Review Article

Jinyan Bai*

Overview and summary of AI competency framework for teachers

https://doi.org/10.1515/gme-2024-0029
Received December 17, 2024; accepted February 17, 2025;
published online March 14, 2025

Abstract: The rapid rise of artificial intelligence has made profound impacts in teaching and learning. In this context, we have hence made an overview of *AI Competency Framework for Teachers* released by United Nations Educational, Scientific and Cultural Organization (UNESCO) in 2024. The framework defines the foundational principles, values, knowledge, and critical skills that teachers should develop to understand the role of AI in education and to utilize it to enhance teaching and learning practices in an ethical, effective, safe and responsible way. The framework outlines competencies for teachers across three developmental levels, emphasizing "human-centered" values that safeguard human agency, accountability, and determination.

Keywords: AI competency; teacher competency development; human agency

Introduction

With its dynamic and rapid development, artificial intelligence (AI) is at the center of public attention and spotlight. AI demonstrates its capacities in processing large amount of information, generating new contents, and assisting in decision-making through predictive analysis. In the field of education, AI will transform the relationship of "teacher and student" into the new type of relationship of "teacher, AI and student". To respond, the United Nations Educational, Scientific and Cultural Organization (UNESCO) has continued to concern with the impacts of AI on education over the past few years and provide guidance for policy and practice.

In 2024, UNESCO released *AI Competency Framework for Teachers* (AI CFT). The framework built on UNESCO's previous work, like, the *ICT Competency Framework for Teachers*, *Recommendation on the Ethics of Artificial Intelligence, AI and education: guidance for policy-makers*, as well as the more recent *Guidance for generative AI in education and research* [1–4]. The framework defined the foundational principles, values, knowledge, and critical skills that teachers should develop to understand the role of AI in education and to utilize it to enhance teaching and learning practices in an ethical, effective, safe and responsible way. The framework emphasized the "human-centered" values, and focused on protecting human agency, accountability and determination [5].

Based on the core values of protecting teachers' rights, enhancing human agency and promoting sustainable development, the framework elaborated on 15 competency blocks for teachers in five aspects. These five aspects included: human-centered mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning. The framework also suggested that teachers' AI competencies were categorized into three levels of progression: acquire, deepen and create [5].

The key principle of AI in education

The AI CFT is anchored in six core principles: ensuring an inclusive digital future, adopting a human-centered approach to AI, protecting teachers' rights and redefining their roles, promoting trustworthy and environmentally sustainable AI for education, ensuring applicability for all teachers and reflecting digital evolution, and lifelong professional learning for teachers [5].

The principle of human-centered approach to AI highlights empowering human-accountable use of AI. Teachers, rather than AI tools, remain accountable for pedagogical decisions. Besides, this principle recognizes human rights to question AI tools' explainability. Teachers need to understand how AI reaches its conclusions and should critically examine the accuracy and relevance of AI-generated outputs. Furthermore, this principle highlights

***Corresponding author: Jinyan Bai**, Center for Teaching and Learning Development, Shanghai Jiao Tong University, Shanghai 200240, China, E-mail: jybjd@sjtu.edu.cn

human-controlled AI impact. Teachers need to develop awareness of design intent behind AI tools and control adverse impacts on student learning and well-beings. In addition, the principle of ensuring an inclusive digital future calls for that AI is used in a way that respects common values such as non-discrimination, sustainability, and inclusion. As well, the principle of protecting teachers' rights recognizes the importance of the protection of teachers' rights and redefining their roles in the context of AI integration. To be substantial, it concretely outlines competencies that enable teachers to maintain control over AI tools and ensure that their professional autonomy is respected. Besides, the trustworthy and sustainable AI principle promotes the use of AI that is trustworthy, reliable and transparent, environmentally sustainable, and aligned with the fundamental educational goals of human flourishing development [5].

These underlying principles reflect a commitment to ensuring that AI is integrated into teaching and learning in a way that is ethical, inclusive, and supportive of human rights and sustainable development. Teachers need to act in the responsible and effective use of AI in educational contexts. Through upholding and adhering to these key principles, teachers at the front not only tend to enhance course teaching and learning but also foster a more equitable and sustainable educational ecosystem.

Five aspects and three progression levels of the AI CFT

The structure of the framework demonstrated in the Figure 1 released by the AI CFT [5] not only delineated five key aspects: human-centered mindset, ethics of AI, AI foundations and applications, AI pedagogy, and AI for professional learning; but also demonstrated three progression levels for development: acquire, deepen, and create.

To illustrate the five aspects respectively, the aspect of human-centered mindset always puts human rights and needs for human flourishing as the focus of AI in education. The aspect of ethics of AI delineates ethical principles, regulations, laws and practical and adaptable ethical rules. The aspect of AI foundations and applications suggests that selecting, applying and creatively customizing AI tools should serve student-centered teaching and learning environments. The aspect of AI pedagogy calls for validating and integrating proper AI tools into pedagogical strategies to support teaching and learning, socialization, and social caring. The aspect of AI for professional learning facilitates the use of AI properly in driving lifelong, collaborative, and transformative professional development [5].

