes can be written in programme documents, but not always connected with actual student progress or labour-market changes. AI can strengthen this process by helping teachers analyse educational data, identify gaps in learning outcomes, recommend resources and provide timely feedback. At the same time, AI should not be understood as a replacement for teachers or curriculum designers. The European Commission's ethical guidelines underline the need for educators to engage critically and ethically with AI systems [2]. Therefore, the research problem is not whether AI should be used in curriculum design, but how it can be integrated with competency-based pedagogy in a responsible and methodologically justified way.

The aim of this article is to develop a conceptual model for improving curriculum design in higher education on the basis of artificial intelligence and a competency-based approach. The object of the study is curriculum design in higher education. The subject is the integration of AI-assisted tools and competency-based principles in designing and renewing educational programmes. The research tasks are to analyse theoretical views, identify methodological principles, propose an integrated model and discuss expected pedagogical outcomes. The scientific novelty of the article lies in presenting curriculum design as an iterative cycle that combines data-driven diagnosis, competency mapping, modular learning outcomes, AI-supported active learning, authentic assessment and ethical governance. The practical significance is that the proposed model can be adapted for different higher education programmes that need to align their content with digital transformation and future professional competencies.

LITERATURE REVIEW AND METHODOLOGY

Recent literature shows that AI is becoming an important factor in educational reform. The OECD project on AI and the future of skills argues that education systems need a reliable understanding of AI capabilities and their relationship to human skills in order to anticipate changes in work and learning [3]. This idea is directly connected with curriculum design because universities prepare graduates for professional contexts where human and AI capabilities will increasingly interact.

UNESCO's guidance for generative AI in education and research is especially important for this article. It places AI within a human-centred vision of education and stresses institutional policy, privacy protection and ethical principles [1]. The U.S. Department of Education also recommends that AI should enhance teaching and learning while keeping human decision-making at the centre of educational processes [4]. These views show that curriculum design requires academic judgement even when digital tools are used. Research on competency-based curriculum design provides the second theoretical foundation. Cravero, Alvarez, Sepulveda, Valdivieso and Munoz proposed Meta4CBC as a metamodel for competency-based curriculum design in higher education. Their study emphasizes coherence among curriculum levels, alignment of components and a common language for interdisciplinary collaboration [5]. This is significant because curriculum design often fails when programme-level competencies, course outcomes, teaching methods and assessment tasks are not aligned.

Chiu and Chai analysed sustainable curriculum planning for AI education through self-determination theory and noted that curriculum development should include content, product, process and praxis approaches [6]. Although their study focused on school education, its theoretical implications are useful for higher education as well. AI-related curriculum design should not only define content, but also consider teacher readiness, learner agency, ethical values and continuous renewal. Recent studies demonstrate the importance of practical and values-based integration. Zhong, Wei and Mo describe an integrated AI curriculum for graduate students, combining industry needs assessment, curricular reform, professional responsibility and ethical awareness [7]. Chu and Ashraf argue that AI can transform curriculum design through data-driven personalization, predictive

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analytics and better alignment with workforce needs [8]. These studies support the idea that AI can make curriculum renewal more evidence-based.

The present article uses a conceptual-methodological research design. It is not an experimental study with primary statistical data; rather, it develops a model through analytical review, comparative synthesis and pedagogical modelling. The methodology includes four stages: review of relevant policy documents and studies; identification of common principles; integration of these principles into a curriculum design cycle; and pedagogical interpretation of the model in relation to higher education practice. The methodological basis of the proposed model consists of five principles: competency orientation, which requires each curriculum element to be connected with graduate competencies; data-informed decision-making, which uses AI to analyse learning needs and progress; modularity, which allows curricula to be updated; ethical governance, which ensures responsible AI use; and reflective improvement, which treats curriculum design as a continuous process.

RESULTS AND DISCUSSION

The main result of the study is an integrated AI-competency curriculum design model. The model is based on the idea that curriculum design should begin with an analysis of social, professional and learner needs and continue through a cyclical process of competency mapping, modular content development, pedagogical implementation, authentic assessment and continuous renewal. AI is integrated into each stage not as an independent decision-maker, but as an analytical and supportive instrument.

The first stage is needs and labour-market analysis. In traditional curriculum design, this stage is often conducted through expert discussion and review of existing standards. These methods remain important, but they can be strengthened through AI-assisted analysis of job advertisements, professional standards, employer surveys, graduate feedback and qualification frameworks. Such analysis helps identify emerging competencies, including AI literacy, data interpretation, communication, teamwork, creativity and ethical judgement.