Furthermore, the three progression levels for development: acquire, deepen, and create would be illustrated sequentially. First, the acquire level refers to a set of teachers' AI literacy. In this stage, teachers need to develop and utilize the most fundamental knowledge and skills to understand and apply AI. To follow up, teachers progressing upward to the deepen level can demonstrate proficiency in integrating AI tools into educational practices and ensure safe and responsible use of AI tools. Finally, advancing and sustaining at the create level, teachers tend to explore pedagogically transformative applications of AI in teaching and learning and further design AI-enhanced pedagogical scenarios that enable open learning options [5].

The AI CFT specifications

The framework including fifteen competency blocks served as a reference pathway for teacher progression, outlining the desired values, knowledge, skills and behaviors at each level per aspect. These competencies, structured across three levels, aim to guide teachers from foundational AI literacy to advanced expertise in AI integration.

At acquire level, the AI CFT [5] demonstrates the following aspects: the competency block for human-centered mindset is human agency which implies being aware of the importance of human agency when using AI tools and identifying its impact on human autonomy and rights. Teachers with this competency tend to demonstrate behavioral changes, like, critically examining hype around concrete AI tools through the basic risk-benefit analysis or listing basic tips customized to help protect students' agency when using AI in learning. Regarding to ethics of AI, the competency block is ethical principle which stresses for upholding foundational principles, like "do no harm", non-discrimination, sustainability, inclusion, and protection of privacy [2]. Teachers with this competency tend to surface ethical dilemmas in the use of AI in education from multiple frames and diverse angles. Besides, the competency block for AI foundations and applications is basic AI techniques, that is, acquiring basic conceptual knowledge on AI and/or using validated AI tools. Teachers with this competency tend to experience different types of AI tools to understand different functional features of technological advances. In practice, teachers not only basically learn how specific AI tools are developed, like data labeling and cleaning, algorithm basics, basic methods of processing data to generate outputs or main categories of AI techniques, but also start to establish a personal collection of trustable AI tools relevant to their own needs. Furthermore, in terms of AI pedagogy, the competency block refers to AI-assisted teaching

Aspects	Progression		
	Acquire	Deepen	Create
1. Human-centred mindset	Human agency	Human accountability	Social responsibility
2. Ethics of AI	Ethical principles	Safe and responsible use	Co-creating ethical rules
3. AI foundations and applications	Basic AI techniques and applications	Application skills	Creating with AI
4. AI pedagogy	AI-assisted teaching	AI–pedagogy integration	AI-enhanced pedagogical transformation
5. AI for professional development	AI enabling lifelong professional learning	AI to enhance organizational learning	AI to support professional transformation

Figure 1: The structure outlines 15 blocks of primary aspects on competency for teachers across three developmental levels; data from the *AI Competency Framework for Teachers* (AI CFT) [5].

which implies that teachers could identify and leverage the pedagogical benefits of AI tools while being aware of and mitigate the risks. Teachers start with basic teaching needs and expected learning outcomes embedded in the foundational educational principles. As well, AI-assisted teaching activities, like teaching materials preparation, classroom teaching deliveries or assessments might be designed and implemented. Teachers do not merely use AI tools to access information and standardized tasks and responses but need to move the use of AI toward student inquiry enrichment and capacity empowerment. Furthermore, the competency block for AI for professional learning is enabling professional learning. With this competency, teachers explore the use of AI tools to assess personal professional learning needs and personalize professional learning pathways. Teachers start with the self-assessment of readiness and competency gaps for teaching in the AI era and use validated AI platforms which identify teachers' personal professional learning interests through their inputs and recommend peer mentors and/or training resources [5].

At deepen level, the AI CFT [5] focuses on aspects as below: the competency block for the human-centered mindset is human accountability which implies critically assessing AI's capabilities in facilitating human–AI decision loops, especially making high-stakes decisions in education. Teachers understand and review threats or risks related to absence of human accountability through examining emerging limitations of AI tools, like not being able to make judgements on values, providing the unexplainable hallucinations, or even weakening critical thinking abilities. Regarding the ethics of AI, the competency block is safe and responsible use. Teachers tend to review social and legal consequences of the insecure and irresponsible use of typical AI tools in education. The competency block for AI foundations and applications is application skills, that is, deepening practical skills concerning data & algorithms and critically examining appropriateness of specific AI tools for education. Teachers tend to proficiently operate AI tools adopted in educational settings, learn deeply about how selected AI systems are trained and work, and hence use the "know-how" to initially design AI pedagogy applications, and as well facilitate students to learn data, algorithms and coding. For AI pedagogy, the competency block is AI-pedagogical integration which suggests adeptly integrating AI into transferring from teaching activities to learning activities, like learning engagement, differentiated learning and interactive learning. Teachers tend to integrate specific AI tools which present advantage in facilitating students' use of AI for higher-order thinking, advising on personalized student engagement, facilitating human interaction for social-emotional learning and monitoring learning process. The competency block for AI for professional learning is AI to enhance organizational learning, that is, utilizing AI tools for participation in collaborative professional learning communities. Teachers with this competency tend to utilize human-accountable AI tools to create an AI coach that simulates specific scenarios so teachers practice skills and get feedback, like dealing with students having learning difficulties or solving ethical dilemmas related to the use of AI [5].