The second stage is AI-assisted diagnosis. Institutional learning data, student performance indicators and feedback are analysed to identify curriculum gaps. For example, if students demonstrate weak performance in research writing, digital collaboration or applied problem solving, curriculum designers can revise learning outcomes and teaching tasks. AI-supported diagnosis allows universities to move from intuitive curriculum revision to evidence-based decision-making, while teachers interpret the results pedagogically.

The third stage is competency mapping. The competency-based approach requires every programme outcome to be connected with course outcomes, learning activities and assessment criteria. AI can help compare programme documents, detect repeated or missing outcomes and generate draft competency maps. However, the final validation should be done by academic staff and external experts because a curriculum is successful only when competencies become practical abilities developed through repeated learning experiences.

The fourth stage is modular learning outcomes and content design. A modern curriculum should be flexible enough to respond to technological and social changes. Modular design allows universities to update particular units, add AI-related tasks, include interdisciplinary projects or revise assessment methods without changing the whole programme. AI can recommend resources, create alternative learning pathways and support differentiated instruction.

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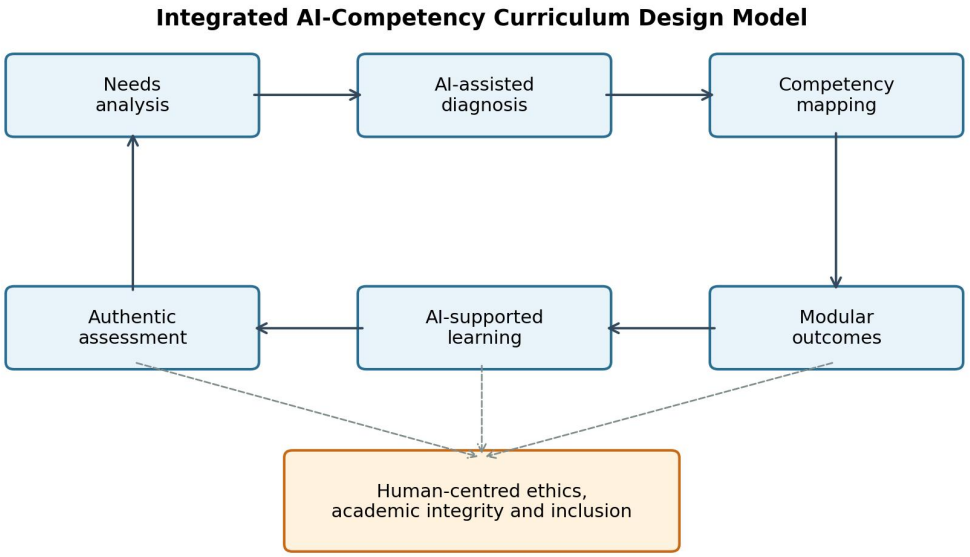


Figure 1. Integrated AI-competency curriculum design cycle

The fifth stage is AI-supported active learning. A competency-based curriculum cannot be implemented through lectures alone. It requires problem-based learning, case studies, simulations, research tasks, collaborative projects and reflective activities. AI tools can support these activities by generating scenarios, offering formative feedback, helping students compare alternative solutions and supporting self-regulated learning. Tasks should require explanation, reflection, oral defence and real-world application, not simple copying of AI-generated answers.

The sixth stage is authentic assessment and feedback. Competencies are best assessed through performance tasks that resemble professional situations. Examples include project design, case analysis, digital portfolio, practicum report, research proposal and problem-solving assignment. AI can help teachers design rubrics, analyse frequent errors and provide formative comments. Yet high-stakes assessment should include human judgement, especially when evaluating creativity, ethics, communication and professional responsibility. The central element of the model is human-centred ethics, academic integrity and inclusion. This component is placed at the centre because every stage of AI-supported curriculum design creates ethical questions. Who owns student data? Are AI recommendations fair? Do all students have equal access to digital tools? How can universities protect academic honesty while encouraging responsible AI literacy? These questions show that AI integration should be governed by institutional rules and pedagogical culture.

The proposed model improves curriculum design in several ways. First, it connects curriculum aims with actual competencies needed in professional life. Second, it strengthens the alignment between learning outcomes, teaching methods and assessment. Third, it makes curriculum renewal continuous because AI-assisted data can show whether students are developing expected competencies. Fourth, it supports personalization by helping teachers provide different learning pathways. Fifth, it encourages ethical and reflective use of technology.