At create level, the AI CFT [5] highlights several aspects: the competency block for human-centered mindset is social responsibility, which suggests that teachers actively participate in and contribute to the building of inclusive AI societies and develop a critical understanding of the implications of AI for emerging societal norms. Teachers tend to promote human-centric social cohesion and participate in collaborative efforts to contemplate what an inclusive,

just, and sustainable social order for the AI era may look like. Besides, regarding the ethics of AI, the competency block is co-creating ethical rules, that is, contributing to the co-creation of ethical rules for AI practices in education. Teachers might simulate debates on how to revise and progressively act to create new regulatory frameworks from the perspectives of multiple stakeholders, including policy makers, regulatory agencies, lawyers, researchers, AI companies, teachers, and students. In addition, for AI foundations and applications, the competency block is creating with AI, that is, creating AI-assisted inclusive learning environments. With this competency, teachers tend to adeptly customize or design tools to address inclusive challenges in education, like inclusion of people with different abilities and further create and iteratively update the repository of trustable and self-created AI tools for education that can be shared through school web spaces or publicly. Furthermore, the competency block for AI pedagogy is AI-enhanced pedagogical innovation, which suggests planning and facilitating AI-immersed learning scenarios and leveraging data and feedback to continuously explore student-centered pedagogical innovation as well. With this competency, teachers will focus more on transferring from learning design to scenario design and designing AI-augmented learning scenarios that promote open learning. For example, teachers might facilitate students' use of AI for open and adaptive learning, like project-based learning. In other words, in open learning scenarios, students might have more options to control over their own learning paths, being self-driven and capable of resilient learning, take accountability in making AI-assisted learning decisions, but still ensure time and space for human interactions and reflections. In terms of AI for professional development, the competency block is AI to support professional development, which implies continuously customizing and modifying AI tools to enhance transformative professional development. Teachers tend to lead or engage in collaborative efforts in innovative pedagogical methodologies, co-creation of trustable, accessible, and inclusive AI tools for education, and iteratively updated ethical rules on the use of AI [5].

Discussion and conclusion

While the framework provides a clear and comprehensive roadmap for integrating AI into teaching for teachers, there are three big challenges that may arise during its implementation. The primary challenge lies in providing teachers with high-quality training and professional development opportunities to develop their AI competencies. This requires significant investment in resources, including adequate financial resources, AI software and technological infrastructure, and effective timeline to tap in expertise. Especially, the necessary support provided to teachers is highly demanding to progress from the deepen toward the create level. Besides, the ethical implications of using AI in teaching must be carefully managed. Teachers need to ensure that AI is used in a way that respects human-centered rights and serve for the flourish of human society. This demands teachers' personal professional learning and public awareness as well. Moreover, there may be resistance from some teachers who are reluctant to adopt new technologies or who may feel threatened by the potential changes to traditional teaching roles and practices. Addressing this resistance requires open and caring communication, support, and effective demonstration of the benefits of AI in teaching and learning.

The AI CFT provides a valuable guide for teachers to develop their AI competencies and integrate AI into their teaching practices. However, the successful implementation of this framework requires addressing several challenges, like teacher training, ethical considerations, and resistance to change. To address these challenges, collaborative efforts among educators, institutions, and policymakers are essential to ensure AI aligns with ethical standards and enhance teaching and learning.

Research ethics: The author is conducting an overview and summary of AI Competency Framework for Teachers released by UNESCO in 2024 and do all citations to respect the original article's intellectual property.
Informed consent: Not applicable.
Author contributions: The author made an overview and summary and elaborate the insights on developing teacher competency in the era of AI.
Use of Large Language Models, AI and Machine Learning Tools: None declared.
Conflict of interest: Not applicable.
Research funding: Not applicable.
Data availability: Not applicable.

References

1. UNESCO. UNESCO ICT competency frame work for teachers. United Nations Educational, Scientific and Cultural Organization; 2018. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000265721.
2. UNESCO. Recommendation on the ethics of artificial intelligence. United Nations Educational, Scientific and Cultural Organization; 2022. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000381137.

3. UNESCO. AI and education: guidance for policy-makers. United Nations Educational, Scientific and Cultural Organization; 2022. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000376709.
4. UNESCO. Guidance for generative AI in education and research. United Nations Educational, Scientific and Cultural Organization; 2023. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000386693.
5. UNESCO. AI competency framework for teachers. United Nations Educational, Scientific and Cultural Organization; 2024. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000391104.