Discussion of the model should also consider possible risks. One risk is technological formalism, where institutions adopt AI tools without changing pedagogy. Another risk is data reductionism, where complex human learning is reduced to numerical indicators. Competency development includes motivation, values, professional identity and creativity; these dimensions cannot be fully measured by

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algorithms. A third risk is inequality if some teachers or students have better access to AI tools than others. To avoid these risks, universities need clear implementation conditions. Teachers should receive training in AI literacy, prompt design, learning analytics, digital assessment and ethical decision-making. Curriculum committees should include teachers, students, employers, IT specialists and quality assurance experts. AI tools should be selected according to pedagogical goals, and assessment policies should define acceptable and unacceptable uses of AI.

The model can be applied in different fields of higher education. In pedagogy, it can support programmes that prepare teachers to use AI responsibly in lesson planning, assessment and inclusive education. In engineering, it can connect technical knowledge with problem-solving and interdisciplinary collaboration. In language education, it can support AI-assisted feedback and translation tasks while preserving communicative competence and cultural sensitivity. A special advantage of the model is that it combines the logic of data and the logic of competence. Data helps reveal what is happening in the learning process, while competencies explain what kind of graduate the programme aims to develop. Without data, competency-based education may become declarative. Without competencies, AI-supported education may become fragmented and tool-centred. Their integration creates a more balanced curriculum design approach.

CONCLUSION

The article has examined the improvement of curriculum design in higher education through the integration of artificial intelligence and a competency-based approach. The analysis shows that these two directions complement each other. The competency-based approach defines the expected graduate profile, learning outcomes and assessment criteria, while AI provides analytical, adaptive and feedback-oriented support for curriculum renewal. Their integration makes it possible to design curricula that are more flexible, personalized, evidence-based and aligned with professional requirements.

The proposed model includes six interconnected stages: needs and labour-market analysis, AI-assisted diagnosis, competency mapping, modular content design, AI-supported active learning and authentic assessment. Ethical governance, academic integrity and inclusion form the central principle of the model. This means that curriculum innovation should not be reduced to technological modernization. It should serve human development, professional competence, social responsibility and lifelong learning. The practical value of the article lies in offering a model that can be adapted by higher education institutions for programme renewal, course design and quality assurance. Future studies should test the model empirically in different fields and evaluate its impact on student competencies, teacher readiness and curriculum coherence.

REFERENCES

1. MIAO F., HOLMES W. Guidance for generative AI in education and research. - Paris: UNESCO, 2023. - 44 p.
2. EUROPEAN COMMISSION. Ethical guidelines on the use of artificial intelligence (AI) and data in teaching and learning for educators. - Luxembourg: Publications Office of the European Union, 2022. - 40 p.
3. OECD. AI and the Future of Skills, Volume 2: Methods for Evaluating AI Capabilities. - Paris: OECD Publishing, 2023. - 180 p.
4. CARDONA M.A., RODRIGUEZ R.J., ISHMAEL K. Artificial Intelligence and the Future of Teaching and Learning: Insights and Recommendations. - Washington: U.S. Department of Education, Office of Educational Technology, 2023. - 71 p.

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HOUGHTON STREET REVIEW JOURNAL
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http://houghtonstreetreview.com/index.php/hsr

5. CRAVERO A., ALVAREZ D., SEPULVEDA S., VALDIVIESO M.-I., MUNOZ L. Meta4CBC: Metamodel for Competency-Based Curriculum Design in Higher Education // Applied Sciences. - 2024. - Vol. 14, No. 22. - Article 10110. DOI: 10.3390/app142210110.
6. CHIU T.K.F., CHAI C.S. Sustainable Curriculum Planning for Artificial Intelligence Education: A Self-Determination Theory Perspective // Sustainability. - 2020. - Vol. 12, No. 14. - Article 5568. DOI: 10.3390/su12145568.
7. ZHONG M., WEI L., MO H. Enhancing graduate AI education through practical and values-driven curriculum integration // Frontiers in Education. - 2025. - Vol. 10. - Article 1630073. DOI: 10.3389/feduc.2025.1630073.
8. CHU T.S., ASHRAF M. Artificial Intelligence in Curriculum Design: A Data-Driven Approach to Higher Education Innovation // Knowledge. - 2025. - Vol. 5, No. 3. - Article 14. DOI: 10.3390/knowledge5030014.
9. DENNY P., GULWANI S., HEFFERNAN N.T., KASER T., MOORE S., RAFFERTY A.N., SINGLA A. Generative AI for Education (GAIED): Advances, Opportunities, and Challenges. - arXiv:2402.01580, 2024.
10. WANG H., DANG A., WU Z., MAC S. Generative AI in Higher Education: Seeing ChatGPT Through Universities' Policies, Resources, and Guidelines. - arXiv:2312.05235, 2023.